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# **JAMB SERIES REMIX**

**From  
1978  
till date**

**Past Questions & Answers**

*On*

# **BIOLOGY**



**COMPILED BY: SAM O. ADEDARA**

*Satisfaction Guaranteed*

## PREFACE

This booklet is specifically designed to address the yearning of students over the years for quality texts that would diligently provide solutions to JAMB/UTME past questions. The solutions herein are accurate, detailed and systemically developed. The questions are not arranged in chronological order of their appearance as JAMB's past questions. It is a topic-by-topic approach geared towards making revision easy for both the teachers and the taught.

This is by no means a substitute for your standard texts although it provides basic facts and figures necessary to do well in your examination while informal gist and hints pervade the entire "bookscape". Students preparing for GCE/WASSCE will also find the booklet invaluable.

**ADEDARA Samuel Olaosebikan**  
February, 2018

## ACKNOWLEDGMENT

Special thanks to the Joint Admission and Matriculation Board (JAMB) for the use of its past questions. We also thank those who contributed in one way or the other to make this publication a reality. To my colleagues who read through the manuscript, your professional touches are highly appreciated. You are the best!

**ADEDARA Samuel Olaosebikan**  
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## HOW TO USE THIS BOOKLET

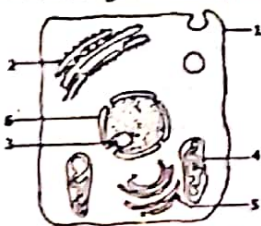
1. Choose a topic of interest for which you have had some background knowledge.
2. Attempt a reasonable number of questions at a time.
3. Grade/assess yourself with the correct options supplied before studying the whys and wherefores of our choices.
4. In most cases, relevant terms are in bold form to call your attention to their importance; matter them.
5. Copious lesson NOTES are aided to save your time; voyaging through your standard textbooks few weeks to your exam might be fruitless.
6. The biological narratives herein are rendered in flowery language characteristic of the descriptive science Biology certainly is.
7. Informal gist and clinically oriented hints pervade the entire "bookscape" to arouse your interest.

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**CHAPTER 1:  
THE CELL ORGANIZATION OF LIFE**

- Which of the following is characteristic of the animal cell?  
A. Presence of chloroplasts B. Possession of a cellulose cell wall C. Absence of large vacuoles D. Presence of large vacuoles E. Presence of chromosomes. (1978:Q13)
- All living organisms A. photosynthesize B. respire C. move D. feed E. transpire. (1979:Q1)
- The vacuole of a plant cell is A. a large empty space B. smaller than that of an animal cell C. filled with air D. an ordinary vacuum E. surrounded by a membrane. (1980:Q4)
- The part of the cell solely responsible for respiration is the A. nucleus B. nucleolus C. mitochondria D. Golgi apparatus E. endoplasmic reticulum. (1980:Q27)
- Which of these combinations is common to plant and animal cells? A. Centriole, middle lamella, Golgi bodies, mitochondrion B. Cytoplasm, sap vacuole, starch grains, leucoplasts C. Plasma membranes, chromosomes, mitochondria, lysosomes D. Nucleus, nucleolus, cellulose cell wall, endoplasmic reticulum E. Cytoplasm, centriole, cellulose cell wall, nucleolus. (1982:Q2)
- Where is energy produced in a cell? A. Nucleus B. Nucleolus C. Lysosomes D. Chloroplast E. Mitochondria. (1982:Q41)
- Which of the following cell constituents is NOT common to both plants and animals? A. Mitochondria B. Chloroplasts C. Ribosomes D. Golgi apparatus E. Vacuoles. (1984:Q7)
- A group of similar cells performing the same function is A. an organ B. a system C. a tissue D. an organelle E. An enzyme. (1985:Q12)
- The function of endoplasmic reticulum is A. protein synthesis B. intracellular transport of materials B. digestion and destruction of foreign bodies D. production of energy from glucose. (1987:Q1)
- The oxidative part of the respiration process takes place in the A. mitochondria B. ribosomes C. endoplasmic reticulum D. Golgi bodies. (1987:Q22)
- The function of ribosomes in cells is A. protein synthesis B. starch synthesis C. transport of materials D. lipid storage (1988:Q1)
- Which of the following structures is common to Euglena, white blood cell and Amoeba? A. Vacuole B. Cell wall C. Cilia D. Cell membrane. (1988:Q2)

Use the figure below to answer questions 13 to 15



- The structure labelled 5 is the A. nucleolus B. Golgi body C. mitochondrion D. vacuole (1989:Q1)
- Which of the labelled parts of the cell contains ribonucleic acid? A. 1 B. 2 C. 3 D. 5 (1989:Q2)

- Which structure is known as the power house of the cell? A. 6 B. 5 C. 4 D. 3. (1989:Q3)

Use the figure below to answer questions 16 and 17

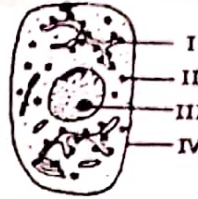


Animal Cell

- Which of the following structures is associated with aerobic respiration? A. 1 B. 2 C. 3 D. 4 (1991:Q1)
- The structure labelled 5 is used for A. protein synthesis B. energy production C. secretion D. excretion. (1991:Q2)
- The organelle involved in tissue respiration is the A. endoplasmic reticulum B. ribosome C. Golgi body D. mitochondrion. (1992:Q1)
- A tissue can best be defined as A. an aggregate of similar cells B. an aggregate of cells performing a similar function C. an aggregate of similar cells performing the same function D. a mixture of different cell types performing the same function. (1992:Q2)

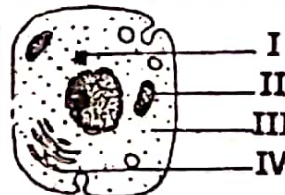
- The membrane surrounding the vacuole in a plant cell is called the A. plasmalemma B. tonoplast C. nuclear membrane D. endoplasmic reticulum. (1994:Q1)
- Which of the following organelles are likely to be present in cells that are actively respiring and photosynthesizing? A. Nucleolus and centrioles B. Mitochondria and chloroplast C. Lysosomes and ribosomes D. Golgi apparatus and endoplasmic reticulum. (1995:Q2)

Use the diagram below to answer questions 22 and 23.



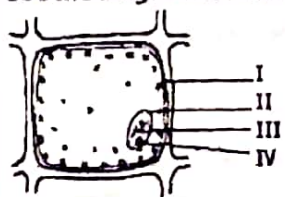
- The structure labelled I is the A. Golgi body B. mitochondrion C. endoplasmic reticulum D. vacuole. (1997:Q1)
- Protein is synthesized in the part labelled A. I B. II C. III D. IV (1997:Q2)
- The nucleus is considered the control organelle of a cell because it A. contains the genetic material B. contains the nuclear sap C. is bounded by the nuclear membrane D. is located at the centre of the cell. (1998:Q)
- The structure that is most commonly identified in all living cells under the light microscope is the A. mitochondrion B. chloroplast C. nucleus D. ribosome (1999:Q5)
- Which of the following is an organ? A. guard cell B. liver C. xylem bundle D. blood (1999:Q6)
- In plant cells, the chloroplasts are located A. inside the cell wall B. outside the protoplasm C. within the vacuole D. within the cytoplasm (1999:Q12)
- Which of the following organisms does not exist as a single free living cell? A. Paramecium B. Volvox C. Amoeba D. Chlamydomonas (2001:Q9)
- An Amoeba and an unlaidd chicken eggs are A. animal tissues B. organelles C. single cell D. organisms (2002:Q1)
- The structures found only in plant cells are A. cell membrane and cytoplasm B. chromatin and nucleolus C. cell wall and chloroplast D. cell membrane and lysosome (2002:Q4)

Use the diagram below to answer question 31 and 32



- The endoplasmic reticulum is represented by the part labelled A. I B. II C. III D. IV (2004:Q1)
- The part labelled II is responsible for A. photosynthesis B. respiration C. protein synthesis D. excretion (2004:Q2)
- The rods in the retina of the eye are examples of A. cells B. tissues C. organs D. systems
- The organelle common to both plant and animal cell is the A. centriole B. plasmalemma C. cell wall D. chloroplast. (2005:Q1)
- Which of the following is likely to have a higher concentration of mitochondria? A. Sperm cell B. White blood cell C. Egg cell D. Red blood cell. (2005:Q2)
- The role of the Golgi complex in a eukaryotic cell is to A. Conduct ions in and out of the cell, B. transport genetic material out of the cell, C. provide attachment for ribosomal granules D. transport organic material in and out of the cell (2006:Q30)

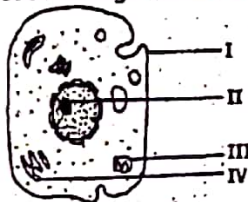
Use the diagram below to answer question 37 and 38



- The organelle responsible for heredity is A. III B. IV C. II D. I (2007:Q40)
- The part labelled I is the A. nuclear membrane B. cell wall C. endoplasmic reticulum D. plasmalemma. (2007:Q41)
- A characteristic that can possibly be shared by both living and non-living organisms is A. locomotion B. irritability C. increase in biomass D. increase in size. (2008:Q2)

40. The cell of an onion bulb can be differentiated from a cheek cell by the presence of A. plasmalemma B. chloroplast C. cell wall D. nucleus. (2008:Q3)
41. What is the level of organization of an onion bulb? A. Tissue B. Organ C. Systemic D. Organismal (2009:Q1)
42. A characteristic exhibited by all living organisms is A. sexual reproduction B. aerobic respiration C. the ability to move from one place to another D. the ability to remove unwanted substances. (2009:Q2)
43. In a cell, the genes are carried by A. nuclear membranes B. chromatin threads C. lysosomes D. mitochondria. (2009:Q3)
44. Which of the following characterizes a mature plant cell? A. The nucleus is pushed to the centre of the cell. B. The cell wall is made up of cellulose. C. The nucleus is small and irregular in shape. D. The cytoplasm fills up the entire cell space. (2010:Q2)
45. Which of the following is NOT a function of the nucleus of a cell? A. It translates genetic information for the manufacture of proteins. B. It stores and carries hereditary information C. it is a reservoir of energy for the cell D. it controls the life processes of the cell (2010:Q3)

Use the diagram below to answer question 46 and 47



46. The organelle responsible for heredity is labelled A. I B. II C. III D. IV. (2012:Q2)
47. The part labelled IV is the A. Mitochondrion B. cell wall C. endoplasmic reticulum D. nucleus. (2012:Q3)
48. The organelles present in cells that are actively respiring and photosynthesizing are A. Golgi apparatus and endoplasmic reticulum B. nucleus and centrioles C. mitochondria and chloroplast D. lysosomes and ribosomes. (2013:Q4)
49. The lowest level of organization in living organisms is A. organ. B. cell C. system D. tissue. (2014:Q4)
50. Which of the following is the most complex according to their cellular level of organization? A. Heart B. Hair C. Euglena D. Hydra. (2014:Q5)
51. Which of the following organisms is multicellular? A. Chlamydomonas. B. Spirogyra C. Amoeba D. Euglena (2014:Q8)

### CHAPTER 1: ANSWERS

- 1C. Animal cell has few, scattered small vacuoles; presence of chromosomes is common to ALL cells.
- 2D. Food for energy and to build body structures.
- 3E. The membrane-bound vacuole contains the cell sap; the membrane is called TONOPLAST.
- 4C. Mitochondria as sites of energy release in aerobic respiration hence are called the "powerhouse" of the cell

#### FUNCTIONAL ORGANELLES

- i. **Nucleus** – central to the cell as it controls all cellular activities; it contains genetic (or hereditary) materials.
- ii. **Nucleolus** (small nucleus) – found inside the nucleus and it synthesizes ribosomes.
- iii. **Golgi Apparatus** (or bodies) – for processing, packaging and transporting secretory granules (as Golgi vesicles); also make Lysosomes.
- iv. **Mitochondria** – see above.
- v. **Endoplasmic reticulum** – Rough Endoplasmic Reticulum (RER) for intracellular transport (especially of proteins made by ribosomes); smooth ones (SER) as sites of lipid and steroid synthesis.
- vi. **Ribosomes** – sites of protein biosynthesis.
- vii. **Lysosomes** – contain lytic or digestive enzymes and involved in breakdown of structures and molecules e.g.

- getting rid of old organelles or digesting bacteria taken into the cell by phagocytosis.
- viii. **Chloroplasts** – contain the green pigment chlorophyll which is involved in photosynthesis.
- ix. **Vacuole** – contains cell sap; may be involved in osmoregulation (as contractile vacuole); may be lysosomal in action.
- x. **Centrosome** (containing Centrioles) – involved in cell division.
- xi. **Cytoskeleton** – helps to strengthen and maintain cell shape.
- 5C. Differences between plants and animal cells. Plant Cell  
Animal Cell
- |                                     |   |
|-------------------------------------|---|
| i. Cellulose cell wall              | ii. No cell wall                        |
| ii. Chloroplast present             | ii. No chloroplast                      |
| iii. No Centrioles                  | iii. Centrioles present                 |
| iv. One large vacuole.              | iv. Few, scattered vacuole.             |
| v. Starch grains as cell inclusion. | v. Glycogen granules as cell inclusion. |

Other organelles including cell surface membrane are common to both.

6E. See Q4. 7B. See Q5

#### 8C. ORGANIZATION OF LIFE

Cells → Tissues → Organs → Systems → Whole organism

9B. See Q4

10A. The non-oxidative part (i.e glycolysis) takes place in the cytoplasm - See Q4 and 6

11A. See Q4

12D. All cells have cell boundary called cell surface membrane. Cell membrane = Plasma membrane = Plasmalemma

13B. 1 → Cell membrane 2 → (RER)  
3 → Nucleolus (in the nucleus) 4 → Mitochondrion  
5 → Golgi body 6 → Doubled-layered nuclear envelope (with nuclear pores)

14C. 3 → Nucleolus

#### NOTE:

1. Nucleolus contains DNA and RNA
2. Nucleus contains nucleolus and Chromatin material.
3. DNA → Deoxyribo Nucleic Acid
4. RNA → Ribonucleic Acid
5. Chromatin → DNA + Histones
6. Histones are basic proteins
7. DNA makes RNA; RNA makes proteins

15C. See Qs 4, 6, 10

16D. See Qs 4, 6, 10, 15

17C. See Qs 4 for Golgi body

18D. See Qs 4, 6, 10, 15, 16

19C. "Tissue" is defined here and see Qs 8

20B. See Qs 3

21B. Glandular or secretory cell would contain numerous Golgi Bodies (See Qs 4)

22C. ER with ribosomes attached is known as RER.

23B. II is free ribosome in contrast to the ER-bound ribosomes.

24A. The genetic material contains specific information for cellular activities and transfer of inheritable characters.

25C. The nucleus being the most easily stained structure as it contains chromatin material ("chromatin" → coloured body)

26B. A → cell C → Tissue D → Tissue Hydra → Tissue

NOTE: The maximum level of organization in hydra is tissue despite being organismal

27D. Cell organelles float in a sea of cytoplasm

NOTE: Cell = Membrane + Protoplasm

Protoplasm = Living component of the cell.

Protoplasm = Nucleus + Cytoplasm.

Cytoplasm = Cytogel + Cytosol

28B. \* A, B and C as free-living organisms.

\* Volvox as a colony.

\* Spirogyra as a filament.

Cheek cell or hepatocyte as part of a whole organism.

29C. These are cellular level of organization.

30C. See Q5 31D. See Q13

- 32B. Mitochondria again!
- 33A. Rods and cones are photosensitive CELLS known as photoreceptors in the eye.
- 34B. See Q 12 for inspiration
- 35A. Sperm cell requires enormous energy to travel through the female reproductive canal and the mitochondria supply this energy. (See Qs 18, 32).
- 36D. A → by ion pumps e.g.  $\text{Na}^+ - \text{K}^+ \text{ATPase}$  pump  
B → makes no sense; genetic materials only move from nucleus to cytoplasm.  
C → by Endoplasmic reticulum, D → See Q 4.
- 37A. III → is chromatin.  
IV → is nucleolus (production of ribosomes).  
I → is cellulose cell wall.  
II → take this to mean nuclear membrane.  
III → is external to plasmalemma (also shown)
- 38A. This is growth
- NOTE:**
1. Living things grow from within by incorporating more protoplasm through feeding.
  2. Non living things grow from outside e.g. a stalagmite or stalactite increases in size in a hot cave by adding new materials to the outside surface.
- 40C. Onion bulb is a plant but it is not chlorophyllous while cheek cell is animal cell - See Q5
- 41D. Onion bulb is a whole organism
- NOTE:**
1. Onion is considered an underground shoot.
  2. But the entire bulb comprises root system + shoot system = organism.
  3. Shoot system = stem (organ) + leaf bases (organ)
- 42D. Excretion prevents the build-up of metabolic wastes to toxic levels in the organism.
- 43B. Chromatin threads condense into chromosomes which bear genes.
- 44D. As a plant cell grows older, deposition of cellulose intensifies and the single vacuole almost completely occupies the entire cell pushing the nucleus to one side of the cell.
- 45C. This is mitochondrial function.
- 46B. See Q 37      47C. See Q 31      48C. See Q 21
- 49B. See Q 8
- 50A. Heart is an organ; hydra is a whole organism but its highest level of organization is tissue level (See Q26)
- 51B. Since Spirogyra is a chain of cells (a filamentous algae)

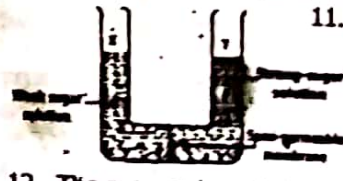
**CHAPTER 2:  
THE CELL AND ITS ENVIRONMENT**

1. A Spirogyra cell was placed in solution X. After 1 minute the cell had been plasmolysed, solution X was A. tap water B. a very strong sugar solution C. a weak sugar solution D. a very weak salt solution E. distilled water. (1978:Q41)
2. The movement of molecules from a region of higher concentration to one of lower concentration is A. diffusion B. transpiration C. osmosis D. translocation E. plasmolysis. (1979:Q7)
3. A fresh kolanut weighing 1g was put into salt solution. After 3 hours, the kolanut weighed 1.2g. This simple experiment demonstrates that A. the salt solution is more concentrated than the cell sap of the kolanut B. the cell sap of the kolanut is more concentrated than the salt solution C. The salt solution has the same concentration as the cell sap of the kolanut D. Kolanut cells can multiply in water E. the kolanut lost some water molecules to the salt solution. (1980:Q13)
4. The filaments of Spirogyra were put into equal volumes of sugar solutions X and Y. After 5 minutes, filaments from X solution had their cell contents rounded up while those from Y were unaffected. The experiment shows that A. solution X was stronger than Y B. solution Y was stronger than X. C. Spirogyra used up the sugar in solution X. D. solution X is good for stimulating sexual reproduction in

Spirogyra. E. solution Y was less contaminated than X. (1980:Q31)

5. If an isolated living cell is left in distilled water for two hours, it is likely to A. lose some of its water to the surrounding water B. lose all of its water to the surrounding water C. reproduce by binary fission D. become more turgid E. die due to excess water.
6. If an isolated living cell is left in distilled water for two hours, it is likely to A. lose some of its water to the surrounding water B. lose all of its water to the surrounding water C. reproduce by binary fission D. become more turgid E. die due to excess water. (1983:Q8)
7. Which of the following will NOT allow osmosis to take place? A. pig's bladder B. Cellophane C. parchment paper D. Transparent polythene E. Cow's bladder. (1983:Q35)
8. When a Spirogyra cell is immersed in a salt solution more concentrated than its cell sap, it A. remains unchanged B. takes up water and bursts C. absorbs a little water D. loses water and shrivel E. becomes turgid. (1983:Q47)
9. Osmosis can be defined as the movement of A. molecules from solution of high concentration to low concentration B. molecules from solution of low concentration to high concentration C. water from solution of high concentration to low concentration D. Water across a semi-permeable membrane from solution of low concentration to high concentration E. water across a semi-permeable membrane from solution of high concentration to low concentration. (1984:Q12)
10. Mineral salts can be absorbed into the roots by A. osmosis only B. osmosis and diffusion C. diffusion and active transport D. diffusion only (1989:Q9)

Use the figure below to answer questions 11 and 12.



11. After 30 minutes, the level of sugar solution the above Figure will. A. rise in X only B. rise in Y only C. be the same in X and Y D. fall in Y. (1991:Q25)
  12. The process by which water moves from X to Y through the semi-permeable membrane is called A. diffusion B. osmosis C. active diffusion D. osmoregulation (1991:Q26)
  13. The process by which a red blood cell placed in distilled water absorbs until it bursts and releases its contents into the surroundings is known as A. osmosis B. plasmolysis C. turgidity D. haemolysis. (1994:Q18)
  14. Salts and water are absorbed in the roots and transported to the leaves by A. diffusion through the xylem tissues B. osmosis through the phloem tissues C. diffusion through the phloem tissues D. osmosis through the xylem tissues (2001:Q27)
  15. When a marine fish was taken from the ocean and put in a tank of fresh water, it died after a short period because A. the tank was too small compared to the large ocean B. the body cells of the fish swelled and burst as a result of the hypotonic fresh water C. the body cells of the fish shrank as their sap was hypertonic to be fresh water. (2002:Q34)
- Use the diagram below to answer questions 16 and 17
16. Yam is used in this set-up because A. it is permeable to the salt solution B. is a plant material C. acts as a storage organ D. acts as a semi-permeable membrane. (2004:Q15)
  17. Which of the following results is to be expected if the set-up is left for several hours? A. Decrease in the size of the yam B. Movement of the salt solution into the water C. Decrease in the volume of water inside the yam D. Movement of water from the salt solution into the yam. (2004:Q16)
  18. What will happen when two equal sized pieces of raw papaya labeled X and Y are dropped into equal volumes of concentrated salt solution and distilled water respectively? A. Papaya X will become turgid B. Both will increase in size C. Papaya Y will become turgid D. Both will decrease in size.

(2008:Q19)

19. A marine protozoan is likely to have no contractile vacuole mainly because the cytoplasm is: A. isotonic to sea water B. hypotonic to sea water C. hypertonic to sea water D. impervious to sea water.
20. Which of the following can cause shrinkage of living cells? A. deionized water B. Hypertonic solution C. Hypotonic solution D. Isotonic solution

### CHAPTER 2: ANSWERS

- 1B. The sugar solution is hypertonic with respect to the interior of the cell hence ex-osmosis of water which when prolonged results in the collapse of the vacuole and the shrinking of the cytoplasm from the cell wall. This is called plasmolysis.

2A. "Diffusion" defined

3B. This is Q1 in reverse gear

#### NOTE:

1. **Hypertonic solution** → More concentrated than cell's interior.
2. **Hypotonic solution** → Less concentrated.
3. **Isotonic solution** → Same concentration.
4. **Water moves out (ex-osmosis)** of cell in hypertonic medium and the cell shrinks.
5. Water moves into (endo-osmosis) cell in hypotonic medium and the cell swells.
6. No change in isotonic medium.

4A. Cells shrink in X- hypertonic medium Cell unaffected in Y- Isotonic medium

5D. Water moves (diffuses) from an area of low (solute) concentration to that of high (solute) concentration until a balance is struck on both sides of the divide (i.e. the semi-permeable membrane)

#### NOTE:

- \* Osmosis = Diffusion of water from where it is more to where it is less or from where its solute is less to where its solute is more.
- \* More solute implies Less water (and vice versa).

6E. Distilled water is hypotonic leading to endo-osmosis hence cell bursts and dies.

#### NOTE:

- \* Take D only if it is specified that the cell is a plant cell.
- \* In plant cell, increased pressure (due to excess water) is resisted by the rigid cell wall hence the cell become turgid as no bursting (or rupture) is encountered.

7D. Polythene is impervious (or impregnable) and non-permeable; others are semi-permeable barriers.

8D. See Qs 1 and 4

9D. "Osmosis" now fully defined - See Q 5

10C. Diffusion is passive (i.e. no energy is needed except the impetus derived from the concentration gradient set up between root hair and the surrounding soil); active transport requires energy derived from respiration.

11B. See Q 5.

12. See Q 9.

13D. Red Blood Cell (RBC) is animal cell; no cell wall to resist the swelling - See Q 6

14D. Water moves by osmosis and mineral salts dissolved in it follow suit by mass flow and active transport.

15B. See Q 6.

16D. Peeled pawpaw can also be used.

17C. Osmosis occurs along the osmotic gradient

18C. Pawpaw Y swells and becomes turgid (being made from plant cells).

19A. The need to get rid of excess water does not arise.

20B. Due to ex-osmosis.

### CHAPTER 3: CLASSIFICATION 1) VIRUSES. MONERA.

#### PROTISTA. FUNGI

1. Euglena may be classified as a plant because it A. has chloroplast B. has a gullet C. lives in a pond D. possesses a flagellum E. has a pellicle. (1978:Q7)
2. Rhizopus (or Mucor) obtains its food from dead organic matter extracellularly. It is said to be A. a facultative parasite B. a saprophyte C. an obligate parasite D. a commensal E. an autotroph. (1978:Q25)
3. Which one of the following options is not true for Mucor or Rhizopus? A. grows on moist dead organic matter B. is a plant C. has cellulose cell wall D. reproduces asexually by producing spores. (1979:Q12)
4. Which of the following statements is not true of Paramecium? A. It is slipper-shaped B. The anterior end is blunt C. The gullet is lined with cilia D. It has an anal pore E. Its food vacuole is not stationary (1979:Q21)
5. One of the following statements is not true of viruses. A. They are micro-organisms B. They are smaller than bacteria C. They can be seen with an ordinary light microscope D. They cause tobacco disease. (1979:Q32)
6. In Mucor or Rhizopus carbohydrate is absorbed in the form of A. Starch B. sucrose C. glucose D. glycogen E. arabinose (1980:Q1)
7. In Rhizopus, carbohydrate is stored in the form of A. glucose B. paramylum C. glycogen D. starch E. oil. (1983:Q43)
8. In which of the following groups of animals are flagella and cilia found? A. Flatworms B. Annelids C. Coelenterates D. Protozoa E. Nematodes (1985:Q2)
9. Which of the following is NOT true of Mucor? It A. contains chlorophyll B. grows saprophytically C. bears spores in sporangium D. consists of hyphae E. reproduces by conjugation (1985:Q7)
10. Viruses are regarded as non-living because they A. can neither reproduce asexually nor sexually B. cannot survive in their respective environments C. do not possess characteristics that can be transmitted from one generation to the next D. can neither respire nor excrete. (1986:Q1)
11. Which of the following features of Euglena is found only in animals? A. Paramylum granules. B. Flagellum C. Pellicle D. Pyrenoid. (1987:Q2)
12. The hypha of Rhizopus is said to be coenocytic because it A. does not contain chlorophyll B. has no cross walls C. is vacuolated D. stores oil globules. (1987:Q9)
13. Spirogyra, Euglena and Chlamydomonas share many characteristics EXCEPT A. nutrition B. reproduction C. mobility D. irritability. (1988:Q7)
14. What is the function of trichocyst in Paramecium? A. Movement B. Defence C. Excretion D. Reproduction (1988:Q9)
15. When a virus is placed in a non-living medium it A. becomes dehydrated B. forms spores C. forms flagella D. becomes crystallized. (1989:Q4)
16. A multinucleate body without internal cell boundaries is characteristic of A. bryophytes B. fungi C. algae D. gymnosperms. (1989:Q6)
17. Viruses are considered to be living organisms because they A. possess transmittable characters B. move from one place to another C. respond to stimulation D. ingest food materials (1990:Q1)
18. Which of the following characteristics is common to Amoeba and Paramecium? A. Oral groove B. Trichocyst C. Contractile vacuole D. Cilia (1990:Q2)
19. Which of the following are non-green plants? A. Euglena B. Fungi C. Spirogyra D. Angiosperms. (1991:Q4)
20. One of the features which adapts paramecium to its environment is the possession of A. a regular shape B. two nuclei C. cilia D. a pellicle. (1991:Q9)

Use the figure below to answer question 21 and 22.



21. The structure labelled X is used by the organism in the same way as man uses his  
A. esophagus B. trachea  
C. stomach D. Intestine  
(1992:Q7)

22. The structure labelled Y is the A. food vacuole B. nucleolus  
C. macronucleus D. contractile vacuole (1992:Q8)
23. In which of the following organisms does a single cell performs all the functions of movement, nutrition, growth, excretion and photosynthesis? A. Paramecium B. Euglena C. Amoeba D. Spirogyra. (1993:Q5)
24. The spores of mucus are dispersed by A. water B. wind  
C. insects D. explosive mechanism. (1993:Q9)
25. Members of the phylum Protozoa use the contractile vacuole  
A. to remove excess food B. for movement C. for digestion  
D. to remove excess water. (1993:Q22)
26. Which of the following is TRUE of the process of conjugation in Paramecium? A. Micro-nucleus disintegrates. B. Each ex-conjugant divides only once. C. Macronucleus undergoes division D. Each micronucleus divides twice. (1993:Q25)
27. The smallest living organisms which share the characteristics of both living and non-living matter are A. bacteria B. fungi  
C. viruses D. protozoa. (1994:Q2)
28. Which of the following does a virus have in common with animal cells? A. Nucleus B. DNA C. Glycogen D. Cytoplasm. (1995:Q1)
29. Virus differ from all forms of life because they A. have a thick cell wall B. feed on waste products of other organisms  
C. cause infectious diseases D. require other living cells to multiply. (1997:Q4)
30. The prokaryotic cell type is characterized by a A. complex cytoplasm in which different regions are poorly defined  
B. localization of differ regions of the cell into tissues.  
C. collection of organelles and macromolecular complexes  
D. simple cytoplasm with well-defined regions. (1998:Q2)

Use the diagram below to answer questions 31 and 32



31. The structure labelled I is formed as a result of the fusion of  
A. two pairs of nuclei B. several pairs of nuclei  
C. a pair of nuclei D. two pairs of nuclei (1998:Q5)

32. The special name of the part labelled II is A. gametangium  
B. hypha C. suspensor D. zygospore (1998:Q6)
33. The most recently evolved structure in animals is the  
A. hair B. cilium C. scale D. feather (2000:Q5)
34. The order in which organic evolution has progressed in plants is  
A. Thallophyta, Schizophyta, Bryophyta, Pteridophyta and Spermatophyta  
B. Schizophyta, Thallophyta, Bryophyta, Pteridophyta and Spermatophyta  
C. Pteridophyta, Spermatophyta, Thallophyta, Schizophyta and Bryophyta  
D. Bryophyta, Pteridophyta, Spermatophyta, Thallophyta and Schizophyta. (2000:Q8)
35. Which of the following groups is the most advanced?  
A. Pteridophytes B. Bryophytes C. Thallophytes  
D. Gymnosperms (2001:Q5)
36. The animals that move by means of flagella include  
A. Chlamydomonas and Euglena B. Planaria and Amoeba  
C. Amoeba and Hydra D. Paramecium and Planari (2002:Q3)
37. The umbrella-shaped fruiting body of a fully developed mushroom is the  
A. Pileus B. Mycelium C. Basidium D. Stipe. (2003:Q7)
38. The similarity among organisms belonging to the same group will be least within each  
A. family B. order C. kingdom  
D. species (2003:Q8)
39. The cell component that is present in a prokaryotic cell is the  
A. Chloroplast B. Ribosome C. Mitochondrion D. Nuclear envelope. (2003:Q11)

40. A plant-like feature in Euglena is the A. pellicle B. pigment spot  
C. large spot D. gullet (2004:Q5)
41. The most common characteristics of the fungal hyphae is the possession of  
A. cell-like compartments with one nucleus each B. cell walls that are both rigid and chitinous  
C. a multicellular mycelium in the substrate D. cell-like partitions formed by cross-walls (2004:Q6)
42. The hyphal wall of fungi is rigid owing to the presence of  
A. cell wall B. lignin C. cellulose D. chitin (2005:Q3)

Use the diagram below to answer questions 43 and 44

43. The part labelled IV is responsible for  
A. osmoregulation B. respiration C. ingestion D. locomotion (2007:Q36)
44. The organelle responsible for sexual reproduction is  
A. III B. IV C. II D. I. (2007:Q37)
45. The chromosomes of members of the kingdom Monera are within the  
A. nucleoplasm B. Cytoplasm C. nucleus  
D. nucleolus. (2007:Q39)
- Use the diagram below to answer questions 46 and 47
46. The Process illustrated is  
A. gametogenesis B. sporulation  
C. sexual reproduction in Spirogyra  
D. sexual reproduction in Rhizopus. (2007:Q44)
47. The structure labelled I is the  
A. sporangium B. Hypha  
C. Zygospore D. Conidiospore. (2007:Q45)
48. In terms of the number of individuals, which of the following taxa is most inclusive?  
A. Order B. Family C. Class  
D. Species. (2008:Q1)
49. A blue-green alga is not a protophyte because  
A. it is aquatic B. its cells are prokaryotic  
C. it cannot move D. it is not a green plant. (2009:Q7)
50. Which of the following groups of cells is devoid of true nuclei?  
A. Algae B. Monera C. Fungi D. Viruses. (2010:Q8)
51. Which of the following is the lowest category of classification?  
A. Class B. Species C. Family D. Genus (2012:Q5)
52. The fungi are a distinct group of eukaryotes mainly because they have  
A. spores B. no chlorophyll C. many fruiting bodies  
D. sexual and sexual reproduction. (2012:Q7)
53. The organ which is sensitive to light in Euglena is  
A. flagellum B. chloroplast C. eyespot D. gullet (2013:Q3)
54. Which if the following is the simplest living organism?  
A. Virus B. Amoeba C. chlamydomonas D. Paramecium. (2013:Q12)
55. Fungi are referred to as heterotrophs because they  
A. lack chlorophyll B. have mycelium C. lack roots  
D. are filamentous (2013:Q21)
- Use the diagram below to answer questions 56 and 57
56. The part labeled II is the  
A. nucleus B. eyespot C. basal granule  
D. contractile vacuole. (2014:Q2)
57. The part responsible for photosynthesis is labeled  
A. III. B. IV. C. I D. II. (2014:Q3)

### CHAPTER 3: ANSWERS

1A. See Chapter 1

#### ANIMAL FEATURES OF EUGLENA

- Mobility : remember that plants are sedentary.
  - Presence of pellicle instead of cellulose cell wall.
  - Presence of photosensitive eye spots
  - Presence of gullet for ingesting food.
- 2B. There are only two classes of saprophytes: bacteria and fungi.

#### NOTE:

- Their activities cause decay.
- Decay = Decomposition = Putrefaction.
- Hence Saprophytes are decomposers in the ecosystem
- Economic importance of decay:
  - Food spoilage and food poisoning.
  - Nutrient recycling in nature.
  - Application in dairy industries e.g. making yoghurt

3C. Fungi have cell wall of chitin in lieu of cellulose  
**NOTE:** Today fungi are no longer regarded as plants; they now belong to a separate kingdom.

4. No option is correct.

**NOTE:**

A → Hence paramecium is called slipper animalcule.

B → It moves its blunt end first hence that end is the anterior end.

C → The ciliary movement elicits water current which directs food into the mouth pore.

D → Undigested food particles exit the cell through the anal pore.

E → Food vacuole moves through a fixed route and egests its contents via the anal pore.

5C. Only an electron microscope can capture a virus.

**NOTE:**

1. The largest virus is smaller than the smallest bacteria.

2. Some viruses called Bacteriophages even infest bacterial cells (bacteria as their hosts)

3. Viruses are usually pathogenic (disease-causing) e.g. Polio Virus that causes infantile paralysis (Poliomyelitis)

6C. Sequel to extracellular digestion of complex carbohydrates into simplest absorbable form called glucose. However, they store glucose as glycogen.

7C. Another snippet of fungi deviating from being plants. See above

### GENERAL FEATURES OF FUNGI

1. They are heterotrophic because they lack chlorophyll hence may be:

a. Parasitic b. Saprophytic c. mutualistic (as in Lichen).

2. They exhibit Extracellular digestion.

3. They have chitinous cell wall.

4. Their body is known as mycelium (which is a network of thread-like hyphae)

5. They may have cross wall (septate) e.g. *Penicillium notatum*.

6. They may not have cross wall (aseptate) e.g. *Rhizopus nigricans*.

7. Cells are usually multinucleated.

8. Carbohydrates are stored as glycogen in Fungi

9. They are non-motile.

10. Reproduction is usually by asexual means called sporulation (spore formation) and sometimes conjugation (sexual method used especially when conditions are unfavourable); and budding in yeast.

8D. e.g. *Chlamydomonas* and *Paramecium*.

**NOTE:**

1. The kingdom Protista contains Protozoa and Protozoa

2. Protozoa are plant-like e.g. *Chlamydomonas riveris* and *Euglena viridis*.

3. Protozoans have animal-like features e.g. *Amoeba proteus*, *Paramecium caudatum* and *Plasmodium sp*

4. Protista move by

a. Pseudopodia - *Amoeba*.

b. Cilia - *Paramecium*

c. Flagella - *Euglena* and *Chlamydomonas*.

9A. *Mucor* is a fungus- See Q7

10D. No cellular structure to execute respiration/excretion.

11C. See Q1

12B. Coenocytic = aseptate = non-septate = no cross wall See Q7.

13C. *Spirogyra* is non-motile.

14D. Cilia: for movement and feeding

Contractile vacuoles: for osmoregulation.

Micronucleus: particularly for reproduction

Reproduction by transverse binary fission (asexual) or

conjugation (sexual).

15D. But resumes living characteristics if taken back to a living system.

16B. See Q7

17A. Every virus contains either RNA or DNA (but not both) and these contain coded messages for transmittable characters.

18C. For Osmoregulation.

19B. See Q7

20C. Cilia enables it to swim away from danger or towards food.

21A. X is even similarly named. i.e. gullet = oesophagus

22C. It has 2 nuclei - one macronucleus, one micronucleus. Also 2 Contractile vacuoles - one anterior, one posterior.

23B. *Euglena* is unicellular and chlorophyllous; *Spirogyra*, a chain of cells, is technically multicellular (filamentous)

24B. Spores are blown away by wind and on reaching a suitable substrate, they grow into new organisms.

25D. For the purpose of osmoregulation.

26D. The conjugants lie side by side at the oral grooves and exchange nuclear materials; they then separate and each ex-conjugant divides twice to produce four daughter cells to gross eight cells overall.

27C. See Q15

28B. Viruses as DNA or RNA viruses

29D. It is non-living outside a living medium. Hence all viruses are pathogenic using the host's genetic machinery.

30A. The nucleus, for example, has no envelope (diffuse nucleus).

**NOTE:**

\* Prokaryotic cells → As in bacteria and Blue-Green algae (cyano-bacteria) only.

\* Eukaryotic cells → All other organisms.

31B. Don't forget that fungi, except yeasts, are multicellular, multi nucleated.

32C. A special hypha. It is Zygosporangium; this is sexual reproduction (conjugation) in fungi e.g. *Rhizopus*.

33A. Hair is characteristic of mammal and mammal is at the apex of the evolutionary scale.

34B. Monerans were called Schizophytes in the past.

**NOTE:**

1. Monerans = Bacteria + Blue-green algae.

2. Thallophytes = Green algae e.g. *Spirogyra*.

3. Bryophytes = Liverworts and Mosses

4. Pteridophytes = Ferns.

5. Spermatophytes = seed plants.

35D. Now consider Q34 as:

Spermatophytes = Gymnosperms + Angiosperms

**NOTE:**

1. Angiosperms are more advanced than Gymnosperms

2. Gymnosperms are non-flowering seed plants.

3. Angiosperms are flowering seed plants.

4. Angiosperms = Monocots + Dicots

5. Monocots are more advanced than Dicots

36A. They are flagellates

37B. These umbrella-shaped mycelium consists of a stalk or stipe and an expanded cap called pileus. Stipe and pileus are closely interwoven hyphae i.e. the hyphae aggregate (rather than branch) into more solid structure or mycelium.

**NOTE:** The body of a fungus is a mycelium of hyphae.

38C. Kingdom is the most diversified taxon and species the least so.

39B. 70S ribosomes always present for protein synthesis.

40B. Pigment spot as chloroplast.

41B. See Q7

42D. Now compare Q41 option B.

43A. Anterior (iv) and posterior contractile vacuoles for osmoregulation.

44D. Micronucleus (iii) rather than the macronucleus (ii)


45B. The few organelles including the nucleus in prokaryotic cells are NOT membrane-bound.



- 46D. See Q 32      47C. See Q 32  
 48C. Consider the taxonomic hierarchy:  
 Kingdom → Phylum (or division) → Class → Order → Family  
 → Genus → Species. (Compare Q 38)  
 49B. See Qs 30 and 34  
 50B. Monerans are prokaryotic with naked nuclei.  
 51B. See Q 48  
 52C. A → Bryophytes and Pteridophytes too produce spores  
 B → Eukaryotic animal cells have no chloroplast either  
 D → Sexual/Asexual reproductions common in protozoans,  
 Coelenterates etc.  
 C → Fruiting body made of branching hyphae is characteristic  
 of fungi.  
 53C. See Q 1  
 54A. Take virus to be living here but if bacterium were present  
 in the option, virus may be taken as non-living because true  
 life begins at bacterial level  
 55A. Hence they cannot manufacture their own food.  
 56D. I → Gullet      II → Contractile vacuole      III → Star shaped  
 chloroplast      IV → Nucleus  
 57A. See Q 56

#### CHAPTER 4:

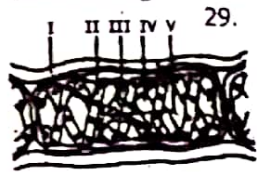
#### CLASSIFICATION II: PLANTAE – THALLOPHYTA, BRYOPHYTA, PTERIDOPHYTA.

- The following events take place during conjugation in Spirogyra. 1. The protoplasm in each of the conjugating cells separate from the cell wall to form a gamete; the gamete of one filament passes through the conjugation tube to meet the gamete of the other filament. 2. The zygote soon becomes surrounded by a thick brown wall to become a zygospore which bursts after a short rest and germinates to produce a new filament. 3. The nuclei of the gametes fuse to form a zygote. 4. The protuberances meet and where they touch the cell-wall disappears so that a conjugation tube joining the two cells is formed. 5. Protuberances appear on the walls of cells of two filaments of Spirogyra lying side by side opposite one another. Now, what is the correct sequence in which the above events occur? A. 1,2,3,4,5, B. 1,2,4,5,3, C. 3,4,5,2,1, D. 5,4,1,3,2, E. 5,4,3,1,2. (1978:Q12)
  - One of the following statements is Not true of Spirogyra. A. It is a simple multicellular plant. B. During conjugation, its gametes, which are structurally and physiologically similar, fuse to form a zygote. C. It possesses spiral chloroplast which enable the plant to photosynthesize. D. Its cells are protected externally by a layer of mucilage. E. There are pyrenoids along the chloroplast. (1980:Q2)
  - One common feature of the fungi, algae, mosses and ferns is that they A. are photosynthetic. B. show alternation of generation. C. reproduce by means of conjugation. D. can survive dry conditions. E. have no seeds. (1981:Q39)
- 
- In fig. 1. the structure labelled X is the A. cellulose cell wall. B. plasma membrane. C. nuclear membrane. D. mucilage wall. E. ectoplasm. (1982:Q45)
  - Which of the following represents the evolutionary sequence in these plants? 1. Flowering plants, 2. Ferns, 3. Mosses, 4. Algae, 5. Conifers. A. 2 → 1 → 4 → 3 → 5. B. 5 → 4 → 3 → 2 → 1. C. 2 → 4 → 5 → 1 → 3. D. 3 → 2 → 4 → 5 → 1. E. 4 → 3 → 2 → 5 → 1. (1983:Q34)
  - Mosses, liverworts and ferns can be grouped together because they A. are all aquatic plants. B. all growing deserts. C. are seedless plants. D. have undifferentiated plant bodies. E. all produce colourless flowers. (1984:Q3)
  - Spirogyra and Mucor can be grouped together as Thallophyta because. A. they are unicellular organism. B. their spores could be dispersed by wind. C. they are capable of living independent lives. D. they reproduce sexually only. E. their bodies are made up of thallus and filaments alternatively. (1984:Q4)
  - Which of the following is INCORRECT? The prothallus of a fern A. is a flattened heart-shaped structure. B. is green because its cells contain chloroplasts. C. is the dominant plant. D. bears the sexual organs. E. is attached to the ground by numerous rhizoids. (1984:Q6)
  - In Spirogyra, the Pyrenoid A. excrete waste products. B. is suspended by cytoplasmic strands. C. is mainly used for respiration. D. usually contains starch. E. makes the plant slimy to touch. (1985:Q1)
  - Bryophytes are different from flowering plant because they A. live in moist habitats. B. are small plants. C. reproduce sexually and a sexually. D. have small leaves. E. have no vascular tissues. (1985:Q8)
  - In lower plants like mosses, the structure which performs the functions of roots of higher plants is called. A. root hairs. B. rootlets. C. hyphae. D. rhizoids. E. thalli. (1985:Q10)
  - Which of the following is NOT true of Spirogyra? A. Reproduces by conjugation. B. Reproduces by fragmentation. C. Consists of branched filaments. D. consists of unbranched filaments. (1986:Q6)
  - In a plant exhibiting alternation of generations, the diploid multicellular stage is known as A. gametophyte. B. spermatophyte. C. holophyte. D. sporophyte. (1987:Q4)
  - A characteristic that distinguishes bryophytes from flowering plants is the A. possession of true stems and leaves. B. ability to reproduce asexually. C. absence of vascular tissues. D. ability to grow in moist habitats. (1987:Q5)
  - In most true ferns sporangia are grouped into A. indusium. B. fons. C. prothalli. D. sori. (1987:Q10)
  - In the reproduction of mosses, water is essential because A. they live in moist habitats. B. they cannot reproduce without water. C. the male gametes must swim to fertilize the ovum. D. they produce spores. (1987:Q11)
  - The term 'Thallophyta' refers to A. ferns and mosses. B. algae and fungi. C. mosses and liverworts. D. fungi and ferns. (1988:Q3)
  - The prothallus of a fern is equivalent to the gametophyte generation of a moss because it A. is inconspicuous. B. has rhizoids. C. bears sexual organs. D. is multicellular. (1988:Q8)
  - The algae, bryophytes and pteridophytes are similar in that they A. are sea weeds. B. have no vascular tissues. C. require moisture for fertilization. D. are microscopic plants. (1990:Q5)
  - The spores of ferns are dispersed by A. wind. B. water. C. insects. D. explosive mechanism. (1990:Q6)
  - In bryophytes, sex organs are produced in the A. gametophyte. B. rhizoid. C. protonema. D. sporophyte. (1990:Q7)
  - Which of the following are differentiated into true roots, stems and leaves? A. Algae. B. Schizophyta. C. Pteridophyta. D. Bryophyta. (1991:Q6)
  - The annulus of fern sporangium helps in A. spore dispersal. B. conduction of mineral salt. C. trapping of light energy. D. water retention. (1991:Q8)
  - Which of the following correctly summarizes the life cycle of a fern plant? A. Spore → prothallus → thallus sporangium. B. Male and Female → gametangia → zygospore → sporangium → spores. C. Spore → thallus → spermatozoa → ovum → sporangium. D. Prothallus → spermatozoid → egg cell → leafy plant → sporangiospore. (1992:Q3)
  - In which of these features do bryophytes differ from pteridophytes? A. Absence of flower. B. Alternation of generation. C. Dependence on water for reproduction. D. Presence of a vascular system. (1993:Q3)
  - Which of the following organs or cell components are common to both the sporophyte and the gametophyte of a fern? A. Rhizoids. B. Roots. C. Chloroplasts. D. Leaves. (1993:Q4)

27. Which is the correct order in an evolutionary sequence for the following plant groups? A. Bacteria → ferns → algae → mosses → seed plant. B. Bacteria → ferns → mosses → algae → seed plants C. Bacteria → algae → mosses → ferns → seed plant D. Bacteria mosses algae ferns seed plants. (1994:Q5)

28. One common characteristic of fungi, algae, mosses and ferns is that they A. show alternation of generations B. reproduce sexually by conjugation C. produce spores that are dispersed D. possess chlorophyll in their tissues. (1995:Q3)

Use the diagram below to answer questions 29 and 30



29. Protein-like bodies are borne on the part labelled A. II B. III C. IV D. V. (1995:Q4)

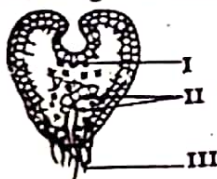
The sexual reproductive functions is performed by the part labelled A. I B. II C. IV D. III (1995:Q5)

31. Which of the following perform similar functions? A. Ascospores and ascocarp. B. antherozoids and rhizoid. C. Sorus and indusium. D. Strobili and inflorescence. (1997:Q7)

32. In ferns, the sporophyte A. develops from a haploid zygote B. reproduces sexually to produce spores C. is haploid and dependent on the gametophyte D. is diploid and independent of the gametophyte. (1997:Q8)

33. In which of the following organisms does each cell combine the function of nutrition, reproduction and growth? A. Rhizopus B. Dryopteris C. Brachymerium D. Spirogyra (1999:Q10)

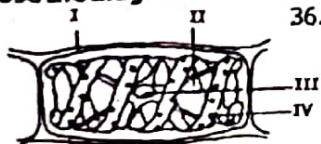
Use the diagram below to answer questions 34 and 35



34. The structures labelled II and III respectively are A. female organs and rhizoid B. male organs and rhizoid C. sporophyte and Sori D. annulus and stalk of sporangium (2001:Q10)

35. In ferns, the structure above is equivalent to the A. zygote of a moss B. gametophyte generation of a moss C. sporophyte generation of a moss D. sporophyte of a moss (2001:Q11)

Use the diagram below to answer questions 36 and 37



36. The structures that are common to both plant and animal cells are labelled A. IV and I B. III and IV C. II and III D. I and II (2003:Q2)

37. Food is stored in the structure labelled A. III B. I C. IV and III (2003:Q3)

38. One distinctive feature in the life history of liverworts is that they exhibit A. Alternation of generation B. Vegetative reproduction C. Asexual reproduction D. Sexual reproduction (2003:Q4)

39. The absence of special food and water-conducting systems restricts the body size in A. algae, liverworts and mosses B. liverworts, mosses and ferns C. the bryophytes and the pteridophytes D. the tallophytes and the pteridophytes. (2004:Q4)

40. The dominant phase in the life cycle of a bryophyte is the A. gametangium B. sporophyte C. gametophyte D. Prothallus (2006:Q33)

41. A water medium is necessary for fertilization in A. fungi B. conifers C. ferns D. angiosperms (2008:Q38)

42. Alternation of asexual and sexual modes of reproduction is found in A. blue-green algae B. Euglena C. fern D. maize (2009:Q4)

43. The dominant phase in the life cycle of a fern is the A. prothallus B. sporophyte C. antheridium D. gametophyte (2010:Q4)

44. In bryophytes, sex organs are produced in the A. protonema B. sporophyte C. gametophyte D. rhizoid. (2014:Q9)

45. Alternation of generation is a feature shown in A. mosses B. fungi C. grasses D. conifers. (2014:Q21)

#### CHAPTER 4: ANSWERS

- 1D. See appropriate text for illustration.  
 2B. Although the filaments are structurally similar, the one whose gamete moves is physiologically male and the other is functionally female (See Q 1)  
 3E. Only spermatophytes produce seeds. These are seedless plants.  
 4D. The mucilage is slimy and it is made of mucin  
 5E. 4. Algae → Thallophyta. 3. Mosses → Bryophyta. 2. Ferns → Pteridophyta. 5. Conifers → Gymnospermae. 1. Flowering plants → Angiospermae.

#### NOTE:

- i. Spermatophytes (seed plants) = Gymnosperms + Angiosperms  
 ii. Tracheophytes (vascular plants) = Pteridophytes + Spermatophytes.  
 iii. Thallophytes + Bryophytes → Avascular Plants  
 iv. Tracheophytes have true roots, stems and leaves because of the presence of conducting or vascular tissues (Phloem/xylem)

- 6C. See Qs 3, 5.  
 7E. Or ... filaments and thallus respectively.  
 8C. Sporophyte is the dominant plant (not gametophyte)

#### NOTE:

- \* Gametophyte of fern is called prothallus.  
 \* Gametophyte is the dominant plant in Mosses and Liverworts.

9D. Pyrenoids, made of protein, occur as colourless patches in the spiral chloroplast(s) and are involved in making starch.

NOTE: The nucleus, not the Pyrenoids, is suspended by the cytoplasmic threads or strands.

- 10E. See Q 5  
 11D. Rhizoids are not true roots (contains no vascular tissue) and they are meant for anchorage (but not for absorption).  
 12C. Conjugation is sexual (Qs 1 and 2) Fragmentation is asexual.

NOTE: Each fragment (after fragmentation) develops into a new, long, unbranched filament.

13D. Sporophyte (which is diploid) alternates with gametophyte (haploid) in the life cycle of liverworts, mosses and ferns.

- 14C. See Q 5  
 Warning: The options describe "bryophytes" (as first mentioned in the question) not "flowering plant". Be wary of option A

15D. Sori → Clusters of sporangia; Indusium → Protective cover for a sorus; Frond → A leaf of the fern; Prothalli → Developing gametophytes of fern

NOTE: Sori (Singular: Sorus), Prothalli (Singular: Prothallus)

- 16C. Ferns too need water 17B. See Q7  
 18C. Gamete - O - Phtyte (See Q15) 19C. See Q16  
 20D. The wall ruptures and spores catapulted from the sporangium  
 21A. Antheridia - Male sex organs  
 Archegonia - Female sex organs

22C. See Q5  
 23A. The wall of a sporangium is made in part by annulus (of thick-walled cells) and in part by stomium (of thin walled cells).

24D. Alternation of generation: Prothallus → as Gametophyte; Leafy plant → as Sporophyte

- 25D. See Q 26C. Compare Q8 27C. See Chapter 3 Q34  
 28C. They produce spores rather than seeds.  
 29A. Pyrenoids on chloroplast (Q 9)  
 30D. The nucleus suspended by cytoplasmic strands (See Q 9)

- 31C. They have one function – to package or protect the sporangia.  
 32D. Remember the sporophyte as the dominant plant. (See Q 8)  
**NOTE:** The sporophyte of a moss is dependent on the gametophyte (dominant plant) throughout its life.  
 33D. Spirogyra is a chain of cells; each cell is independent of the others. Note that spirogyra cells can undergo photosynthesis (Nutrition)  
 34B. This is the prothallus of a fern (See Qs 8 and 13)  
 I → Female organs (higher up)  
 II → Male organs (lower down)  
 III → Root-like Rhizoid  
 35B. See Q 8  
 36C. II → Vacuole; III → Nucleus (See Chapter 1)  
 37C. IV → Pyrenoid (Stores starch)  
 38A. See Q 13  
 39A. Pteridophytes (ferns) are vascular plants like the spermatophytes (See Q5)  
 40C. See Q 8  
 41C. In bryophytes and Pteridophytes.  
 42C. Also in mosses and liverworts.  
 43B. See Q 8.  
 44C. Gamete – O- Phyte  
 45A. See Q 13

**CHAPTER 5:  
 CLASSIFICATION III: HIGHER PLANTS—  
 SPERMATOPHYTA.**

Use the figure below to answer questions 1 and 2

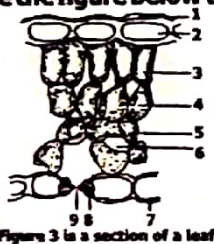


Figure 3 is a section of a leaf

1. The number shown as 8 refers to A. upper epidermis B. cuticle C. stoma D. guard cell E. lower epidermis (1978:Q35)  
 2. The structure responsible for trapping the sun's energy during photosynthesis is A. 5 B. 6 C. 3 D. 2 E. 8 (1978:Q36)  
 3. Which of these plays no role in photosynthesis? A. 9 B. 8 C. 5 D. 2 E. 3 (1978:Q37)  
 4. In the above diagram (Fig 1) the cell which controls the opening and closing of stomatal pore is A. 1 B. 2 C. 3 D. 4 E. 5 (1979:Q36)  
 5. Root hairs have their origin from A. endodermis B. pericycle C. cortex D. epidermis E. Xylem. (1979:Q46)  
 6. One significant difference between roots and stem is that A. branch roots originate in the pericycle while branch stems do not B. stems are always above the ground while roots are always below the ground C. stems are positively geotropic while roots are negatively geotropic D. stems are sometimes used for storage while roots are never so used E. stems grows in both length and circumference while roots grow only in length (1979:Q49)

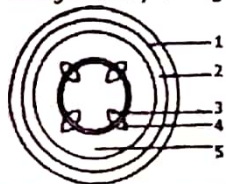


Fig. 3: T. S. Herbaceous Stem

7. Which of the labeled tissues in Fig 3 is responsible for the transport of mineral salts and water in a living plant? A. 1 B. 2 C. 3 D. 4 E. 5 (1981:Q10)  
 8. Which of the following tissues are made up of dead cells? A. Meristematic B. Xylem tissues C. Cambium D. Mesophyll E. Palsade. (1982:Q28)  
 9. Root hairs are developed from the A. root apex B. epidermis of roots C. vascular bundles D. endodermis E. pericycle (1983:Q1)

Use Figure below to answer questions 10 - 12

Fig. 1 represents a cross-section of a part of a Dicot plant.



10. Which of the following features can be used to identify Fig 1? A. Position of 7 B. Its circular nature C. Number of 5 D. Presence of 3 E. Width of 2. (1983:Q2)  
 11. The main function of 6 is to A. separate 5 from 7 B. produce more of 5 and 7. C. produce cork D. translocate water and mineral salt E. conduct carbon dioxide to the other parts. (1983:Q3)  
 12. The main function of 4 is to A. surround the inner tissues B. produce cork C. produce root hairs D. produce lateral roots E. produce more of 3. (1983:Q4)  
 13. In a dicot leaf, guard cells differ from other epidermal cells because they A. have no definite shape B. lack nuclei C. are smaller D. contain chloroplasts E. lack vacuole (1983:Q5)  
 14. Herbs differ from shrubs because they A. do not produce fruits B. are useful to herbalists C. do not become woody D. are only annuals E. are only perennials. (1983:Q7)  
 15. Which of the following is NOT a characteristic of monocot plants? A. occurrence of secondary thickening B. Parallel Venation C. Scattered vascular bundles D. Floral parts arranged in threes E. Perianth is usually insignificant (1983:Q41)  
 16. Which of the following statements is NOT true of the piliferous layer of a root? It A. has a very thin cuticle B. is the outermost layer of the cortex C. may bear root hairs D. breaks down as the root ages E. is replaced by cork in old roots. (1984:Q27)  
 17. Which of the following is seed bearing? A. Mosses B. Whistling pine C. Algal filaments D. Liverwort E. Fern fronds. (1985:Q3)  
 18. In an angiosperm leaf, the xylem is A. beside the phloem B. surrounded by the phloem C. above the phloem D. around the phloem E. in separate bundles from the phloem (1985:Q11)  
 19. Which of the following is common to a dicotyledonous stem and a monocotyledonous root? A. Medullary rays B. Central pith C. Wide cortex D. Narrow cortex E. Pericyclic fibres. (1985:Q13)  
 20. Which of the following pairs are fully adapted to terrestrial life? A. Ferns and algae B. Ferns and mosses C. Bryophyte and flowering plants. D. Flowering plants and conifers. (1986:Q2)  
 21. Which of the following has cones? A. Angiosperm B. Gymnosperm C. Pteridophyte D. Bryophyte (1986:Q4)  
 22. The stem differs from the root in having the xylem and phloem strands A. on the same radii B. scattered C. on alternate radii D. towards the pith. (1986:Q13)  
 23. The correct sequence of tissues in the anatomy of a young dicotyledonous stem from the inside to the outside is A. pith, phloem, cambium, xylem, parenchyma, collencyma and epidermis B. xylem, phloem, cambium, cortex, endodermis, collenchyma and epidermis C. pith, xylem, cambium, phloem, collenchyma, parenchyma and epidermis D. phloem, xylem, cambium, cortex, endodermis, Collenchyma and epidermis (1987:Q15)  
 24. Secondary thickening is initiated in a dicotyledonous stem by the A. xylem parenchyma B. secondary phloem C. endodermis D. cambium. (1987:Q16)  
 25. Which of the following statement gives the BEST description of bark? A. Tissues outside the vascular cambium B. Cork-like tissues found only in stems C. Brown tissues never

found in primary growth D. Cork-like tissues of old trees. (1988:Q16)

26. In the transverse section of the leaf of maize vascular bundles are arranged in A. arcrow B. one circle C. alternate positions D. two circles. (1988:Q17)

27. Double fertilization is a unique feature of A. angiosperms B. bryophytes C. pteridophytes D. algae. (1989:Q7)

Use the figure below to answer questions 28 and 29

28. The part labelled 3 is the A. leaf scar B. lenticel C. auxiliary bud D. girdle scar (1990:Q8)

29. Which part of the twig produces auxins? A. 4 B. 3 C. 2 D. 1 (1990:Q9)

30. Angiosperms and gymnosperms belong to the plant group known as A. Schizophyta B. Bryophyta C. Pteridophyta D. Spermatophyta. (1991:Q3)

31. To facilitate gaseous exchange, breathing roots have A. stomata B. mitochondria C. cuticle D. lenticels. (1991:Q7)

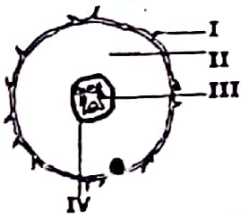
32. A wide pith with a ring of conducting tissue is characteristic of the root of A. sunflower B. maize C. bean D. okra. (1991:Q16)

33. The flow of air and water in or out of the mesophyll layer of a leaf is controlled by the A. stomata B. lenticels C. air spaces D. guard cells. (1991:Q11)

34. The major site of photosynthesis in the leaf is the A. palisade parenchyma B. mesophyll parenchyma C. upper epidermis D. lower epidermis. (1992:Q13)

35. Production of naked seeds is a distinctive feature of the group of plant called? A. grasses B. conifers C. legumes D. palms. (1993:Q2)

Use the diagram below to answer questions 36 and 37



36. Which of the labeled part allows for efficient absorption of water and mineral? A. I. B. II C. III. D. IV. (1994:Q11)

37. Starch is usually stored in the part labelled A. I. B. II. C. III. D. IV. (1994:Q12)

38. Secondary thickening in dicotyledonous stem is controlled by the A. xylem B. phloem C. cambium D. pericycle. (1995:Q10)

39. Stomata pores open when there is A. an increase in the sugar content of guard cells B. a decrease in the osmotic concentration of guard cells C. a decrease in the sugar content of mesophyll cells D. an increase in the sugar content of mesophyll cells. (1997:Q20)

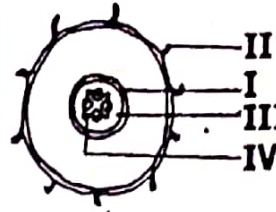
40. Which of the following structures is capable of producing more tissues in the stem of a herbaceous flowering plant? A. Epidermis B. Pericycle C. Xylem D. Cambium. (1998:Q11)

41. Which of the following features are all associated with monocots? A. Fibrous root system, branched network of veins and one seed leaf B. Fibrous root system, two seed leaves and floral parts in threes C. One seed leaf, petals in threes or groups of threes and parallel venation of leaves D. One seed leaf, net-veined leaves and petals in three or multiples of three. (2000:Q3)

42. Peripheral arrangement of vascular tissues in dicots is a characteristic of the internal structure of the A. leaf B. petiole C. stem D. root (2000:Q13)

43. Most monocots are easily recognized by their A. short leaves with petioles B. long and sword-like leaves C. long and palm-like leaves D. short leaves with many veinlets (2001:Q6)

Use the diagram below to answer question 44 and 45



44. The function of absorption is performed by the structure labelled. A. I B. II C. III D. IV (2002:41)

45. The structure labelled I represents the A. phloem B. xylem C. cortex D. pericycle (2002:Q42)

46. In the internal structure of plants, a wide pith in the centre is common to A. dicot stems and monocot stems B. dicot stems and monocot roots C. dicot roots and monocot roots D. dicot roots and monocot stems (2004:Q11)

47. Angiosperms and gymnosperms belong to the class A. Schizophyta B. Spermatophyta C. Pteridophyta D. Bryophyta (2005:Q4)

Use the diagram below to answer questions 48 and 49



48. The angle between the parts labeled ii and iii is the A. bud B. node C. internode D. axil (2005:Q8)

49. The part of the plant where photosynthesis is least likely to take place is A. I B. II C. III D. IV (2005:Q9)

50. In the transverse section of a dicot stem, the region lying between the endodermis and the vascular bundle is the A. parenchyma B. pericycle C. phloem D. hypodermis (2006:Q17)

51. Monocot stems differ from dicot stems in that monocots have A. no cambium B. no pith C. fewer vascular bundles D. phloems with parenchyma. (2007:Q23)

52. The opening and closing of the stoma are regulated by A. transpiration B. respiration C. diffusion D. osmosis (2007:Q23)

53. In a dicotyledons stem, the zone between the epidermis and the pericycle is the A. cortex B. stele D. xylem D. phloem. (2008:Q13)

Use the diagram below to answer questions 54 and 55



54. The structure that controls loss of water vapor during transpiration is labeled. A. I B. II C. III D. IV (2009:Q13)

55. The part labeled I is the A. spongy mesophyll B. upper epidermis C. cuticle D. vein. (2009:Q14)

56. Which of the following is true if the transverse section of a dicot stem? A. The xylem is more interiorly located than the phloem. B. The cambium lies between the cortex and the vascular bundles C. The vascular bundles are randomly scattered within the cortex. D. The epidermis is completely encircled by the cortex. (2010:Q11)

57. Seed plants are divided into A. monocotyledons and dicotyledons B. tracheophytes and bryophytes C. Tracheophytes and ferns D. angiosperms and gymnosperms. (2011:Q4)

58. Plants that show secondary growth are usually found among the A. thallophyte B. pteridophyte C. monocotyledons D. dicotyledons. (2012:Q6)

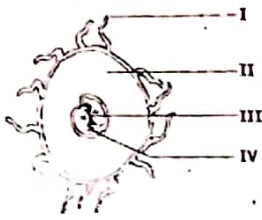
59. Which of the following plant structures lacks a waterproof cuticle? A. Leaf. B. Stem. C. Root. D. Shoot. (2012:Q13)

60. Which of the following is involved in secondary thickening in plants? A. Collenchyma and xylem cells B. Vascular cambium and collenchyma cells. C. Vascular cambium and

cork cambium D. Cork cambium and cork sclerenchyma (2012:Q22)

61. Seed plants are the most dominant vegetation on land because of A their motile gametes B. their ability to photosynthesize C. efficient seed dispersal D. availability of water. (2014:Q10)

Use the diagram below to answer questions 62 and 63



62. The part labeled I is the  
A. Xylem B. phloem C. root hairs D. cortex. (2014:Q12)
63. The diagram is the transverse section of a  
A. Monocotyledonous stem B. dicotyledonous stem  
C. Monocotyledonous root D. Dicotyledonous root (2014:Q13)

### CHAPTER 5: ANSWERS

- 1D. 1 → Cuticle (made of cutin). 2 → Upper epidermis.  
3 → Palisade mesophyll layer.  
4,5,6 → Spongy mesophyll layer. 7 → Lower epidermis.  
8 → Guard cells 9 → Stoma (Plural: Stomata)

#### NOTES:

- Palisade layer:** Cells are columnar and perpendicular to upper epidermis.
  - Spongy layer:** Wider intercellular air spaces than in palisade layer; cells are irregularly shaped, loosely packed. Both mesophyll layers contain chlorophyll.
  - But palisade layer is the predominant site of photosynthesis.
  - Epidermal cells have no chlorophyll but guard cells do
  - Stomata are openings especially in the lower epidermis and each stoma is flanked by a pair of guard cells.
  - Cuticle is waxy and water repellent.
- 2C. It is the best position to receive sunlight hence it is the main photosynthetic part.
- 3D. It contains no chloroplast.
- 4E. The size of the stoma is a function of the flaccidity or turgidity of the guard cells flanking it. Turgid Guard Cells → Pore opens. Flaccid Guard cells → Pore closes.
- 5D. This epidermal layer is technically called "Piliferous layer"

#### NOTE:

- The internal structure of a root:
- Endodermis is the innermost layer of the cortex.
- The endodermis is also called starch sheath because it starch (Stains blue-black to iodine).

- 6A. That is lateral or side roots.

#### NOTE:

- Irish potato and yam are swollen underground stems (stem tubers) while sweet potato and cassava are root tubers; prop, stilt and buttress roots are above the ground.
  - Stem and root tuber could be storage organs.
  - Stems are negatively geotropic, roots are positively geotropic.
  - Both grow in length and circumference e.g. buttress root.
- 7C. Xylem (3) is nearer the centre than phloem (4).

#### NOTE:

- Phloem transport manufactured food from leaves to all other parts of the plant.
  - In between Xylem and phloem is the cambium (containing stem or meristematic cells) which is responsible for secondary thickening in dicots.
  - In root, phloem and xylem are arranged alternately.
- 8B. For conduction and mechanical support.

#### NOTE:

- Xylem tissue has 4 cell types:

- \* tracheid ii. \*vessels iii. \*fibres iv. parenchyma  
\* These are composed of dead and lignified cells.

### 2. Other supporting tissues

- Turgid parenchyma – Living cells, as pericycle root.
  - Collenchyma – Living cells thickened at the corners by extra deposition of cellulose.
  - Sclerenchyma – Dead and lignified and of two types: fibres/sclereids.
- Phloem as pericycle of stem living, not involved in support (but conduction) and of two cell types: Sieve tube/Companion cell.
  - Cambium as a meristematic tissue which contains stem cells capable of division to give rise to new vascular tissues (Phloem/xylem).
- 9B. Root hairs from epidermis (piliferous layer); lateral root from pericycle. See Qs 5 and 6.
- 10A. Xylem (7) extends into the pith and obliterates it.

#### NOTE:

- 1 → epidermis 2 → Cortex 3 → endodermis  
4 → pericycle 5 → phloem 6 → cambium 7 → xylem

- 11B. See Q8

- 12D. Now compare Qs 5,6 and 9

- 13D. See Q1

### 14C. THREE TYPES OF PLANTS

- Herbs** – They do not grow as tall as shrubs and trees and do not become woody; they may be annuals or perennials.
- Shrubs** – Larger than herbs; woody stems; always perennials, stem divides into branches close to the ground; evergreen or deciduous.
- Trees** – Large woody stem or trunk; always perennial; branches are several feet above the ground; evergreen or deciduous.

- 15A. Note the differences between dicots and monocots.

Dicot	Monocot
1. Two seed leaves.	1. One seed leaf.
2. Floral parts in 4's or 5's.	2. Floral parts in 3's.
3. Net venation of leaves	3. Parallel veins in leaves (exception: yam).
4. Tap root system.	4. Fibrous root system.
5. Stem: Vascular bundles arranged in rings, pith, cortex and cambium all	5. Stem: Scattered vascular bundles, no pith, little cortex, no cambium.
6. Root: Little or no pith, xylem centrally arranged and it radiates like a star with phloem between rays.	6. Roots: Wide pith surround by alternating phloems and xylems.
7. Secondary thickening from meristematic cambium	7. No secondary thickening no cambium.

- 16A. No cuticle so as to facilitate absorption but the ability is lost in older roots.

- 17B. This is a conifer (gymnosperm)

#### NOTES:

- Gymnosperms include:**

- cycads b. gingkos c. conifer

- Features of gymnosperms:**

- Seed plants that bear no flower.
- Naked seeds borne in cones.
- As evergreen shrubs or trees.
- Needle-like, scale-like or broad leaves.
- Residents of temperate regions of the world (coniferous forests).

- Uses of gymnosperms:**

- Soft wood for timber and paper industry.
- Sources of resins and turpentine.

- Important conifers a. Pine b. Spruce c. fir

18C. And they are surrounded by a layer of parenchymal cells.

19B. Wide central pith.

20D. Water not needed for fertilization.

21B. See Q17

22A. See the scattered bundles in monocot stem as being anomalous and compare dicot stem with monocot and dicot roots (alternate arrangement).

23C. But note the correct sequence outwards

Pith - made of parenchymal cells

Pericycle - Sclerenchyma

Endodermis - Parenchyma;

24D. See Q 8

25B. Cork tissue in older root is only a thin layer and does not develop into bark.

**NOTE:**

1. Cork is tissue outside cork cambium (not vascular cambium).

2. Cork cambium gives rise to cork cells towards the outer side of stem and gives rise to more cells for the cortex (secondary cortex) towards the inner side.

3. Cork cells are dead and have intercellular spaces.

4. Walls of cork cells are impregnated with a water proof substance called suberin.

5. Lenticels, ordinarily visible to the eyes, are air pores on the surface of the bark where cork cells replace epidermal cells.

6. Lenticels in stem perform similar role as stomata in leaf.

7. The cork layer prevents desiccation; prevents damage by fungi and insect and acts as insulation.

26B. A circle called veins which is surrounded by a layer of parenchymal or sclerenchymal sheath.

27B. One fertilization produces the embryo, the other one produces the endosperm.

28C. 1 → Terminal bud (causing apical growth)

2 → Girdle scar (showing scale scars of previous year's terminal bud)

3 → Dormant axillary (or lateral) bud.

4 & 5 → Leaf scars (where leaves have fallen off)

29D. Auxins cause apical growth here.

30D. Or seed plants.

31D. Breathing roots also called pneumatophores common in white mangrove

**ROOT TYPES**

1. **Tap root system** - There is a main or tap root which give rise to small lateral branches or side roots.

2. **Fibrous root system** - No single main root but many same size roots.

**NOTE:** Tap root is characteristic of dicots, fibrous root of monocots.

**SPECIAL ROOT TYPES**

1. **Clasping roots** e.g. epiphytic fig.

2. **Prop roots** e.g. banyan/maize.

3. **Buttress roots** e.g. Silk cotton.

4. **Stilt roots** e.g. red mangrove.

5. **Breathing roots** e.g. white mangrove.

32B. Maize, a monocot

33D. Guard cells control the size of stomata hence exit and entry of air and water (See Q4)

34A. See Q 1                      35B. See Q 17

36D. IV as Xylem.

37B. Precisely in the innermost layer of cortex called endodermis (or starch sheath).

38C. See Q 7

39A. **OPENING / CLOSING OF STOMATAL PORES**

1. Pores generally open in the presence of light and close in the dark.

2. Guard cells convert their starch content into sugar in the presence of light hence osmotic pressure increases and this draws water from surrounding epidermal cell; guard cells get turgid as pores open (See Q4)

3. But the above is reverse in the dark; cells get flaccid and pores close.

**NOTE:** Sugar is converted to glucose in the presence of light in mesophyll cells and starch to sugar in the dark.

40D. See Qs 7 and 8

41C. See Q 15

42C. Cortex is relatively thinner in stem than root.

43B. or grass-like leaves.

44B. Root hair from piliferous layer

45D. Encapsulating the vascular bundle.

46B. Now compare Q 19

47B. See Q 30

48D. Angle between stem and leaf; and the bud (unlabelled here) is axillary bud.

**NOTE:**

1. A leaf emerges from a node and the internode is the space between two nodes.

2. Terminal bud (at the tip of the plant) gives rise to floral branches.

3. Axillary or lateral bud gives rise to branch stem

49D. Root is even underground hence no access to light

50B. See the order in Q 23

51A. Hence no secondary growth or thickening

52D. The osmotic pressure in the guard cells (See Q 39)

53A. ...of which endodermis is a part (innermost layer)

54D. Guard cell controlling size of stoma.

55A. Note the elaborate intercellular space.

56A. ...and vascular cambium intervening between them

57D. See Q 30                      58D. See Q 15

59C. To facilitate absorption of water in root and prevent excess water loss (desiccation) in the others.

60C. Vascular cambium makes more wood and increases the girth of tree plant while cork cambium makes bark.

61C. Hence water is not necessary for fertilization unlike Bryophytes and Pteridophytes.

62C. Root hair, of course.

63D. As xylem (iii) obliterates the pith

## CHAPTER 6:

### CLASSIFICATION IV: LOWER INVERTEBRATES

1. Which one of the following animals is NEVER a secondary host of tapeworms? A. cow B. Fish C. Pig D. Man E. Dog. (1980:Q5)

2. The two types of human tapeworm can be distinguished by the presence or absence of A. Scolex B. Hook C. head D. sucker E. Proglottis. (1981:Q23)

3. A tapeworm has no alimentary canal because A. it is autotrophic B. It does not feed C. it has no enzymes D. its body absorbs digested food E. the suckers on the scolex suck blood. (1982:Q13)

4. Flatworms and roundworms are said to be invertebrates because A. they are small animals B. they can live inside the vertebrates C. some of them are unicellular D. they have no backbones E. they are parasitic. (1982:Q40)

5. Which of these worms is beneficial to man? A. Hookworm B. Tapeworm C. Roundworm D. Earthworm E. Guinea worm. (1983:Q31)

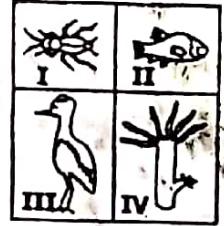
6. Exoskeleton is NOT found in the A. maggot B. mosquito larva C. earthworm D. caterpillar E. termite (1984:Q15)

7. The parts used by tapeworm to fasten itself to the host's intestine are the A. neck and suckers B. hooks and suckers C. rostellum and suckers D. young proglottis and neck E. rostellum, hooks and suckers. (1984:Q13)

8. Which of these animals is radially symmetrical? A. Squid B. Hydra C. Snail D. Cockroach. (1986:Q3)
  9. Which of the following lacks chaetae, tentacles and antennae? A. Snail B. Crab C. Millipede D. Earthworm. (1986:Q7)
  10. A good example of a diploblastic organism is. A. Amoeba B. Hydra C. Earthworm D. Roundworm. (1987:Q6)
  11. The function of the ditellum in the earthworm is to A. aid digestion B. prevent desiccation C. assist locomotion D. secrete cocoon. (1987:Q7)
  12. In tapeworm, the two structures that run through the length of the body are the A. nerve cord and the excretory duct B. sperm duct and the nerve cord C. genital pore and the excretory duct D. sperm duct and the genital pore. (1987:Q12)
  13. Which of the following is NOT a characteristic of snails? A. Bilateral symmetry B. Chitinous exoskeleton C. Muscular foot D. Soft unsegmented body in a mantle. (1987:Q13)
  14. The following organisms are hermaphrodites EXCEPT A. snail B. taenia C. schistosoma D. earthworm. (1988:Q4)
  15. Parasitic forms are NOT found among A. platyhelminthes B. nematodes C. molluscs D. annelids. (1988:Q5)
  16. Which of the following sets of organism represents the correct trend from simple to complex structural organization? 1. Mollusca 2. Platyhelminthes 3. Nematoda 4. Protozoa A. 4 1 2 3 B. 4 3 2 1 C. 4 2 1 3 D. 4 2 3 1 (1988:Q6)
- Use the diagram below to answer questions 17 and 18**
17. At which stage in this cycle can man be infected? A. 2 B. 4 C. 5 D. 6. (1988:Q10)
  18. Which stage is found in the muscle of an infected pig? A. 3 B. 4 C. 5 D. 6 (1988:Q11)
19. A characteristic of the phylum coelenterate is that A. most of them are marine B. they possess a gut with a single opening C. they possess numerous pores on their body D. they are bilaterally symmetrical. (1989:Q5)
  20. Which of the following phyla have members with both internal and external segmentation? A. Platyhelminthes B. Nematoda C. Algae D. Mollusca (1989:Q8)
  21. The body of a snail is divided into head A. thorax and abdomen B. visceral mass and abdomen C. thorax and foot D. visceral mass and foot. (1989:Q12)
  22. Hydra removes undigested food by A. passing it through the anus B. passing it through the mouth C. means of a contractile vacuole D. egesting it through the body surface. (1990:Q3)
  23. Which of the following groups of invertebrates reproduces by budding. A. Arthropoda B. Annelida C. Mollusca D. Coelenterata. (1990:Q4)
  24. In the tapeworm, the suckers on the scolex are used for A. sucking the blood of the host B. holding fast to the host C. reproduction D. locomotion (1990:Q12)
  25. Sting cells are normally found in A. Flatworms B. Hydra C. Snails D. Paramecium. (1991:Q5)
  26. In the earthworm, the cocoon is secreted by the A. chaeta B. prostomium C. peristomium D. ditellum. (1991:Q10)
  27. The respiratory organ in the land snail is the A. radula B. mantle C. tentacle D. foot. (1991:Q12)
  28. A major difference between platyhelminthes and coelenterates is that platyhelminthes A. are multicellular B. have developed a mesoderm C. reproduce sexually D. reproduce asexually. (1992:Q4)
  29. The essential structural difference between Hydra and tapeworm is that while Hydra, A. has tentacles, tapeworm is parasitic B. is diploblastic, tapeworm is triploblastic C. has a mouth, tapeworm feeds by suckers D. has mesoderm, tapeworm has mesogloea. (1992:Q5)

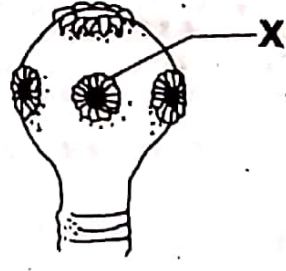
30. The soil swallowed by the earthworm to form the worm cast is ground up in the A. ditellum B. prostomium C. mouth D. gizzard. (1994:Q4)
31. The cnidoblast cells found in Hydra are used for A. reproduction B. offence and defence C. locomotion and nutrition D. food collection. (1997:Q5)
32. Annelids differ from nematodes in that they A. exhibit bilateral symmetry B. are triploblastic C. are metamericly segmented D. possess complete digestive system. (1997:Q6)
33. In snails, the hard calcareous shells are secreted by the A. radula B. ctenidium C. pneumostome D. mantle (1998:Q4)
34. The habitat of the Cysticercus of Taenia solium is A. alimentary canal of cattle B. muscles of pig C. alimentary canal of pig D. muscles of cattle (1999:Q1)
35. The division of a body into two equal halves along a longitudinal plane is called A. bilateral symmetry B. transverse section C. radial symmetry D. longitudinal section (1999:Q9)
36. Coelom is absent in the class of animals termed A. Mollusca B. Reptilia C. Arthropoda D. Coelenterata (2000:Q6)
37. An example of a radially symmetrical organism is A. Planaria B. Hydra C. Tapeworm D. Roundworm (2005:Q5)
38. The leech and the earthworm belong to the A. molluscs B. crustaceans C. arachnids D. annelids. (2005:Q6)
39. One primitive feature of the coelenterates is the possession of A. a dorsal mouth B. radial symmetry C. bilateral symmetry D. a false foot (2006:Q38)

**Use the diagram below to answer questions 40 and 41**



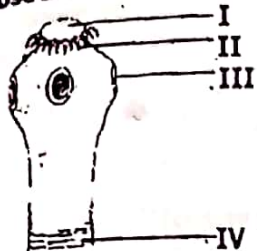
40. Which of the organisms is characterized by the possession of a chitinous exoskeleton? A. I B. II C. III D. IV (2008:Q4)
41. The type of reproduction illustrated in IV is A. sexual B. conjugation C. binary fission D. budding. (2008:Q5)
42. Radial symmetry is a feature common to the A. platyhelminthes B. nematodes C. coelenterates D. arthropods. (2008:Q9)

**Use the diagram below to answer questions 43 and 44**



43. The structure labeled X is for A. attachment B. feeding C. seeing D. breathing (2009:Q8)
44. The habitat if the organism is A. slow moving streams and marshes B. the stomach of large mammals C. under leaf litter on forest floor D. the small intestine of large vertebrates. (2009:Q9)
45. Which of the following is most advanced in the evolutionary trend of animals? A. Liver fluke B. Earthworm C. Snail D. Cockroach. (2012:Q4)
46. An animal body that can be cut along its axis in any plane to give two identical parts is said to be A. radially symmetrical B. bilaterally symmetrical C. Asymmetrical D. Symmetry. (2012:Q9)
47. Tanenia solium can be found in A. goat B. dog C. pig D. cow. (2013:Q5)
48. The structure labelled II is the A. cocoon B. clitellum C. chaetae D. spermathecal pore. (2013:Q6)
49. The organisms is found in soils rich in A. humus B. clay C. sand D. mud. (2013:Q7)

Use the diagram below to answer questions 50 and 51



50. The organs for attachment to the lining of the hosts's intestine are labeled a. II and III B. III and IV C. I and II D. I and III (2014:Q6)
51. The young proglottides of organisms is represented by A. III B. IV C. I D. II (2014:Q7)

### CHAPTER 6 ANSWERS

1D. Man is always a primary host.

#### 2B. THE TWO TYPES OF TAPEWORM

1. Taenia saginata - Has hooks; pig as secondary hence man is infested if he eats under cooked pork
2. T. saginata -No hook; cattle as secondary host; infestation via the eating of beef

#### NOTE:

1. Hooks and suckers to fasten T. solium to human intestinal wall while only suckers do the fastening in T. saginata.
  2. "Sucker" is not for "sucking" but for adhering to the intestinal wall (as in option 3E below).
- 3D. The need for one does not arise since it lives in the midst of fully digested food, and precisely in the ILEUM of the small intestine.
- 4D. ...i.e. no "vertebrae"(or vertebral column).

#### COMMON INVERTEBRATES

- I. Poriferans - Sponges
- II. Coelentrates-Hydra, jellyfish, coral, sea anemones
- III. Platyhelminthes - Tapeworm, planeria, liver fluke, blood fluke (or Schistosoma)
- IV. Nematodes-Hookworms, filarial worms, threadworms, common roundworms (Ascaris lumbricoides).
- V. Annelids - Earthworms, leeches, seaworms.
- VI. Molluscs Snails, mussels, clams, scallops, oysters, octopuses, squids.
- VII. Arthropods - Insects, crustacians, myriapods, arachnids.
- VIII. Echinoderms - Starfish, sea urching, sea cucumber.

#### NOTE:

1. The order above follows the evolutionary trend (or scale).
2. Platyhelminthes are generally called the flatworms and the Nematodes the roundworms.

#### 5D. ECONOMIC IMPORTANCE OF EARTHWORM

1. It aerates the soil.
2. It adds humus to the soil.
3. It improves soil texture.
4. It causes soil turn-over.

NOTE: It is usually found in moist soil especially during the rainy season.

6C. Hydroskeleton in the earthworms.

7B. See Q 2

8B. ...i.e. the hydra can be cut at any plane to produce two identical halves; only one of such planes is possible in bilateral symmetry.

#### NOTE:

1. Poriferans are usually asymmetrical.
  2. Coelentrates and Echinoderms are radially symmetrical.
  3. Bilateral symmetry is an advancement over radial symmetry.
  4. Bilateral symmetry supports specialization and concentration of sense organs in the anterior part of the body of an animal (i.e. the brain in the head).
- 9B. The Earthworm uses CHAETAE (or bristles) for movement
- NOTE: Snail has two pairs of knobby tentacles, the bigger pair bear a pair of eyes. Millipedes/centipedes have a pair of antennae for feeling.
- 10B. A diploblastic animal has two germ layers-ectoderm and endoderm only.

#### NOTE:

1. A triploblastic animal has an additional layer of mesoderm intervening between ecto- and endodermal layers.
  2. The intervening jelly-like layer in Hydra is called Mesogloea but it is not a germ layer.
  3. Mesogloea performs skeletal function in Hydra.
- 11D. The cocoon stores eggs.
- 12A. The excretory ducts run through the entire length of the body and are joined at the posterior end of each proglottis by a cross tube.
- 13B. Calcareous exoskeleton (of shell) instead i.e. shell made of calcium compounds (especially calcium carbonate) rather than chitin.
- 14C. Sexes are separate in blood flukes.
- 15C. A — Tapeworm is parasitic. B — Ascaris is parasitic. D — Leeches are blood-sucking parasites.
- 16D. See Q 4.
- 17B. 6 — Adult tapeworm in the gut of man.
- 1 — Ripe detached segment (or proglottis containing a large number of eggs in faeces).
  - 2 — Egg in the field; may be eaten by a pig or cow.
  - 3 — Embryo in the gut of pig or cow.
  - 4 — Bladderworm in the muscle of pig or cow eaten by man as pork or beef.
  - 5 — Bladderworm with scolex (or head) now tucked out
- NOTE: Bladderworm is also called Cysticercus.
- 18B. See the stages above.
- 19B. A single opening which doubles as mouth and anus while the gut is called ENTERON.
- 20C. Sometimes called metameric segmentation.
- 21D. FEATURES OF THE SNAIL
1. The head bears two pairs of tentacles.
  2. The mouth is on the underside of the head with a spiky tongue called RADULA; no teeth.
  3. The entire body in the inactive state is covered by the MANTLE which secretes the shell especially at the COLLAR.
  4. Genital pore is on the right side of the head.
  5. The snail is hermaphroditic (hence possesses OVO-TESTIS). However, only cross-fertilization is allowed.
  6. Its body is divided into three parts:
    - a. Head.
    - b. Muscular foot.
    - c. Visceral mass (organs inside the shell).
- THE ECONOMIC IMPORTANCE OF SNAIL
- a. As herbivore, it damages crops and garden plants.
  - b. Carrier of diseases like BILHARZIASIS (or schistosomiasis) and liver fluke.
  - c. The giant land snail (Achatina) is edible.
- 22B. See Q 19.
- 23D. Hydra buds asexually under favourable conditions or else it reproduces sexually; Hydra is a hermaphrodite.
- 24B. See Qs. 2 and 7.
- 25B. CNIDOBLAST (or Nematoblasts) are batteries of stinging cells used for offence and defence in Hydra.
- 26D. See Q 11
- 27D. It uses its moist muscular foot in respiration.
- 28B. Platyhelminthes are triploblastic while coelenterates are diploblastic (See Q 10)
- 29B. Qs 28 and 29 are technically the same.
- 30D. Vegetable matter in the swallowed soil is ground against small stones in the gizzard.
- 31B. See Q 25      32C. See Q 20      33D. See Qs 13 and 21
- 34B. See Qs 2 and 17      35A. See Q 8
- 36D. The enteron in hydra is not a coelom since coelenterates are diploblastic (no mesoderm). The enteron is even considered part of the exterior of the animal.
- NOTE: Triploblastic animals are classified as:



1. **Acoelomates**—No body cavity e.g. platyhelminthes
  2. **Pseudocoelomates**—Have false body cavity partially lined with mesoderm e.g. Nematodes
  3. **Coelomates**—True body cavity completely lined with mesoderm e.g. Annelids.
- 37B. See Q 8 38D. See Q 4 39B. See Q 8  
 40A. I—An insect (See Chapter 7)  
 41D. See Q 23 42C. See Qs 8 and 39 43A. See Q 2  
 44D. Beware of option B  
 1. Pig/cow and specifically man are truly mammalia.  
 2. Tapeworm, however, lives in the small intestine (not in the stomach) of man where all food substances must have been completely digested (See Q 3)  
 45D. An Arthropod (specifically insect)—See Q 4  
 46A. See Q 8 47C. See Q 2  
 48B. A glandular swelling which secretes the cocoon necessary to store eggs—See Q 11  
 49A. See Q 5  
 50A. II—Hook; III—Sucker (See Qs 2 and 44)  
 51. IV—Neck region where new proglottides are produced while older proglottides are found towards the tail end of the worm.

### CHAPTER 7:

#### CLASSIFICATION V: HIGHER INVERTEBRATES

1. Which of these is not true of the insect? The possession of  
 A. two pairs of antennae B. jointed appendages  
 C. exoskeleton D. three pairs of legs E. segmented body. (1978:Q23)
2. Insects show considerable powers of water conservation. This is due to the fact that  
 A. the chitinous cuticle is impregnated with tanned proteins B. nitrogenous waste is eliminated as uric acid C. chitin is impermeable to water  
 D. the Malpighian tubules are impermeable to water E. the cuticle is covered with wax. (1979:Q45)
3. A mosquito which produces eggs with float, and whose larvae lie horizontal to the water surface, also rests at an angle on a vertical surface. This type of mosquito is  
 A. Aedes B. Anopheles C. Culex D. Tiger mosquito E. none of the above. (1980:Q48)
4. Which of the following insects has an incomplete metamorphosis during its life cycle?  
 A. Butterfly B. Bee C. Mosquito D. House-fly E. Grasshopper. (1981:Q11)
5. Which of these statements is NOT true of insects?  
 A. They are arthropods B. Their body is divided into three distinct regions of head, thorax and abdomen  
 C. Their thorax comprises three segments, only two of which bear a pair of appendages each  
 D. Respiration is by means of trachea  
 E. They undergo metamorphosis. (1982:Q26)
6. A centipede differs from a millipede by its  
 A. colour B. numerous abdominal segments  
 C. paired legs on each abdominal segment D. poison claws E. cylindrical body. (1983:Q23)
7. 'Jointed skeleton' is absent in the  
 A. cockroach B. spider C. millipede D. snail E. dragon fly. (1983:Q45)
8. Which of the following invertebrates does NOT possess antennae?  
 A. Centipede B. Crustacean C. Millipede D. Insect E. Spider (1984:Q5)
9. Each of the following is an arthropod EXCEPT the  
 A. crab B. spider C. snail D. millipede E. cockroach (1985:Q4)
10. Incomplete metamorphosis in the  
 A. butterfly B. grasshopper C. mosquito D. housefly (1986:Q8)
11. When the original king and queen of termites die, they are replaced by  
 A. the king and queen of another colony  
 B. some adult reproductives from the same colony  
 C. some adult workers which are specially fed to breed.  
 D. Developing nymphs nurtured as secondary reproductive. (1986:Q10)

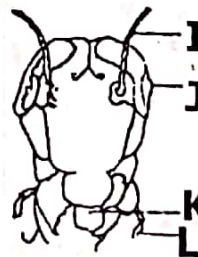
12. The male cockroach differs from the female by having  
 A. mandibles B. a pair of styles C. spiracles D. a pair of cerci (1986:Q11)
  13. The crayfish is an arthropod because  
 A. its body consists of a cephalothorax and an abdomen  
 B. it has a pair each of antennae and antennules  
 C. every segment of its body carries a pair of appendages  
 D. its body is covered with an exoskeleton made of chitin. (1987:Q8)
  14. In the life history of a butterfly, destruction of crops is caused by the  
 A. maggot B. nymph C. caterpillar D. pupa. (1987:Q14)
  15. Insects and millipede have many features in common EXCEPT  
 A. exoskeleton B. jointed, appendages  
 C. Compound eyes D. segmented body (1988:Q14)
  16. Which of the following is a common characteristic of crustaceans?  
 A. Possession of a pair of antennae  
 B. Possession of two pairs of antennae.  
 C. Each segment has a pair of walking legs  
 D. Four pairs of walking legs on the cephalothorax. (1989:Q10)
  17. The pedipalpi in spiders are used for  
 A. grasping B. walking  
 C. feeling D. web spinning. (1989:Q11)
- Use the diagram below to answer questions 18 to 19



Mouth parts of Butterfly.

18. Which of the labelled parts is used for feeling?  
 A. 1 B. 2 C. 3 D. 4 (1989:Q13)
19. The structure labelled 2 is the  
 A. compound eye B. ocellus  
 C. antenna D. labial palp. (1989:Q14)
20. The function of maxillipeds in crayfish is to aid  
 A. walking B. swimming  
 C. feeding D. respiration. (1991:Q11)
21. Which of the following insects undergoes incomplete metamorphosis?  
 A. mosquito B. Termite  
 C. Housefly D. Moth. (1992:Q9)
22. The butterfly is of great economic importance because  
 A. of its use in scientific studies  
 B. it sucks nectar from lowers  
 C. it adds to the beauty of the environment  
 D. it pollinates flower of crops and other plants. (1993:Q12)

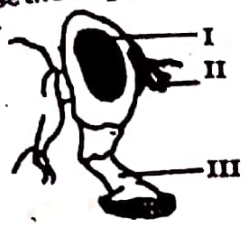
Use the diagram below to answer questions 23 and 24  
 Head of a cockroach



23. The part used for feeling is labelled  
 A. 1 B. J C. K D. L (1994:Q7)
24. The mouth part of the insect is adapted for  
 A. biting and chewing  
 B. suckling and chewing  
 C. biting and sucking  
 D. piercing and sucking. (1994:Q8)
25. Which of the following insects lays its eggs in horny, purse-like cases?  
 A. Mosquito B. Butterfly  
 C. Termite D. Cockroach (1995:Q7)
26. The group of insects that undergoes complete metamorphosis is  
 A. houseflies, beetles and cockroaches  
 B. cockroaches, grasshoppers and bees  
 C. houseflies, beetles and butterflies  
 D. aphids, grasshoppers and butterflies (1997:Q9)
27. The three classes in a termitarium are  
 A. soldiers, queen and workers  
 B. workers, soldiers and reproductives  
 C. soldiers, workers and kings  
 D. kings, queen and soldiers. (1997:Q48)
28. The ability of the cockroach to live in cracks and crevices is enhanced by the possession of  
 A. wings and segmented body  
 B. compound eyes  
 C. claws on the legs  
 D. dorso-ventrally flattened body. (1998:Q7)

29. The case of termites that lacks pigmentation is the A. king B. worker C. soldier D. queen. (1998:Q8)
30. In the honey bee colony, the drones are A. sterile males with reduced mouth parts B. sterile males with well developed mouth parts C. fertile males with reduced mouth parts D. fertile males with well-developed mouth parts. (1998:Q47)
31. The group of Arthropods that has no antennae is the A. crustacea B. chilopoda C. arachnida D. diplopoda (1999:Q4)

Use the diagram below to answer questions 32 and 33

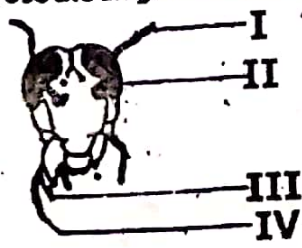


32. The structure labelled II is used for A. tasting B. feeling C. biting D. sucking (1999:Q7)
33. The structure labelled III represents the A. mandible B. palp C. proboscis D. labium (1999:Q8)

Use the diagram below to answer questions 34 and 35

34. The part that will develop into an organ for feeling is labelled A. IV B. III C. II D. I (2000:Q1)
35. The part labelled II is the A. silk thread B. thorax C. forewing D. anchor (2000:Q2)
36. The jointed structure in Insects that bears organs which are sensitive to touch, smell and vibration is the A. maxilla B. labium C. antenna D. abdomen (2001:Q4)
37. Water fleas, wood lice and barnacles belong to the group A. Arachnida B. Crustacea C. Insecta D. Chilopoda (2001:Q7)
38. The role of the male adult honey bee is to A. clean the hive B. ventilate the hive C. mate with the queen D. care for the young (2001:Q46)
39. When oil is poured into the breeding site of mosquitoes, it A. deprives the larvae of water B. kills the adults C. suffocates the pupae D. slows down egg development (2002:Q6)
40. A feature of the caste systems of bees and termites is that A. the workers are sterile B. the kings are bigger than the queens C. only the worker perform duties D. nuptial fight is performed by all members (2002:Q24)
41. 'Jointed Skeleton' is absent in the A. cockroach B. spider C. millipede D. snail E. dragon fly. (2003:Q10)
42. Insects are considered the most successful among the invertebrates because they A. possess exoskeletons B. survive in various environmental conditions C. have wings for flight D. possess the ability to change their forms (2004:Q7)
43. The larval stage of a mosquito is called A. wriggler B. grub C. maggot D. caterpillar (2004:Q8)
44. The function of the long-winged reproductives in a termite colony is to A. disperse the population B. feed the young C. participate in swarming D. protect the young (2004:Q9)
45. The stage in the life history of a moth responsible for the destruction of agricultural crops is the A. nymph B. imago C. pupa D. caterpillar. (2005:Q10)
46. The only caste in the termite colony whose members can feed themselves are the A. reproductive B. workers C. nymph D. soldiers. (2005:Q49)

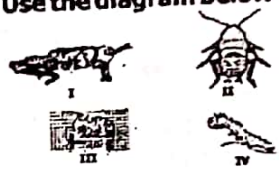
Use the diagram below to answer questions 47 and 48



47. The maxillary palp is labeled A. III B. IV C. I D. II (2006:Q31)
48. The structure labeled I is sensitive to A. light and touch B. chemicals only C. light only D. chemicals and touch (2006:Q32)

49. The process of shedding the exoskeleton of an arthropod is known as A. metamorphosis B. instar formation C. ecdysis D. tagmosis. (2007:Q42)
50. Which of the following is common to the mosquito, housefly and blackfly? A. They undergo complete metamorphosis. B. They are parasites of man C. Their immature stages are aquatic D. Their adults have two pairs of wings. (2007:Q43)
51. The most abundant group of organisms in the animal kingdom is A. Mammalia B. Aves C. Arnelida D. Insecta. (2008:Q8)
52. Which of the following animals is most adapted for water conservation? A. Earthworms B. Mammals C. Flatworms D. Insects. (2009:Q47)
53. The main distinguishing features between the soldier termite and other members of the caste are the A. presence of wings, possession of a large thorax and a small head B. absence of wings, possession of strong mandibles and a large head C. absence of wings, possession of big head and the absence of mandible D. presence of wings, possession of a small head and large thorax. (2010:Q49)

Use the diagram below to answer questions 54 and 55



54. Which of the organisms represented are notable agricultural pests? A. II and III B. I and III C. II and IV D. I and IV (2011:Q6)
55. An economic importance of the organism represented by IV is that A. its faeces pollutes drinking water B. it helps in the control of mosquito larvae C. it transmits water-borne diseases to humans D. it is destructive to farm crops (2011:Q7)
56. The adult form of III is a vector of A. cholera B. elephantiasis C. sleeping sickness D. river blindness. (2011:Q8)
57. The adaptive importance of nuptial flight from termite colonies is to A. ensure cross-breeding between members of one colony to another B. expel the reproductive so as to provide enough food for other members C. disperse the reproductive in order to establish new colonies D. provide abundant food for birds and other animals during the early rains. (2011:Q9)
58. An arthropod that is destructive at the early stage of its life cycle is A. butterfly B. mosquito C. bee D. millepede. (2012:Q8)
59. The significance of a very large number of termites involved in nuptial swarming is to A. provide birds with plenty of food B. ensure their perpetuation despite predatory pressure C. search for a favourable place to breed D. ensure that every individual gets a mate. (2012:Q48)
60. Which of the following describes a characteristic of arthropods? A. The organism has a pair of jointed appendages B. The body is not divided into a number of segments C. The body is covered by chitin D. The organism finds it easy to grow freely. (2013:Q8)
61. Which of the following distinguishes a butterfly from a moth? A. Both are active during the day B. They have similar antennae C. The abdomen of a moth is fatter than that of a butterfly D. The wings of a butterfly rest horizontally but those of a moth rest vertically. (2013:Q9)
62. Proboscis is a structure that is mostly found in A. tapeworms B. amphibians C. molluscs D. insects. (2013:Q13)

## CHAPTER 7 ANSWERS

- 1A. Insect has one pair of antennae.  
 2C. The chitinous exoskeleton called cuticle covers the entire body and  
 a. Protects insect mechanically  
 b. Prevents water loss  
 c. Provides firm sites for muscular attachments

Anopheles	Culex
1. Eggs float singly -	1. Eggs fastened together in batches of 100-300 eggs; may float as raft of eggs.
2. Larvae lie parallel to the water surface	2. Larvae lays at an angle to the water surface.
3. Body of adult angulated to the	3. Body held parallel to the surface. Surface on which it is resting
4. Wings have black	4. No spot on wings. white or red spot.

**NOTES:** Aedes is another strain of Culex mosquito called Aedes aegypti.

4E. Metamorphosis is the transformation an Insect undergoes in the course of its life cycle from egg to adult.

- Complete metamorphosis:** No similarity between the intermediate stages and the adult stage.  
Egg → larva → pupa → adult/imago
- Incomplete metamorphosis:** Adult insect looks like the intermediate stage called nymph.  
Egg → Nymph → Adult/Imago.

### NOTES:

- Four stages in "complete", three stages in "incomplete".
- The nymph differs from adult by:
  - Being smaller** – miniature version of the adult.
  - Being wingless** – if adult is winged
  - Being sexually immature.**
- Insects which undergo "incomplete":
  - Grasshopper
  - cockroach
  - termite
  - Aphid
  - Locust
- Insect which undergo complete:
  - Butterfly
  - moth
  - bee
  - housefly
  - Tsetsefly
  - weevils/beetles
  - mosquito.

### 5D. CHARACTERISTICS OF INSECTS

- Segmented body – Divided into head, thorax and abdomen.
- Three-part thorax – Divided into prothorax, mesothorax and metathorax; each bearing a pair of legs / appendages.
- Meso – and metathorax bear a pair of wings (if insect is winged).
- Chitinous exoskeleton made of chitin – This is common to all arthropods.
- Jointed appendages – six legs, two antennae.
- Short life span, prolific egg – laying.
- Life cycle of insect:
  - Begins with Internal fertilization
  - May be complete or incomplete metamorphosis
  - Sexual reproduction but sometimes **parthenogenesis** possible (e.g aphid)
- Breathing/Respiration – By means of a network of open air – tubes called tracheae within the body which opens to the exterior as spiracles.

Centipede	Millipede
1. Fewer body segments	1. Numerous segments
2. A pair of leg per segment	2. Two pairs per segment (esp. at abdomen)
3. Presence of poison Claws on 1st segment	3. No poison claw.

4. Flat elongated body.
4. Cylindrical elongated body.

5. Carnivore
5. Herbivore.

**NOTES:** Millipedes and centipedes are collectively called myriapods of the phylum arthropoda.

- 7D. Snail is a mollusc rather than anthropod.  
 8E. Arachnids (spider is a member) have no antennae. Spider instead has a pair of pedipalpi or grasping claws.  
 9C. Snail is a mollusc (compare Q7)  
 10B. See Q4  
 11D. Several pairs of such secondary reproductives are developed to maintain the rate of egg laying.  
 12B. A pair of style is characteristic of the male while a pair of cerci (singular: cercus) is common to both sexes.  
 13D. A feature common to all anthropods.

### NOTES:

Anthropods include the following:

- Crustaceans:** crabs, prawns, shrimps, crayfish, lobsters, water fleas, woodlice and barnacles.
- Insects:** grasshopper, mosquito e.t.c.
- Arachnids:** spiders, scorpions, mites and ticks.
- Myriapods:** Centipedes, millipedes

14C. Caterpillar, the larval stage of butterfly, is disadvantageous to the farmer by eating leaf tendrils. The adult insect, however, is a foremost pollinator of crops hence beneficial to the farmer.

### NOTES:

Insect	Larva	Pupa
Housefly	Maggot	Grub
Mosquito	Wiggler	Tumbler
Butterfly	Caterpillar	Chrysalis
Moth	Caterpillar	Chrysalis

15C. While insects have a pair of compound eyes in addition to a number of simple ones (ocelli), millipedes may have simple or compound or none.

16B. **Characteristics of Crustaceans:**

- Two pairs of antennae.
- Usually aquatic.
- Body into cephalothorax and abdomen
- Appendages often modified for swimming.
- Gaseous exchange by gills.

17A. Pedipalpi are primarily used for grasping (capturing) preys but they are also sensitive to touch (for feeling)

### Features of Arachnids

- Usually terrestrial.
- Body divided into **cephalothorax** and abdomen.
- No antennae but **pedipalpi**.
- Simple eyes only.
- Four pairs (or 8) walking legs.
- Gaseous exchange by gills, lung-books or tracheae.

18A. 1 → Antenna

19D. 2 → Labial palp    3 → maxillary palp    4 → Proboscis

20C. **Maxillipedes** aid in chopping food and passing it into the mouth.

21B. See Q4    22D. Compare Q14    23A. See Q18

24A. Grasshopper – biting/chewing  
 Mosquito – piercing/sucking  
 Housefly – lapping/sponging  
 Butterfly – sucking  
 Tsetsefly – piercing/sucking

25D. These cases are also called **oothecae** (singular: ootheca)

26C. See Q4

27B. **NOTES:**

- Short-winged and wingless reproductives may also be present.
- Workers and soldiers are wingless, sterile and blind.

3. **Mandibulated** soldiers defend the colony by using their powerful jaws (mandibles) for offence or blocking the tunnels with their large heads against invaders.
4. **Nasute** soldiers kill enemies by the poison claw at the tip of their pointed heads.
5. The entire colony is fed by the workers which are the only caste with capacity to digest cellulose.

28D. Compare the laterally flattened body of many fish (streamlining)

29B. This gives the workers a whitish appearance hence termites are also called "white ants" since workers are the most populous in a colony.

30C. **Queen**

1. A fertile winged female with poorly developed mouth parts.
2. Legs bear no pollen baskets or brushes.
3. Shorter wing but larger abdomen with respect to workers.
4. Unbarbed sting which can be used again and again.

**Drones**

1. Fertile winged males with poorly developed mouth parts; stout body.
2. No pollen baskets/brushes; no sting

**Workers**

1. Sterile winged females with well developed mouth parts.
2. Legs bear pollen comb(1st legs), prongs(2nd), pollen baskets (3rd)
3. Barbed sting – stinging is suicidal.

**NOTES:**

1. Honey bees like ants and termites are social insects.
2. There are 3 castes in a bee colony: Queen – only one copy; Drones – a few hundreds; Workers – several thousands
3. Bees live in hive (beehive); termites live in a termitarium (or anthill)

31D. See Q17 32B. Antenna for feeling.

33C. This proboscis is modified for lapping or sponging (see Q24)

34D. I → Will develop into head and thorax and the head bears a pair of antennae.

**NOTES:** This is the pupal stage (or chrysalis) of a butterfly (or moth).

35A. The silk thread forms a girdle which suspends the pupa on the twig. II → tracheal opening or spiracle. IV → silken pad

36C. See Q32 37B. See Q13

38C. This mating is a suicidal mission on the part of the drone concerned as its copulatory organs are ruptured from its body.

**NOTES:** A queen is fertilized once in a lifetime.

39C. The oil film cuts off air thereby suffocating the larva (but not the pupa, please); besides, some oil may enter and block breathing organs and spiracles.

40A. See Qs 27 and 30 41D. See Q14

42B. Most successful; most numerous.

43A. See Q14

44A. The aim of swarming (C) is to disperse the population (A) so as to prevent overcrowding in the colony and to establish another.

**NOTES:**

1. **Swarming** – Flying off of long-winged reproductives from the colony (or nest) in large numbers.
2. **Nuptial flight or wedding flight** – flying and isolation of a male – female pair to establish a new colony.

45D. Moths and butterfly are similar in many respect (See Q14) but note the following differences:

Butterfly	Moths
1. Thinner body	1. Fatter body
2. Less hairy	2. More hairy
3. Diurnal	3. Nocturnal
4. Antennae with knobs	4. Pointed antennae
5. At rest, wings are vertical	5. At rest, wings are horizontally spread out.
6. Fore – and hind wings not connected.	6. Fore – and hind wings are connected.
7. Usually colourful.	7. Usually dull.
8. Pupa not encased in a cocoon	8. Pupa is usually cocooned

46B. See Q27

47B. I → antenna II → Compound eye

48D. The multi-jointed antenna is provided with olfactory/smell receptor (sensitive to chemical) and tactile receptors (sensitive to touch).

49C. The periodic replacement of the exoskeleton (cuticle) is called moulting or ecdysis and each stage between two moultings or ecdyses is an instar.

50A. They are not parasites but vectors for parasites of man e.g. plasmodium.

51D. About 70% of known species of animals are insects.

52D. Its cuticle prevents water loss by evaporation; it excretes nitrogenous wastes as uric acid instead of the osmo-active urine.

53B. See Q27

54D. Grasshopper and caterpillar of butterfly/moth.

55D. See Q14

56B. III → pupa (tumbler) of mosquito.

**NOTES:**

1. Mosquito (adult) is a vector for the filarial worm which causes filariasis
2. **Filariasis** could be fatal or may lead to elephantiasis.
3. **Elephantiasis** (from elephant) is a condition whereby the victim's limb swells considerably and the disfigurement arises from the blockade of lymphatic vessels of the limb by the worm.

57C. See Q44 58A. See Q14

59B. The few which survive predation perpetuate the species.

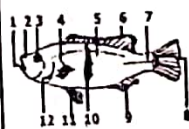
60C. See Q5 61C. See Q45

62D. Insects like butterfly, housefly and mosquito.

## CHAPTER 8:

### CLASSIFICATION VI: VERTEBRATES I – PISCES. AMPHIBIANS. REPTILES

1. The part numbered 12 is A. pectoral fin B. scale C. opercular plate D. gill plate E. pectoral girdle (1978:Q26)
2. During the movement of the fish from point A to target B, one of these parts is not involved A. 7 B. 5 C. 3 D. 6 E. 10 (1978:Q27)
3. The feature that distinguishes the toad or frog from a fish is the absence of A. scales B. lungs C. paired appendages D. a tail E. skin glands (1978:Q28)
4. Which of these is not associated with the tadpole stages of the toad or frog? A. V-shaped gland B. Operculum C. External gills D. Jelly E. Shell (1978:Q29)
5. Some of the feature of an animal are scales, teeth, nares and backbone. The animal is likely to be a toad. A. toad B. bird C. lizard D. rat E. bat. (1980:Q6)
6. Which of the following animals is cold-blooded? A. cat B. Lizard C. Whale D. Bird E. Horse. (1981:Q4)
7. The main function of the swim-ladder is for A. swimming B. detecting sound C. buoyancy D. breathing E. reproduction (1982:Q17)

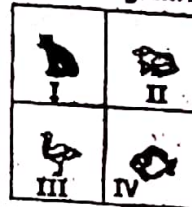


8. When an operculate fish breathes it takes in water through the A. mouth and passes it out through the same way B. mouth and passes it out through the operculum C. operculum and passes it out through the mouth D. operculum and passes it out through the nostrils E. nostrils and passes it out through the operculum. (1982:Q27)
9. Which of the following structures is NOT found in the female Agama lizard. A. Pre-natal pads B. Ear drum C. Gular fold D. Nasal scale E. Nuchal crest. (1983:Q6)
10. The male toad differs from the female by having A. vocal sacs. B. shorter hind limbs. C. longer forelimbs. D. bulging eyes. E. nictating membrane. (1984:Q2)
11. The dorsal and anal fins of fish are used for A. upward movements B. controlling rolling movements C. downward movements D. steering E. buoyancy. (1984:Q14)
12. In fish the sense organs which detect movements in the water are located within the A. gills B. operculum C. nostrils D. median fins E. lateral line. (1985:Q5)
13. At what stage in the life history of a toad is its mode of breathing similar to that of a fish? A. Tadpole stage B. External gill stage C. Adult stage D. Internal gill stage E. Larval stage. (1985:Q9)
14. Fishes are cold-blooded because their body temperature is A. constantly low B. constantly high C. dependent on that of their surroundings D. regulated at will (1986:Q9)
15. The fins making up the limbs of the bony fish are A. caudal and ventral B. ventral and pelvic C. pelvic and pectoral D. pectoral and dorsal. (1986:Q12)
16. The long and coiled intestine of a young tadpole is an adaptation to its A. herbivorous diet B. carnivorous diet C. aquatic habitat D. insectivorous habit. (1988:Q12)
17. The major function of the swim-bladder in fishes is A. breathing B. buoyancy C. swimming D. diving (1988:Q15)
18. Which of the following animals has homodont dentition? A. Rat B. Man C. Lizard D. Pigeon. (1990:Q10)
19. In which of the following does external fertilization take place? A. Toad B. Lizard C. Bird D. Cockroach. (1990:Q11)
- Use the figure below to answer questions 20 and 21**
20. The structure labelled 4 is for A. feeding B. attachment C. excretion D. respiration. (1991:Q13)
21. As the tadpoles develops, the structure labelled 5 A. grows longer B. becomes shorter C. becomes the hind legs D. remains unchanged. (1991:Q14)
22. The gill rakers of fishes take part in A. feeding B. respiration C. swimming D. diffusion. (1991:Q15)
- Use the figures below to answer questions 23 and 24**
23. Which of the following is the correct order of the development stages? A. 1→2→3→4→5 B. 5→1→3→2→4 C. 2→1→3→4→5 D. 5→3→2→1→4. (1993:Q10)
24. Stage 3 breathes A. with the lungs B. with the external gills C. with the internal gills D. through the skin. (1993:Q11)
25. Cold blooded animals are referred to as A. poikilothermic B. homoiothermic C. polythermic D. homeostasis (1993:Q49)
26. Which of the organism has lost the pentadactyl limb structure? A. Bat B. Fish C. Frog D. Pigeon. (1993:Q50)
27. Which of the following combinations differentiates a bony fish from a cartilaginous fish? I. Presence of gills. II. Absence of gill slits III. Possession of bony skeleton IV. Possession of laterally compressed body V. Possession of dorso-ventrally compressed body. A. I, II and III. B. I, III and IV. C. II, III and IV. D. II, III and V. (1994:Q9)
28. Which is the most important adaptation of a bony fish to life in water? A. The possession of a streamlined shape B. The presence of overlapping scales C. The covering of the body by thin film of shine. D. The possession of a caudal fin.

(1994:Q10)

29. In which of the following vertebrates does the skin function as a respiratory surface? A. Rat B. Lizard C. Fish D. Frog (1995:Q8)
30. In which of the following groups of vertebrates would the largest amount of yolk be found in the egg? A. Mammals B. Fishes. C. Amphibians. D. Reptiles. (1997:Q25)
31. The structures that prevent food particles from escaping through the fish gills are called gill. A. arches B. filaments C. rakers D. lamellae. (1998:Q9)
32. The possession of scales, laying of eggs with shells and bony structure of the head are characteristics shared by A. birds and reptiles B. fishes and birds C. reptiles and fishes D. birds and molluscs (1999:Q3)
33. The key event in the transition of the amphibians from water to land is the A. replacement of the gills with lungs B. possession of webbed limbs C. development of long hind D. limbs E. possession of tympanic membrane (1999:Q11)
34. The set of fins that controls steering, balancing and change of direction and pitch in fish is A. dorsal and anal B. pectoral and pelvic C. caudal and dorsal D. anal and pelvic (2000:Q4)
35. Amphibians are normally found A. on dry land and in water B. in water and on moist land C. on moist land D. in water (2001:Q2)

**Use the diagram below to answer questions 36 and 37**



36. The correct evolutionary sequence of the organisms represented is A. I III II IV B. II III IV I C. III II IV D. IV II III I (2002:Q7)
37. Oviparity is the type of fertilization exhibited by the organism labelled. A. I. B. II C. III D. IV (2002:Q8)
38. The presence of endoskeleton is characteristic of A. invertebrate B. vertebrate C. insecta D. coelenterata (2002:Q30)

**Use the figures below to answer questions 39 and 40**



39. A noticeable adaptation of the animal to its aquatic habitat is the possession of A. a wide mouth B. large eyes C. webbed digits D. fore limbs (2003:Q5)
40. The processes of water loss and intake indicated by the arrows labelled I and II are respectively A. exhalation and osmosis B. urination and diffusion C. osmosis and diffusion D. evaporation and osmosis (2003:Q6)
41. I. Rattus rattus II. Agama agama III. Bufo regularis IV. Tilapia zillii The order of evolutionary advancement of the above vertebrates is A. I, II, III, IV B. I, IV, III, II C. II, III, IV, I D. IV, III, II, I (2005:Q7)
42. The main function of the caudal fin in Tilapia is to A. propel it forward in water B. steer it while changing direction C. balance it in water D. enable it to float in water. (2005:Q13)
43. In lizards, the lowering of the gular fold is used to A. catch insects B. attract mates C. defend their territory D. frighten enemies. (2007:Q15)
44. An example of a fish that aestivates is A. shark B. croaker C. lung fish D. cat fish. (2007:Q16)
- Use the figures below to answer questions 45 and 46**
45. The diagram shows that the organisms are A. hermaphrodite B. viviparous C. oviparous D. ovoviviparous (2007:Q18)
46. The breeding posture illustrated in the diagram is known



- A. mating B. amplexus C. courtship display D. reproductive swimming. (2007:Q19)
47. Which of the following is used mainly for balancing in fish?  
A. The caudal fin B. The pectoral fin C. The anal fin D. The dorsal fin (2008:Q10)
48. The most important characteristic that makes reptiles to conquer terrestrial habitats is the possession of  
A. long tail B. scaly skin C. sharp claw D. amniotic egg. (2008:Q12)
49. The first terrestrial vertebrates evolved from  
A. Pisces B. Reptilia C. Amphibia D. Mammalia. (2009:Q5)
50. The feature that makes locomotion in water easy for fish is the  
A. scaly body B. slimy body C. streamlined body D. lateral line. (2009:Q10)

Use the figures below to answer questions 51 and 52

51. With respect to their decreasing dependence on aquatic conditions for reproduction, which of the following is the correct arrangement of the animals represented?  
A. IV, III, II and I B. I, II, IV, and III C. III, II, IV and I D. I, IV, II and III (2010:Q6)
52. Which of the animals represents the oldest creatures in terms of evolutionary history?  
A. II B. I C. IV D. III. (2010:Q7)
53. The function of the red head in male Agama lizards is to  
A. attract female lizards for mating purposes B. warn predators of the distastefulness of the animal C. conceal and camouflage the animal from predators D. scale other males from the territory. (2011:Q2)
54. The basking of Agama lizards in the sun is to  
A. change the colour of their body B. raise their body temperature to become active C. fight to defend their territories D. attract the female for courtship. (2012:Q47)
55. An example of poikilothermic organisms is a  
A. lizard B. cockroach C. rabbit D. bird. (2014:Q48)

### CHAPTER 8 ANSWERS

- 1C. Or "gill cover"
- 2E. Scale is considered as an exoskeleton unconnected with locomotion.  
I → Mouth II → Nostril III → Eye  
IV → Pectoral fin V → Lateral line VI → Dorsal fin  
VII → Caudal peduncle VIII → Caudal (tail) fin  
IX → Ana/Vertical fin X → Scales XI → Pelvic fin  
XII → Operculum.
- 3A. The toad in particular has warty, dry skin unlike frog with moist, smooth skin.
- 4E. **Metamorphosis in Toad**
- The female lays unfertilized eggs in a string of jelly only to be externally fertilized by the male.
  - The eggs hatch into a little curved tadpoles.
  - A tadpole wriggles clear of the jelly and attaches itself to a water weed by sticky cement secreted by its V-shaped gland and it develops external gills.
  - It develops a mouth with horny jaw while its long, coiled intestine is consistent with herbivorous mode of nutrition.
  - The external gills disappear and opercula replace them since the tadpole/ develops internal gills now like a fish.
  - The hind-limbs appear as knobs in the base of the tail and fore-limbs later under the cover of the operculum.
  - The tail begins to disappear after the limbs are fully developed.
- 5C. Rat/Bat are mammals – No scale but hair.  
Birds – No teeth. (Zero dentition)  
Toad – No scale (See Q3)
- 6B. **Concerning the vertebrates:**
- Pisces and Amphibians are cold blooded or poikilothermic.

- Reptiles, aves and mammals are warm blooded or Homiothermic.

#### NOTE:

- Poikilothermic animals** have varied body temperature which varies with the temperature of the environment (exothermicity)
  - Homiothermic animals** have constant body temperature regardless of external temperature (internally regulated – endothermicity)
  - The term cold – blooded is a misnomer and better avoided because the body temperature of a lizard might be warmer than that of a mammal on a hot day.
- 7C. That is to keep the fish afloat even when it is moving.
- NOTES:**
- Swim-bladder or air bladder is a long, narrow, thin-walled, air-filled sac found only in bony fishes.
  - The bladder also controls the pitch (swimming up or down) of the fish.
  - In some fishes e.g. lung-fish, the bladder is used for respiration (breathing).
  - Therefore, lung-fish can aestivate when a pond dries up.
- 8B. Remember the expression "drink like a fish". Thus a fish drinks (not vomits) water. Have you ever noticed the flaring of the opercula of a fish when it is out of water? Water is meant to exit the opercula
- 9A. A pre-anal pad is in fact the hemi-penis at each end of the cloaca.
- NOTE:**
- The cloaca (also in birds) is an opening which serves 3 purposes  
a. Digestive b. Urinary c. genital
  - Fertilization is internal in the lizard.
- 10A. The vocal sacs/cords are used to make a croaking noise, a form of courtship behavior.

#### NOTE:

- The male toad also has a large sticky pad (nuptial pad) on each fore-head with which it grasps the female on whose back it is mounted during mating.
  - The female is now larger than the male as it contains a large number of eggs.
  - Fertilization is external (see Q4).
- 11B. They stabilize the fish thus acting like the keel of a ship.
- NOTES:**
- Caudal fin – Propulsion of a fish through water, controlling direction of movement (like a rudder) and keeping the fish upright (like a keel).
  - Pectoral/pelvic fins – for steering and balancing; control of pitch of fish; provide braking force.
  - Caudal/Anal/dorsal fins – Medium and unpaired.
  - Pectoral/Pelvic fins – paired fins i.e. two each.
  - Pectoral and pelvic fins are analog of fore and hind-limbs in other vertebrates.
- 12E. Lateral line contains sensory cells which help fish to respond to vibration and changes in pressure in the water.
- 13D. See Q4 14C. See Q6 15C. See Q11
- 16A. See Q4 17B. See Q7
- 18C. Aves – Zero dentition Mammals – Heterodont dentition.
- NOTES:**
- Homodont** – All teeth are same size, shape and function.
  - Heterodont** – Teeth are of different sizes, shapes and functions as dictated by feeding habits (herbivore, omnivore, carnivore)
- 19A. See Q4
- 20A. Coiled intestine (See Q4)
- 21B. See Q4
- 22A. Gill rakers act as food strainers, preventing the entry of

food into the gill chamber from the pharynx.

23D. See Q4 24C. See Q7

25A. See Q6

26B. Pentadactyl limb structure suggests 5-digit limbs invertebrates while pectoral and pelvic fins are primitive versions of this pattern.

27C. Bony	Cartilaginous
1. Found in marine and fresh water.	1. Only in marine water.
2. Skeleton of bones.	2. Skeletons of cartilages or gristles.
3. Cycloid scales which are not overlapping.	3. Placoid scales which are overlapping.
4. Presence of gill cover hence gill slits not visible.	4. No gill cover hence visible gill slits.
5. Mouth is terminal.	5. Mouth is ventral.
6. Fertilization is usually external.	6. Fertilization is usually internal.
7. Laterally flattened body	7. Dorso-ventrally flattened body.

**NOTES:**

1. Placoid scales have teeth-like appearance especially internally.
2. Cycloid scales are thin round overlapping plates of bones.
3. Bony fishes include: carp, goldfish, mackerel, guppy, anchovy, cod, tilapia herring.
4. Cartilaginous fishes: dogfish, shark, sting ray, skates.

28A. Hence water offers little or no resistance to the movement of the fish.

29D. Routes of Respiration in Frogs/Toad.

1. Mouth - Buccal respiration.
2. Skin - Cutaneous respiration.
3. Lung - Pulmonary respiration.
4. Gills - Only in tadpole stage of life (external/internal gills)

30D. Mammals do not lay eggs except in primitive mammals e.g. Scaly ant-eater and duck-billed platypus; Birds have more yolk than reptiles.

31C. Now compare Q22

32B. Scales of birds confined to legs only; yolky egg of birds in calcareous shells; yolky eggs of reptiles in leathery skin.

33A. Amphibians believed to have evolved from the fishes.

34B. See Q11

35B. Toad more to the land (common during rainy season) and frog more to water - amphibians have dual habitat - land/water.

They always return to water for breeding and egg laying while reptiles always lay their eggs on land even if they live in water.

36D. Fish → amphibian → reptile → bird → mammal.

37D. Ovoviviparity only possible in certain fishes.

**NOTES:**

1. Oviparity - laying of eggs which later hatch into young animals e.g. many fishes (internal fertilization) and toad/frog (external fertilization).
2. Viviparity - Young ones are born alive after having been nourished directly from the maternal blood.
3. Ovoviviparity - Fertilized egg remains in the body until it hatches into a young one born alive e.g. the guppy.
4. All mammals are viviparous except the primitive ones called the monotremes e.g. spiny anteater and duck-billed platypus.

38B. And this includes their backbone.

39C. This facilitates swimming and floatation (buoyancy).

40D. Evaporation is minimized by the warty skin and osmoregulation by the kidneys.

41D. Tilapia zilli - A fish.

Bufo regularis - Common toad

Agama agama - Agama Lizard

Rattus rattus - rat

42A. See Q11

43B. Gular fold is lowered in courtship (B) and sometimes when frightened. Nuchal crest is raised when males fight each other ((C) and (D)).

44C. See Q7 45C. See Qs 4 and 37

46A. See Q10 47D. See Q11

48B. Which prevents water loss by evaporation.

49A. Amphibians as the first land vertebrates evolved from the Pisces.

50C. See Q28

51A. Consistent with evolutionary trend.

52C. Fish is the most primitive.

53A. It is an adaptation for securing mate.

54B. Remember its poikilothermicity?

55A. See Qs 6 and 54.

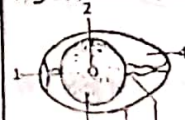
**CHAPTER 9**

**CLASSIFICATION VII: VERTEBRATE II- BIRDS AND MAMMALS**

1. A trawler on a fishing trip landed a type of animal with hairs on its body. This animal could have been A. An amphibian B. a reptile C. a shark D. a mammal E. a seagull. (1978:Q8)
2. Which of these is not a part of the feather of a bird? A. wing B. Aftershaft C. Inferior umbilicus D. Vane E. Barbule. (1978:Q31)
3. Which of these animals is NOT metamerically segmented? A. Tapeworm B. Earthworm C. Centipede D. Crayfish E. Shark. (1982:Q3)
4. An homoiothermic animal kept in a room where the temperature is lower than the body temperature may lose heat by four physical processes. Which of the following processes is NOT connected with body temperature regulation? A. Radiation B. Sweat C. Evaporation D. Conduction E. Convection. (1982:Q7)
5. Fig1 represents a quill feather. The structure labelled "M" is the A. quill B. rachis C. superior umbilicus D. inferior umbilicus E. after shaft (1984:Q11)

Use the figures below to answer questions 6 and 7

Fig 2, transverse section of a fowl's egg



6. The young chick is formed from A. 3 B. 3 and 4 C. 1, 3 and 5 D. 2 E. 4 (1984:Q24)
7. Which parts provide food for the developing chick? A. 2 and 3 B. 4 and C. 3 and 4 D. 2 and 5 E. 1 and 2 (1984:Q25)
8. Which of the following adaptations is NOT concerned with the flight of birds? A. Streamlined shape B. Presence of powerful muscles C. Reduced body weight D. Broad sternum E. Webbed feet. (1984:Q32)
9. In mammals, the function of the sebaceous gland is to A. produce sweat B. secrete sodium C. secrete water D. produce an oily substance E. manufacture vitamin D. for the skin. (1985:Q24)
10. For effective functioning of a bird's quill feather, hooks fit on the ridges of the A. vane B. rachis C. barbules D. barbs. (1986:Q5)
11. A feature which adapts birds to flight is the possession of A. scally legs B. light bones C. two walking legs D. a pointed beak. (1990:Q13)
12. In which of the following organisms would glycogen be stored? A. Spirogyra. B. Chlamydomonas. C. Rattus D. Magnifera. (1993:Q6)
13. Birds maintain their body temperature with the help of their A. blood which maintains constant temperature B. feathers

which cover the body C. skin which conserves moisture  
D. veins which transport fluid of constant temperature to all body tissues. (1995:Q9)

14. The mammalian organ which acts as a digestive and as an endocrine organ is the A. oesophagus B. liver C. pancreas D. spleen (1995:Q14)
15. A distinguishing feature of mammals is the possession of A. skin B. scale C. nail D. hair. (1998:Q10)
16. In dissection, the rib cage of a mammal has to be opened in order to expose the A. diaphragm B. liver C. heart D. sternum (1999:Q23)
17. In mammals, the organ which performs digestive and endocrine functions is the A. liver B. pancreas C. gastric gland D. salivary gland (1999:Q31)
18. A characteristic of vertebrates that is unique to mammals is A. the presence of pentadactyl limbs B. parental care C. the possession of scrotum D. pulmonary circulation. (2000:Q7)

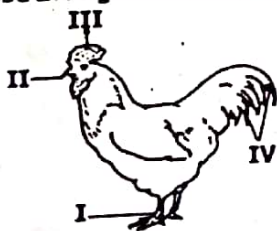
19. Complex social behaviour and organization are found mostly in A. insects B. birds C. reptiles D. mammals (2000:Q49)

20. Viviparity occurs mainly in the A. mammals B. reptiles C. Aves D. amphibians (2001:Q3)
21. Which of the following pairs of organs is located in the anterior half of the mammalian body cavity? A. Kidneys and lungs B. Heart and ovary C. Lungs and hearts D. Kidneys and heart (2002:Q35)

22. A peculiar characteristics of mammals is that they A. have teeth B. are warm-blooded C. have lungs D. have sebaceous glands (2004:Q10)

23. The eggs of birds contain relatively larger quantities of yolk than those of amphibians and reptiles because A. birds are generally bigger in size B. embryonic development is longer in birds C. those of birds are fertilized internally D. birds lay shelled eggs (2004:Q27)

Use the figures below to answer questions 24 and 25



24. A unique characteristic that distinguishes the class of vertebrates represented from other vertebrates is the presence of A. two pairs of limbs B. scales on the lower legs C. a pair of wings D. a covering of feathers. (2006:Q36)

25. The structures used for offence and defense are labeled A. I and IV B. I and II C. II and II D. III and IV. (2006:Q37)

26. A characteristic that exemplifies the evolutionary advancement of mammals over other vertebrates is the A. viviparous mode of reproduction B. possession of paired limbs C. terrestrial mode of life D. possession of a heart. (2006:Q39)

27. Which of the following produces both hormones and enzymes? A. Ileum B. Pancreas C. Gall bladder D. Kidney. (2006:Q14)

28. The part of a domestic fowl responsible for preventing heat loss is the A. filoplume B. contour feather C. down feather D. quill (2009:Q46)

29. Parental care is exhibited by A. snails B. earthworms C. birds D. toads. (2010:Q5)

Use the figures below to answer questions 30 and 31



30. The main function of the feathers covering the part labeled I is to A. generate heat to keep the animal warm B. provide some power for flight C. serve as insulator to maintain

body heat D. prevent ecto parasites from attacking the animal. (2010:Q9)

31. Based on the shape and structure of the beak and feet, the bird represented is likely to feed mainly on A. fruits B. seeds C. nectar D. flesh. (2010:Q10)
32. In which of the following groups of vertebrates is parental care mostly exhibited? A. Aves B. Mammalia C. Reptilia D. Amphibia. (2011:Q5)
33. Which of the following possesses mammary gland? A. Dogfish B. Whale C. Shark D. Catfish. (2012:Q10)
34. The feature that links birds to reptiles in evolution is the possession of A. feathers B. beak C. skeleton D. scales. (2012:Q11)
35. Which of the following types of feathers is used for flight in birds? A. Filoplume B. Covert C. Down D. Quill (2013:Q10)

### CHAPTER 9: ANSWERS

- 1D. Hair (or fur) is a mammalian characteristic
- Scale - fishes/birds.  
Feather - birds.  
Hair - mammals
  - The above are considered as exoskeleton in vertebrates.
- 2A. Wing is a fore - limbs of a bird usually modified for flight
- 3E. A vertebrate transfer to ch 8
- 4B. Sweat is not a process

#### NOTE:

- Body gains heat by:
    - Absorption from the surroundings
    - Metabolic activities especially in the liver and muscle cells.
  - Body loses heat by:
    - Radiation, conduction and convection.
    - Evaporation which causes cooling when sweat evaporates from the body surface
    - Exhaled air.
    - Excreted urine.
- 5C. J → Vane K → Shaft or ractus M → Superior ambilicus  
N → Quill O → Inferior umbilicus
- 6D. 1 → Air space 2 → Germinal disc (forms the embryo)  
3 → Yolk 4 → Albumen (egg white)  
5 → Chalaza (a tough strand of albumen) 6 → Calcareous shell

- 7C. Also the shell.
- 8E. Adaptation for flight in birds
- Fore - limbs modified into wings
  - Stream/lined body which tapers towards the tail and neck.
  - Light but strong wing feathers.
  - Broad sternum (breast bone) engineered to form a keel and it provides an anchorage for flight muscles.
  - Huge, strong flight muscles especially the pectoralis major and pectoralis minor (which are antagonistic muscles).
  - Hollow bones to confer lightness.
  - Presence of air sacs joined to the lungs by narrow tube to enhance oxygen supply for entire respiration which flight demands.

- 9D. The oily substance called sebum keeps the hair and skin waterproof and supple; it also prevents entry of germs and dust.

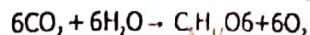
- 10C. Note the branching on a feather:  
Shaft → Barbs → Barbules (small; barbs); upper barbules on a barb have hooks while the lower ones have grooves so that hooks fit into adjacent grooves

- 11B. See Q8
- 12C. Rattus, the rat, is an animal and glycogen is the storage form of glucose in animals unlike in plants which store glucose as starch.



- 13B. Feathers provide insulation.
- 14C. Pancreas produces digestive enzymes and hormones.
- 15D. See Q1
- 16C. The thoracic cavity whose anterior wall is the ribs contains the: 1. Heart 2. Lungs 3. Great vessels 4. Oesophagus (thoracic portion) 5. Trachea/bronchi
- 17B. See Q14
- 18C. Unique features of mammals.
1. Presence of hair (or fur) in the skin.
  2. Presence of sebaceous and sweat glands in the skin.
  3. Presence of well developed mammary glands in adult females with which they suckle their young (mammals are named after this characteristic).
  4. Presence of external ears as cartilagenous funnel-like pinnae.
  5. A strong, muscular and elastic sheet called the diaphragm separates the thoracic and abdominal cavities.
  6. Heterodont dentition fashioned to fit the food types eaten.
  7. Brains better developed than in other classes of animals with superior intelligence.
  8. Presence of a pair of testes inside a scrotal sac outside the body in the males.
  9. Most young are born alive – Viviparity.
- NOTE:** Consider these three classes of mammals.
1. **Monotremes** – Primitive oviparous mammals which lay eggs, e.g. spring ant eater and duck billed platypus.
  2. **Marsupials** – Primitive mammals which born under developed young which continue their development in a pouch of a skin of the mothers. e.g. Kangaroo and Koala.
  3. **Placental mammals** – Advanced and viviparous animals e.g. rat, rabbit, man.
- 19D. e.g. man 20A. See Q18
- 21C. Anterior (quadruped mammals) or superior (man) half refers to the thoracic cavity while the posterior/inferior half is the abdominal cavity (Now See Q16)
- 22D. See Q18
- 23B. Yolk provides nourishment.
- 24B. See Q14 and 17
- 25D. Feathers only in birds.
- 26B. I → Leg II → Beak or bill III → Comb (for courtship display) IV → Tail (may contain oil gland to keep feather glossy and water)
- 27A. See Q18
- 28C. **Types/Functions of feathers**
1. **Quill feathers** – For flying (hence known as flight feathers) and are found at the wings and tail.
  2. **Covert feathers** – Serve as body cover and have widest distribution.
  3. **Down feathers** – Provide insulation especially in young birds and they grow beneath quill and covert as well as upper part of legs.
  4. **Filoplumes** – small, hair-like and sparsely distributed feathers with unknown function.
- NOTES:**
1. Quill and covert feathers are collectively called contour feathers as they determine the contour of the bird.
  2. Covert is a replica of Quill but smaller.
- 29C. However, mammals show the most complex and longest period of parental care among vertebrates.
- 30C. See Q28
- 31D. Curved, sharp beak, sharp claws.
- 32B. Compare Q29
- 33B. Note that Whale and dolphins are mammals not fishes.
- 34D. Scales confined to legs only.
- 35D. See Q28

## CHAPTER 10: NUTRITION. FOOD SUBSTANCES

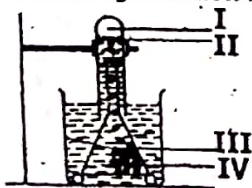


1. The process represented by the above equation is A. protein-synthesis B. respiration C. Photosynthesis D. transpiration E. translocation. (1978:Q2)
2. The oxygen given off during the process is derived from A. sunlight B. chlorophyll C. carbon dioxide D. atmosphere E. water. (1978:Q3)
3. Which of these elements is required by plants in small quantities only? A. Boron B. Nitrogen C. Phosphorus D. Magnesium E. Potassium. (1978:Q33)
4. Which of these is a direct photosynthetic product? A. Glucose B. Starch C. Protein D. Fats E. Latex. (1978:Q34)
5. An organism which lives on the remains of a dead plant is A. an endo parasite B. a saprophyte C. a commensal D. a symbiont E. an ecto parasite (1979:Q5)
6. Which of the substances listed below is a trace element for plants? A. Potassium B. Sodium C. Copper D. Phosphate E. Nitrate. (1979:Q6)
7. A sugar solution was boiled with Fehling's solutions A and B and the colour remained blue. The sugar tested was A. glucose B. maltose C. fructose D. sucrose E. lactose. (1979:Q22)
8. Alkaline pyrogallol was used in an experiment. That experiment must have been connected with A. excretion B. germination C. transpiration D. digestion E. photosynthesis. (1979:Q23)
9. The element nitrogen is utilized in A. formation of ATP B. formation of glucose C. formation of amino acids D. Photosynthesis E. none of the above. (1979:Q47)
10. Magnesium is utilized in the formation of A. ATP B. glucose C. amino acids D. chlorophyll E. fats (1979:Q48)
11. In testing for glucose, the necessary reagent and the condition under which the reagent reacts best are A. Fehling's reagent, in the cold B. Million's reagent, boiled C. Fehling's reagent in acid medium, heated D. iodine solution, boiled E. Fehling's reagent in neutral or alkaline medium, boiled. (1980:Q18)
12. A green plant growing in a compost pit is feeding A. holozoically B. parasitically C. saprophytically D. holophytically E. in none of the above ways (1980:Q26)
13. The mushroom is an organism which feeds A. parastically B. saprophytically C. holozoically D. symbiotically E. autotrophically. (1981:Q12)
14. If Benedict's solution gives a positive result in a food test, the food contains A. sugar B. protein C. oil D. fat E. cellulose. (1981:Q30)
15. The deficiency of Vitamin D leads to A. scurvy B. pellagra C. rickets D. beriberi E. polio (1981:Q40)
16. Which of these substances is likely to be deficient in the diet of a person having goitre? A. Potassium B. Calcium C. Iodine D. Sodium E. Phosphorus. (1981:Q41)
17. Some of the major elements required by plants are A. Potassium, nitrogen, phosphorus, sodium, calcium B. Nitrogen, phosphorus, molybdenum, sodium, calcium C. Potassium, phosphorus, molybdenum, sodium, calcium D. Potassium, nitrogen, iron, sodium, calcium E. Potassium, nitrogen, phosphorus, silicon, cadmium. (1982:Q4)
18. Kwashiorkor is caused by severe deficiency of A. water B. oil C. drugs D. proteins E. sugars (1982:Q6)
19. Which of the following pairs are the products of sucrose hydrolysis? A. Glucose + glucose B. Fructose + fructose C. Glucose + fructose D. Galactose + fructose E. Fructose + galactose. (1982:Q18)

20. If an organic compound has its Hydrogen: Oxygen ratio as 2:1, it is likely to be A. a protein B. a carbohydrate C. a fat D. a fatty acid and glycerol E. an amino acid. (1983:Q9)
21. Which of the following elements are necessary for the formation of chlorophyll in a plant? A. Magnesium and iron B. Calcium and potassium C. Calcium and sulphur D. Potassium and sulphur E. Phosphorus and potassium. (1983:Q10)
22. Which of the following statements is NOT true of insectivorous plants? A. They obtain part of their food by trapping and feeding on insects B. They attract insects simply because of pollination. C. They can grow in soils poor in nitrogenous salts. D. They can supplement the nitrogen supply by feeding on insects E. Examples include butterworts, sundews and pitcher plants. (1983:Q30)
23. A mixture of mercurous and mercuric nitrates is added to a food substance. A white precipitate is formed which on gentle heating turns red. The food substance is A. protein B. oil C. Carbohydrate D. Fat E. Fatty acid. (1984:Q9)
24. In a Biuret test, some protein was mixed with sodium hydroxide solution. Which of the following chemicals should be added to the mixture for a positive result? A. Mercurous nitrate B. Copper sulphate C. Mercuric nitrate D. Sodium carbonate E. Ammonium hydroxide (1984:Q21)
25. Fehling's solution will readily change colour from blue to a reddish colour when it is A. mixed with sugar solution in the cold B. warmed or heated by itself C. mixed with reducing sugar in the cold D. warmed or heated with a complex solution E. warmed with a solution of reducing sugar. (1984:Q35)
26. A food substance which produces red colouration with Sudan III contains A. protein B. sugar C. starch D. cellulose E. fat. (1985:Q15)
27. If calcium is deficient in food this may cause A. anaemia B. retarded growth C. sterility D. goitre E. beriberi (1985:Q16)
28. A young plant showing yellow leaves is likely to be deficient in A. calcium B. magnesium C. potassium D. boron E. molybdenum. (1985:Q36)
29. Oxygen liberated during photosynthesis has been demonstrated to come from A. carbon dioxide B. air C. water D. chlorophyll. (1986:Q14)
30. Which of these is a trace element? A. Iron B. Copper C. Calcium D. Sulphur (1986:Q15)
31. The main organic substances found in the human body are A. carbohydrates, proteins and salts B. salts, fats and proteins C. fats, carbohydrates and proteins D. salts, fats and carbohydrates. (1986:Q16)
32. Which of the following elements is essential for the formation of haemoglobin? A. Sodium B. Potassium C. Calcium D. Iron. (1986:Q17)
33. The severe deficiency of vitamin C leads to A. kwashiorkor B. beriberi C. pellagra D. scurvy (1986:Q18)
34. In addition to the high calories derived from fats and oils, they are A. used in producing new cells B. necessary for enzyme formation C. used as insulators from cold D. required for growth (1986:Q19)
35. The extract from a food substance reacting with sodium hydroxide and copper sulphate solutions will produce violet to purple coloration if A. fats are present. B. carbohydrate is present C. protein is present D. reducing sugar is present. (1986:Q20)
36. In demonstrating the importance of mineral elements in the plants, the culture bottle must be darkened to A. prevent algal growth in culture solution B. allow root growth C. prevent breakdown of mineral elements D. prevent photosynthesis in the root. (1987:Q17)
37. The vitamin which is important in the formation of the retina pigments is A. vitamin A B. vitamin B C. vitamin C D. vitamin (1987:Q18)
38. In the standard experiment to show that oxygen is given off during photosynthesis, sodium bicarbonate is used to A. neutralize the acid in water B. supply mineral salts to water plant, C. supply carbon dioxide for photosynthesis D. Kill micro-organism in water. (1987:Q20)
39. The most important substances necessary for the maintenance of life are carbon, oxygen A. hydrogen, soil and enzymes B. hydrogen, salt and water C. nitrogen, salt and soil D. nitrogen, salt and water. (1988:Q39)
40. If a healthy potted plant is continuously kept in dim of light A. the rate of respiration may equal that of photosynthesis B. more carbon dioxide and water are taken in C. respiration may be halted D. the volume of oxygen released increases. (1989:Q18)
41. The seedlings in a rice field were found to have thin lanky growth with reddish leaves and poor root development. This is because the soil lacks A. sulphur B. phosphorus C. potassium D. iron. (1989:Q21)
42. The mode of nutrition in which digestion is extracellular is A. holophytic B. parasitic C. holozoic D. saprophytic. (1990:Q17)
43. The first step in the process of photosynthesis is the A. activation of the chlorophyll B. photolysis of water C. reduction of carbon dioxide D. formation of sugar. (1990:Q18)
44. Which of the following food substances will produce a brick-red colour when warmed with Benedict's solution A. Glucose B. Starch C. Egg white D. Maltose. (1990:Q19)
45. Etiolation is caused by the influence of A. mineral salts B. water C. carbon dioxide D. light. (1990:Q25)
46. Which of the following is formed immediately after the first product of photosynthesis? A. Lipid B. Starch C. Oxygen D. Sugar (1991:Q17)
47. The element common to protein, carbohydrate and lipid is A. hydrogen B. sulphur C. nitrogen D. phosphorus. (1991:Q21)
48. 5cm<sup>3</sup> dilute sodium hydroxide solution and 5cm<sup>3</sup> one percent copper sulphate solution are added to a solution of food specimen. The purple colour which is observed shows the presence of A. glucose B. starch C. fat D. protein. (1992:Q14)
49. Interveinal chlorosis is normally associated with the deficiency of A. magnesium B. potassium C. iron D. calcium. (1993:Q14)
50. Osmic acid boiled with a solution of food substance gave a black precipitate. This indicated the presence of A. fats and oils B. proteins C. amino acids D. starch (1993:Q15)
51. Carnivorous plants are usually found in area A. which are deficient in nitrate B. which are deficient in oxygen C. with low pH D. where insects are abundant. 3. Green plants are distinguished from other living organisms by their ability to A. make use of water B. make use of oxygen C. respond to sunlight D. manufacture their own food. (1993:Q34)
52. Green plants are distinguished from other living organisms by their ability to A. make use of water B. make use of oxygen C. respond to sunlight D. manufacture their own food (1994:Q3)
53. The failure of transport and respiratory systems in plants as well as the presence of reddish colour in stems and leaves result from the deficiency of A. magnesium B. nitrogen C. potassium D. phosphorus. (1994:Q13)

54. In a drought situation, plants suffer from water stress which could result in A. reduced biochemical activities B. enhanced chemical activities C. enhanced microbial activities D. reduced phototropic activities. (1994:Q38)
55.  $2\text{H}_2\text{O} - 2\text{H}^+ + \text{O}_2(\text{g})$ . The equation above represents a part of the light stage of photosynthesis. Which of the following must be present for this reaction to occur? A. Enzyme and light energy. B. carbon dioxide and light energy. C. Light energy and chlorophyll II. D. Chlorophyll and enzyme. (1995:Q11)
56. In an experiment to investigate the effect of nitrogen on the growth of plants, the substrate should be a medium of A. washed and sand B. sawdust C. cow dung D. clay soil (1995:Q12)
57. Which vitamin plays an important role in blood clotting? A. Vitamin A B. Vitamin K C. Vitamin B12. D. Vitamin (1995:Q13)
58. Trace elements are required by plants mainly for the A. formation of pigments and enzymes B. production of energy and hormones C. manufacture of carbohydrates D. manufacture of proteins. (1997:Q13)
59. A food substance was treated with a few drops of Sudan III solution and a red coloration was obtained. The food contained A. protein B. starch C. fat D. mineral salt. (1997:Q16)
60. The element that is essential for the coagulation of blood is A. potassium B. calcium C. phosphorus D. iron. (1997:Q18)
61. The manufacture of carbohydrates by plants takes place only in A. the leaves B. the green stems C. chlorophyllous parts D. flowering plants. (1998:Q12)
62. In a water culture experiment, a plant showed poor growth and yellowing of the leaves. These may be due to deficiency of A. copper B. iron C. magnesium D. calcium. (1998:Q13)
63. In millon's test, when the reagent is added to a protein food item, a white precipitate is produced which turns A. blue on heating B. yellow on heating C. green on heating D. red on heating. (1998:Q14)
64. The dark reaction of photosynthesis involves A. fixation of carbon (IV) oxide to give a six-carbon sugar B. fixation of carbon (IV) oxide with the help of oxygen C. use of carbon (IV) oxide to produce glucose using ATP D. The fixation of carbon(IV)oxide on chlorophyll using hydrogen (1999:Q16)
65. The modes of nutrition in Nitrobacter, Ascaris and Homo sapiens respectively are A. photosynthetic, parasitic and holozoic B. chemosynthetic, parasitic and holozoic C. photosynthetic, parasitic and heterophytic D. chemosynthetic, holophytic and holozoic (1999:Q18)
66. The richest sources of vitamin A are A. palm oil and groundnut oil B. palm oil and carrots C. rice and groundnut oil D. oranges and carrots. (1999:Q19)
67. Yellowing of leaves is a symptom associated with deficiency of A. iron, calcium and magnesium B. nitrogen, sulphur and potassium C. sulphur, phosphorus and iron D. magnesium, nitrogen and iron (1999:Q21)

Use the diagram below to answer questions 68 and 69

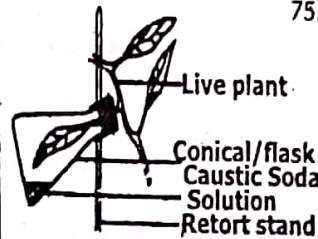


68. The substance labelled II originates from A. III only B. IV only C. I and IV D. III and IV 15. The gas occupying the space labelled I is A. carbon (IV) oxide B. nitrogen C. hydrogen oxygen (2000:Q14)
69. The gas occupying the space labelled I is A. carbon (IV) oxide B. nitrogen C. hydrogen D. oxygen (2000:Q15).
70. The production of violet colouration, when dilute NaOH

solution is added to a solution of food substance, followed by drops of 1% CuSO<sub>4</sub> solution while making indicates the presence of A. protein B. carbohydrates C. fats D. reducing sugar (2000:Q21)

71. The greatest amount of energy will be obtained by the oxidation of 100kg of A. meat B. butter C. sugar D. biscuits (2000:Q22)
72. The mode of feeding in Amoeba and Hydra is A. heterotrophic B. holophytic C. autotrophic D. symbiotic (2001:Q8)
73. A seedling grown in the dark is likely to be A. etiolated B. dormant C. sturdy D. stunted (2001:Q17)
74. When specimen X is mixed with few drops of iodine solution, the appearance of a blue-black colour confirms that X is A. Galactose B. Starch C. Sucrose D. Glucose (2001:Q24)

Use the diagram below to answer questions 75 and 76



75. Which of the following statements is correct about the experiment? A. The flask must be of the conical type B. Caustic soda can be replaced with distilled water C. The enclosed leaf will lose its green colour D. The leaves outside the flask serve as control (2002:Q32)
76. The experimental set-up can be used to demonstrate that A. light is necessary for photosynthesis B. oxygen is necessary for photosynthesis C. photosynthesis occurs in the leaves of plants D. carbon (IV) oxide is necessary for photosynthesis (2002:Q33)
77. The capture and digestion of insects by a pitcher plant is a special form of nutrition termed A. autotrophic B. heterotrophic C. chemosynthetic D. saprophytic (2002:Q31)
78. A person that is obese must avoid meals containing A. carrots and oranges B. margarine and butter C. beef and beans D. rice and yam (2002:Q39)
79. The dark reaction of photosynthesis involves the A. reduction of carbon (IV) oxide to organic compounds. B. release of oxygen and the splitting of water. C. photolysis of water and the production of starch D. splitting of water into hydrogen ions. (2003:Q16)
80. All living cells require water because it A. is a medium for all metabolic reactions B. is a medium that neutralizes acids in cells C. is the main source of energy for the cells D. prevents the development of diseases in cells (2004:Q13)
81. Night-blindness results from a deficiency of A. vitamin E B. vitamin A C. vitamin K D. vitamin C. (2006:Q1)
82. The photosynthetic pigments include A. chlorophyll and carotenoids B. chlorophyll and cytochromes C. melanin and haemoglobin D. carotenoids and haemoglobin (2007:Q20)
83. Stunted growth and poor root development are a result of a deficiency in A. Sulphur B. phosphorus C. calcium D. iron. (2007:Q25)
84. Insectivorous plants trap and kill their prey to derive A. Phosphorus B. calcium C. nitrogen D. Zinc. (2008:Q15)
85. Which of the following is an example of a carnivorous plant? A. Hydra B. Bladderwort C. Yeast D. Spirogyra.
86. Which of the following is lacking in the diet of a person with kwashiorkor? A. Proteins B. Carbohydrates C. Minerals D. Vitamins. (2010:Q14)
87. The mode of nutrition of sundew and bladderwort can be described as A. saprophytic B. holozoic C. chemosynthetic D. autotrophic. (2010:Q15)

54. When a mixture of a food substance and Benedict's solution was warmed, the solution changed from blue to brick-red. This indicates the presence of A. Fatty acid B. sucrose C. amino acid D. reducing sugar. (2010:Q16)

89. Chemosynthetic organisms are capable of manufacturing their food from simple inorganic substances through the process of A. denitrification B. reduction C. phosphorylation D. oxidation. (2010:Q25)

90. I. Parasitism - Sendew  
II. Autotrophism - Amoeba  
III. Saprophytism - Alga  
IV. Heterotrophism - Agama

Which of the above modes of nutrition is correctly matched with the organism that exhibits it? A. IV B. I C. II D. III (2011:Q18)

91. In plants, which of the following is required in minute quantities for growth? A. copper B. Potassium C. Phosphorus D. Sodium (2012:Q15)

92. Which of the following organisms is both parasitic and autotrophic? A. Sundew B. Loranthus C. Rhizopus D. Tapeworm. (2012:Q16)

93. Which of the following is a polysaccharide? A. Glucose B. Sucrose C. Maltose D. Cellulose. (2012:Q18)

94. During the manufacture of food by plants, which of the following organisms use energy from the sun? A. sulphur bacteria B. Nitrosomonas Sp C. Nitrobacter sp. D. Anabaena (2013:Q16)

95. Plants that have special devices for trapping and digesting insects are A. symbiotic B. parasitic C. saprophytic D. carnivorous (2013:Q19)

### CHAPTER 10 ANSWERS

1C. In the process, simple low-energy compounds ( $\text{CO}_2$  and  $\text{H}_2\text{O}$ ) are converted to high-energy glucose (sugar).

#### NOTES:

1. Photosynthesis occurs only in green plants (as they contain the green pigment, chlorophyll in their chloroplasts)
2. The chemical energy stored in glucose is derived from sunlight (solar energy).
3. Oxygen ( $\text{O}_2$ ) is given off as by-product and it is derived from (photolysis) of water ( $\text{H}_2\text{O}$ ) not carbon dioxide ( $\text{CO}_2$ ).

2E. See Q1

3A. Boron is a micro-nutrient or minor element or trace element. Trace elements are necessary for formation of pigment and enzymes.

Macro-nutrients	Micro-nutrients
Nitrogen (N)	Molybdenum (MO)
Sulphur (S)	Boron (B)
Phosphorus (P)	Copper (CO)
Magnesium (Mg)	Manganese (Mn)
Potassium (K)	Zinc (Zn)
Calcium (Ca)	-
Iron (Ferric form)	-

#### NOTES:

1. Carbon, hydrogen and oxygen are also macro nutrients and their exclusion from the above table is justified as they form the very bulk of the plant.
  2. C, H and O are obtained from photosynthesis (Q1) while others are obtained from the soil.
  3. Iron in ferric form ( $\text{Fe}^{3+}$ ) not ferrous form ( $\text{Fe}^{2+}$ ) is involved in plant nutrition.
- 4A. The glucose (Q1) is then converted into an indirect product, starch (B) in most plants for storage.

5B. Saprophytes include bacteria and fungi and their activities lead to decay/decomposition/putrefaction.

6C. See Q3

7D. No colour change observed.

#### NOTES:

1. Positive test for Fehling's solution is colour change from blue ( $\text{Cu}^{2+}$ ) to orange-red ( $\text{Cu}^+$ )
2. Sucrose produces positive results after warming with dilute hydrochloric acid but not before.
3. The acid hydrolyses sucrose to simpler sugar (glucose and fructose) which can now give positive test with Fehling's
4. Neutralization (using caustic soda) is necessary before adding Fehling's.
5. Benedict's solution can be used in place of Fehling's and boiling is also required.

8E. Alkaline pyrogallol has a strong affinity for oxygen gas, the by-product of photosynthesis.

9C. All Amino acids contain nitrogen and all proteins are synthesized from amino acid monomeric unit.

#### NOTES:

1. Nitrogen - protein synthesis; synthesis of nitrogenous bases, and chlorophyll.
2. Sulphur - found in many proteins.
3. Phosphorus - synthesis of nucleic proteins and coenzymes; involved in nuclear division; acts as buffer in the cell sap.
4. Calcium - Cell wall formation; healthy growth; neutralization of organic acids, activation of certain enzymes.
5. Magnesium - Formation of chlorophyll.
6. Iron - Formation of chlorophyll
7. Potassium - Cell formation; regulation of certain cellular activities.

10D. See Q9 11E. See Qs7 and 23

12D. Note that the plant is green hence it feeds autotrophically or holophytically; the compost pit only means rich supply of mineral elements; beware of (C).

#### NOTES:

1. Autotrophic nutrition = Holophytic nutrition.
2. Autotrophism means ability to make own food by plant (as in photosynthesis).
3. Always take the suffix "Phyte" to mean plant (as in holophyte, protophyte, epiphyte etc).
4. Always take "zoo" to mean animal (as in protozoa, holozoic, Spermatozoan, zoology etc)

13B. A fungus (See Q5)

14A. See Q7

15C. Ricket before maturity, osteomalacia in adult.

#### Deficiency symptoms of vitamins.

1. Vitamin A - Night blindness; total blindness in extreme cases.
2. Vitamin B1 - Beri-beri
3. Vitamin B2 - Skin lesion especially around the mouth (angular stomatitis)
4. Vitamin B3 - Pellagra; mental illness if deficiency is prolonged.
5. Vitamin B5 - Nervous and digestive disorders
6. Vitamin B6 - Anaemia, diarrhea.
7. Vitamin B12 - Pernicious anaemia.
8. Folic acid - Anaemia (especially in pregnant women)
9. Vitamin C - Scurvy
10. Vitamin K - Prolonged bleeding or haemorrhage.
11. Vitamin E - Sterility or repeated abortion (but not in humans)

16C. Since iodine is necessary for the production of thyroid hormones and normal thyroid function.

**NOTES:**

- Sea foods are rich in iodine.
- Table salt is mandatorily iodized nowadays before being sold.

17A. Phosphorus is more important than iron. Comparing (A) and (D):

Ca is needed in trace amount though it is considered a major element.

**NOTE:**

- Sodium is added here in error, it is not a requirement in plant.
- Animals require the following mineral elements: Sodium, Potassium, Chlorine, Calcium, iron, Copper, Phosphorus, Magnesium, manganese, Iodine, Fluorine and cobalt. (Compare to plant requirement).

18D. Kwashiorkor is a malnutritional disorder which arises from protein-energy imbalance.

**NOTES:**

- Kwashiorkor occurs in children weaned late and then fed solely on starchy food—poor growth, oedema and miserable disposition are characteristic.
- Marasmus is another protein-energy disorder in children who are weaned early and then fed exclusively on starchy food—poor growth and wizened appearance are characteristic of marasmus.

19C. Hydrolysis of Disaccharides.

Maltose → Glucose + Glucose

Sucrose → Glucose + Fructose

Lactose → Glucose + Galactose

**NOTE:**

- The monosaccharides above can undergo **condensation** to form the disaccharides e.g. Glucose + Glucose Maltose
- Hydrolysis** of disaccharides and polysaccharides to form simpler sugars can be achieved in the lab by adding dilute acid and in biological system by enzymatic actions.

20B. Carbohydrates generally have the formula:

$C_xH_yO_z$ , or  $C_n(H_2O)_n$ ,

The ratio is as seen in water (Carbohydrate = Hydrated carbon)

21A. See Q9

22E. **Insectivorous plants** also called **carnivorous plants** include: 1. Bladderwort 2. Sundew 3. Pitcher plant 4. Venus flytrap.

23A. This are the contents of Millon's reagent used to test for protein.

**NOTES:**

1. **To test for protein:**

- Millon's reagent** – Heating required; deep red colour or precipitate formed; content: mercuric nitrite and mercuric nitrate [ $Hg(NO_2)_2$  and  $Hg(NO_3)_2$ ].
- Bieuret solution** – No heating required; violet or purple colour for protein, pink colouration for peptone; Contents: caustic soda (NaOH) and copper (ii) sulphate (Cubo.).

2. **To test for sugar:**

- Fehling's solution** - Heating required; contents: Solution A as copper (ii) sulphate, solution B as sodium potassium tartarate and sodium hydroxide.
- Benedict's solution** - Heating is required; contents: copper (ii) sulphate, sodium citrate and sodium carbonate.

3. **To test for starch** – Iodine solution is added; no heating is needed, blue-black colouration is positive.

4. **To test for fat and oils.**

- Translucency paper test – fat and oil makes a translucent spot on paper.

- Sudan (iii) solution – produces distinct red colouration
- Osmic acid – Produces black precipitate on boiling

24B. See Q23 25E. See Qs 7 and 23

27B. Calcium is necessary for bone and teeth development hence

calcium is needed by a growing animal; calcium is also necessary for blood coagulation; proper functioning of muscles (including cardiac muscles); proper functioning of nervous system; needed by animals to make exoskeleton e.g. snail, crab, insect.

**NOTES:**

- Sodium** – Components of extra-cellular fluid; involved in nervous transmission; assist in acid-base balance; osmoregulation of blood.
- Potassium** – Component of intra-cellular fluid; some functions as sodium.
- Chlorine** – Involved in acid-base balance; formation of hydrochloric acid necessary for digestion; osmotic pressure of blood.
- Iron** – Formation of haemoglobin, myoglobin and respiratory enzymes.
- Phosphorus** – Component of nucleic acids, regulates metabolic activities; component of bones and teeth chiefly as inorganic substances: Water and mineral salts.
- Magnesium** – Component of bones; activates glycolysis in muscles calcium phosphate [ $Ca_3(PO_4)_2$ ]
- Iodine** – Thyroid function.

28B. Deficiency of any of the following elements causes yellowing of leaves – N, S, Fe and Mg.

**Deficiency Symptoms in Plants**

- Nitrogen – Yellowing of leaves; stunted growth.
- Sulphur – Yellowing of leaves; slender stem.
- Calcium – Weak, stunted growth; poor root development.
- Phosphorus – Poor weedy growth; purplish or reddish leaves; mottling of lower leaves.
- Magnesium – Poor growth, yellowing of leaves.
- Iron – As in magnesium.
- Potassium – Very poor growth, orange or brown leaves.

29C. See Q2 30B. See Q3

31C. Others: Vitamins, nucleic acid and inorganic substances namely water and mineral salts.

32D. See Q27 33D. See Q15

**34C. Functions of Food Substances**

- Proteins – For body-building (growth); repair of worn-out tissues; formation of enzymes and hormones.
- Carbohydrates - Main, immediate and short-term sources of energy; making of exoskeleton (chitin) in arthropods.
- Fat/oils – Long-term energy store; insulation against cold.
- Mineral salt/vitamins – To maintain health.
- Water - Medium for metabolism; maintenance of osmotic pressure of blood.

35C. Biuret Test (Q 23)

36A. This cuts off sunlight to prevent photosynthesis of the algae as the algal population would use up oxygen in the bottle and plant root would die.

37A. Hence deficiency causes blindness (Q 15)

**NOTES:**

1. **Vitamin A is also called retinol (from retina)**

Vit B1 → Thiamine

Vit B2 → Riboflavin

Vit B3 → Niacin or Nicotinic acid

Vit B5 → Pantothenic acid

Vit B6 → Pyridoxine

Vit B12 → Cyanocobalamin (it contains cobalt)

Vit C → Ascorbic acid

Vit D → Calciferol (related to calcium)

Vit E → Tocopherol

Vit K → Phylloquinone

## 2. Functions of vitamins

A - Aids normal and night vision; needed for normal epithelial functions

B1 - As coenzyme

B2 - Involved in electron transport in cellular respiratory chain

B3 - As in B2

B5 - As in B2

B6 - Synthesis of amino acids

B12 - Formation of red blood cells

Folic acid also a vitamin - As in B12

C - Required for healthy connective tissues.

D - Bone and teeth development.

E - Fertility in animals (not human); as antioxidant in prevention of cancer.

K - A necessary factor for the blood-clotting mechanism

38C. Sodium bicarbonate decomposes to produce carbon dioxide.  
 $\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$

**NOTES:** To deprive an experimental setup of carbon dioxide, caustic soda or potash is used  
 $2\text{NaOH} + \text{CO}_2 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$

39D. These would combine to form carbohydrates, proteins, fats/oils.

40A. Photosynthesis is otherwise faster than respiration in bright light.

41. Ambiguous question - Lanky growth (S), reddish or purplish leaves (P), poor root development (Ca).

42D. Digestive enzymes is secreted on the substrate and the digested food is then absorbed into the body of the saprophyte.

43A. Photosynthesis is a two-stage process:

1. Light stage or reaction.

a. Activation of chlorophyll - Chlorophyll is energized.

b. Photolysis of water - water is split (oxygen released in the process)

c. Uptake of  $\text{H}^+$  of photolysis by the coenzymes NADP.

d. Formation of ATP - To power dark reaction later.

2. Dark Reaction - Reduction of Carbon dioxide by hydrogen atom supplied by NADP.  $\text{CO}_2 + \text{H} \rightarrow \text{CH}_2\text{O}$

**NOTE:**  $\text{CH}_2\text{O}$  is the skeletal moiety of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )

44A. A simple reducing sugar.

### NOTES:

1. Benedict's Test is more sensitive than Fehling's

2. Fehling's Test is less convenient than Benedict's since Fehling's solution A and B are needed.

45D. A plant grown in the dark will become etiolated for lack chlorophyll (chlorosis).

46B. That is why a leaf is tested for starch instead of glucose.

47A. Carbon, hydrogen and oxygen are common to them.

**NOTES:** Lipids means fats and oils.

48D. Biuret test for protein (See Q23)

49A. Chlorosis simply means yellowing of leaves; In magnesium the yellowing is between the veins of the leaves.

50A. See Q23 51A. See Q22

52D. In photosynthesis (Q1) 53D. See Qs 9 and 28.

54A. See Q34 55C. See Q1 and 43

56C. Cow dung is rich in nutrients.

57B. See Q37 58A. See Q3 59C. See Q23 60B. See Q27

61C. Any chlorophyllous parts such as leaves, stems, sepals of flower and even petals in sepaloid flower.

62C. (B) and (C) are ordinarily correct but (C) is preferred since chlorosis is more pronounced.

63D. See Q23 63D. See Q43

65B. 1. Photosynthetic nutrition in green plants

2. Chemosynthesis in nitrifying bacteria such as nitrobacter and nitrosomonas.

3. Holozoic nutrition in most animals which ingest complex organic food to be digested and assimilated within their bodies and these animals include

a. Herbivores - feeding on plant only.

b. Carnivores - feeding on flesh/animals only.

c. Omnivores - feeding on plant/flesh

d. Scavengers - feeding on only dead animals

4. Parasitic nutrition involves a (small) parasite feeding on another (large) organism called host and causes the host bodily harm.

5. Saprophytes feed on decaying organic matter e.g bacteria, mushroom.

6. Carnivorous or insectivorous plants growing in soils deficient in Nitrogen (See Q)

7. Mutualism (formerly symbiosis) involves a feeding relationship where two organisms derive mutual benefits from each other.

**NOTE:** 1. Photosynthesis and Chemosynthesis = autotropism

2. Others are heterotropism

3. Autotropic = holophytic

4. Heterotropic = holozoic

66B. Other sources of vitamin A:

1. Fish - cod liver oil 2. Butter/cheese 3. Milk/egg

4. Sweet potatoes 5. Pumpkin 6. Spinach

7. Banana 8. Peaches 9. Plum 10. Green vegetables

69D. See Q28

68A. III → is a photosynthesizing water plant such as Elodea.

69D. By → product of photosynthesis.

70A. Biuret's Test.

71B. A given mass of fat (butter) or oil produces twice as much energy as equal mass of carbohydrate (sugar/biscuit) or protein (meat). Mineral salt/vitamins/water yield no energy.

72A. They ingest food

73A. Etiolated and lanky (See Q45)

74B. See Q23

75D. The leaves outside flask test positive to starch while the one inside does not.

### NOTE:

1. Test experiment - A set-up which contains all the variables except the variable being tested.

2. Control experiment - All variables are present so as to put the outcome of test experiment in proper perspective.

76D. Caustic soda absorbs  $\text{CO}_2$  from the flask (compare Q38)

77B. See Q65

78B. Excess fat causes obesity.

79A. See Q43 80A. See Q34 81B. See Qs 15 and 37

82A. The green pigment, chlorophyll masks the accessory pigments, carotenoids in plants.

### NOTES:

1. Chlorophyll molecule contains magnesium.

2. Carotenoids are of two types: Carotenes and Xanthophylls.

3. Commonest carotene is  $\beta$ -carotene responsible for the orange appearance of carrots.

4. Vitamin A is a derivative of carotene.

83C. See Q28 84C. See Q22 85B. See Q22 86A. See Q18

87B. Holozoic is a broad term which may capture the mode of nutrition of carnivorous plants. Here holozoic as synonymous with heterotrophic.

88D. See Q23

89D. Nitrifying bacteria and iron bacteria exhibit chemosynthesis by oxidation.  $2\text{NH}_3 + 3\text{O}_2 \Rightarrow 2\text{HNO}_3 + 2\text{H}_2\text{O}$

$\text{HNO}_2 + \text{O}_2 \Rightarrow 2\text{HNO}_3 + \text{Fe}_2 + \text{Fe}_3$

- 90A. Sundew (carnivorous); amoeba (heterotrophism).  
 91A. See Q3  
 92. Sundew is not a parasitic plant; it is a carnivorous plant hence no option was right.  
**NOTES:**  
 1. A partially parasitic plant like the mistletoe was intended in this question.  
 2. A partial parasite does not depend on its host for manufactured food because it has chlorophyll  
 3. A total parasite through its haustoria penetrates to the level of xylem of its host to obtain only water and mineral salts.  
 4. A partial parasite penetrates the phloem (for food) and xylem (for water/salt) hence its leaves are achlorophyllous. e.g. dodder plant.
- 93D. **Classification of Carbohydrates**  
 1. Monosaccharides – Glucose, fructose, galactose.  
 2. Disaccharides – Maltose, Sucrose, Lactose.  
 3. Polysaccharides – Starch, Glycogen, Cellulose, Chitin.
- 94D. (A), (B) and (C) are chemosynthetic i.e. they derive their energy from inorganic compounds.  
 95D. See Q22

### CHAPTER 11

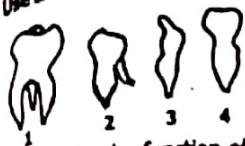
#### DIGESTIVE SYSTEM. DIGESTIVE ENZYME. DENTITION

- When proteins are broken down they also provide A. oxygen B. carbohydrates C. energy D. amino acids E. enzyme (1978:Q10)
- The mammalian stomach can carry out a number of processes except A. absorption of glucose B. secretion of hydrochloric C. secretion of gastric juice D. churning of food E. production of trypsin (1978:Q40)
- Which of these is the terminal portion of the alimentary canal of a mammal A. Oesophagus B. Stomach C. Rectum D. Colon E. Appendix (1979:Q4)
- Which of these is not an enzymes? A. Pepsin B. Gastrin C. Amylase D. Chymotrypsin E. Trypsin (1979:Q13)
- The digestive enzymes that coagulates proteins in milk is A. ptyalin B. pepsin C. renin D. trypsin E. amylase (1979:Q34)
- The arrangements below are steps in protein digestion. Which is the correct sequences? a-polypeptides, b-protein c-aminoacids d-peptones A. a → b → c → d B. c → d → a → b C. b → c → a → d D. b → d → a → c E. b → a → c → d (1979:Q50)
- Which of the following organs produces bile? A. Gall bladder B. Pancreas C. Spleen D. Liver E. Stomach (1980:Q9)
- Which of the following food substances is digested in the stomach? A. Carbohydrates B. Fats and Oils C. fats and proteins D. Proteins E. Carbohydrates and Fats. (1980:Q15)
- Which of the following is the dental formula of man?  
 A.  $\frac{12}{2} \frac{c0}{1pm} \frac{2}{2} \frac{m}{3/3}$  B.  $\frac{12}{2} \frac{c}{1} \frac{1pm}{2/0} \frac{m}{3/3}$   
 D.  $\frac{1}{2} \frac{c}{1} \frac{1pm}{3/3} \frac{m}{2/2}$  E.  $\frac{12}{2} \frac{c}{1} \frac{1pm}{2/2} \frac{m}{3/3}$  (1981:Q7)
- The kind of teeth used for tearing food materials is the A. fang B. canine C. premolar D. carnassial E. Incisor (1981:Q8)
- Milk protein is hydrolysed by A. renin B. amylyse C. lipase D. lactase E. pepsin (1981:Q18)
- All the following are digestive enzymes except A. bile B. lipase C. maltase D. pepsin E. ptyalin (1981:Q24)
- The correct route for a piece of bread eaten by a mammal is A. oral cavity-oesophagus-stomach-ileum-rectum B. oral cavity-stomach-oesophagus-duodenum-ileum-rectum C. oral cavity-oesophagus-duodenum-stomach-ileum-rectum D. oral cavity-oesophagus-ileum-stomach-duodenum-rectum
- E. oral-cavity-oesophagus-stomach-ileum-duodenum-rectum. (1981:Q49)
- In the enzymes reactions starch \_\_\_\_\_ sugar amylase starch is referred to as the A. substrate B. product C. enzymes D. enzymes-substrate complex E. reaction mixture. (1982:Q22)
- If the gall bladder of a man is removed by surgery, which of the following processes will be most seriously affected? A. Digestion of fats and oil B. Formation of Urea C. Digestion of starch D. conversation of proteins E. Storage and release of urine. (1982:Q39)
- The mammalian pancreas is involved with the A. digestion of food only B. digestion and absorption of food C. digestion of food and regulation of blood sugar D. digestion of food production of hormone and the regulation of blood sugar E. digestion of food, and the production of insulin. (1982:Q48)
- The dental formula:  $\frac{1}{1} \frac{c}{1} \frac{pm}{4} \frac{m}{2} = 42$  represents that of a A. rabbit B. full grown man C. young child D. dog E. sheep (1983:Q29)
- Which of the following statements about the dentition of man is INCORRECT? Man has A. more molars than incisors B. no diastema C. the same number of teeth on upper and lower jaws D. a total of thirty-two teeth E. a total of six molars (1983:Q46)
- The mouth part of the housefly are adapted for A. lapping and sponging. B. sucking and chewing. C. piercing and sucking. D. chewing and lapping. E. biting and chewing. (1984:Q1)
- Which of the following statements is NOT true of enzymes? They A. are proteins B. need cofactors to activate them C. are sensitive to hydrogen ion E. can withstand high temperatures. (1984:Q13)
- Pepsin is a digestive enzyme which breaks A. cellulose into glucose molecules B. carbohydrates into simple sugars C. protein into peptones D. fats into glycerol and fatty acids E. sucrose into glucose and fructose. (1984:Q17)
- The removal of a man's pancreas by surgical operation can affect only the digestion of A. starch B. starch, protein and fats C. oils and fats D. proteins E. carbohydrate and fats. (1984:Q22)
- The presence of diastema in the jawbone indicates that the mammal lacks the teeth suitable for A. tearing B. chewing C. cutting D. chewing and tearing E. cutting and grinding (1984:Q36)
- Which of the following represents the sequence of protein hydrolysis? 1. Polypeptides 2. Amino acids 3. Proteins 4. Peptones A. 3 → 1 → 2 → 4 B. 3 → 2 → 4 → 1 C. 3 → 4 → 2 → 1 D. 3 → 4 → 1 → 2 E. 3 → 1 → 4 → 2 (1985:Q14)
- Partially digested food ready to leave the stomach is referred to as A. chyme B. curd C. glycogen D. paste E. roughage (1985:Q17)
- The three important organs that are situated close to the stomach are A. kidney, liver and gall bladder B. pancreas, liver and kidney C. liver, kidney and spleen D. gall bladder, pancreas and spleen. (1986:Q21)
- Evidence that a tooth is a living part of the mammalian body can be found within the A. gum B. pulp cavity C. cement D. enamel. (1986:Q22)
- Which of the following lists of organs is directly involved in nutrition? A. Oesophagus, bronchus, stomach, pancreas and anus B. Spleen, pharynx, duodenum, jejunum and rectum C. Teeth, oesophagus, ileum lungs and large intestine D. Salivary gland, liver, stomach, villi and colon (1987:Q19)
- If an animal has diastema, it would NOT possess A. incisors B. canines C. premolars D. molars (1988:Q18)
- If the gall bladder of a mammal is damaged, which of the following will be most seriously affected? A. Glycolysis

B. Digestion of starch C. Digestion of fats and oils  
D. Digestion of proteins. (1988:Q19)

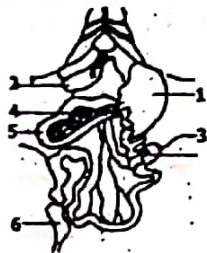
31. Which of the following will be first digested if ingested at the same time? A. Cooked beans B. Cooked rice C. Cod liver oil D. Roasted beef. (1988:Q20)

Use the diagram below to answer questions 32 to 33



32. Which of the structure's is the molar? A.1 B.2 C.3 D.4 (1989:Q16)
33. What is the function of 3? A. Cutting off large pieces of food B. Seizure and tearing of prey C. Grinding of food D. Tearing of flesh only (1989:Q17)
34. The pancreatic juice contains the enzymes amylopsin. A. pepsin and trypsinogen B. rennin and steapsin C. steapsin and trypsinogen D. steapsin and ptyalin. (1989:Q19)
35. The organ which secretes digestive enzymes as well as hormone is the A. liver B. salivary gland C. pancreas D. spleen. (1990:Q20)
36. The villus in the small intestine is significant because it A. increases the surface area for absorption B. increases the surface area for digestion C. assists in mixing digested food D. assists in filtering undigested food. (1990:Q21)

Use the figure below to answer questions 37 and 38  
Dissection showing the Abdominal Cavity of a rat



37. In the digestive system, absorption of nutrients into the blood takes place in the part labeled A.1 B.2 C.3 D.4 (1991:Q18)
38. The gland which produces trypsin, amylase and lipase is labelled A.6 B.4 C.2 D.1 (1991:Q19)
39. One of the accessory organs of the digestive system is the A. kidney B. spleen C. liver D. lung (1991:Q20)
40. The crown of the mammalian tooth is covered with A. cement B. dentine C. caries D. enamel. (1991:Q22)
41. Which enzymes are contained in the pancreatic juice? A. Ptyalin, lipase and pepsin B. Maltase, erepsin and trypsin C. Rennin, sucrase and lipase D. Amylase, lipase and trypsin (1992:Q22)
- Use the figure below to answer questions 42 and 43
42. Which of the labeled parts is the diastema? A. 2 B. 3 C. 4 D. 6. (1993:Q16)
43. The lower jaw is typical of a A. sheep B. rabbit C. dog D. cat. (1993:Q17)
44. The end products of the digestion of fats and oils in mammals are A. maltose and fatty acids B. amino acids and glucose C. fatty acids and fructose D. fatty acids and glycerin. (1993:Q18)
45. The dental formula  $I^1, C^1, PM^1, M^2$  is that of a A. goat B. rabbit C. man D. dog (1994:Q14)
46. The activity of ptyalin of ptyalin is likely to decrease with an increase in the concentration of A. oxygen B. starch C. protein D. acid. (1994:Q16)
47. The part of the stomach nearer the gullet is called the A. epiglottis B. cardiac sphincter C. duodenum D. pyloric sphincter. (1997:Q12)

Use the diagram below to answer questions 48 and 49

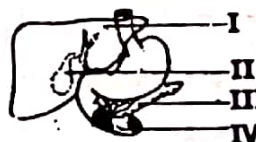


48. The part that is similar to bone is labelled A. IV B. III C. II D. I. (1997:Q14)
49. The parts labelled I and II constitute the A. crown B. neck C. root D. gum (1997:Q15)

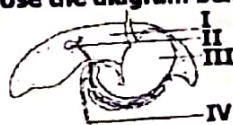
50. The group of insects that have mouth parts adapted for both piercing and sucking is A. cockroaches, aphids and mosquitoes B. aphids, houseflies and moths C. mosquitoes, tsetse flies and aphids D. aphids, beetles and grasshoppers. (1998:Q44)

51. The enzyme invertase will hydrolyze sucrose to give A. maltose and glucose B. glycerol and fatty acid C. glucose and fructose D. mannose and galactose (2000:Q18)
52. The carnassials teeth of a carnivorous animal consists of the A. last upper premolar and the first lower molar B. last upper molar and the last lower molar C. first upper premolar and the first lower molar D. first upper molar and the first lower molar (2002:Q23)
53. Examples of organisms in which extracellular digestion occurs are A. Fungus, Loranthus and housefly B. Rhizopus, sponges and earthworm C. Roundworm, tapeworm and Hydra D. Rhizopus, housefly and Hydra (2002:Q28)
54. The organ located within the duodenal loop in the mammal is the A. spleen B. pancreas C. liver D. gall bladder (2002:Q37)
55. The part of mammalian digestive system where absorption of nutrients take place is the A. ileum B. colon C. oesophagus D. duodenum (2003:Q20)
56. An insect with a mandibulate mouth part will obtain its food by A. biting and chewing B. chewing and sucking C. chewing D. sucking. (2003:Q44)
57. The gall bladder of a mammal has a duct connected to the A. liver B. duodenum C. small intestine D. pancreas (2004:Q12)
58. The breakdown of fats and oils into simpler absorbable compounds is catalyzed by the group of enzymes called A. lipases B. hydrolases C. amylases D. peptidases. (2004:Q14)
59. Rodents gnaw on food with their A. molar teeth B. strong jaws C. flat-ridged teeth D. chisel-like front teeth (2004:Q48)

Use the diagram below to answer questions 60 and 61



60. The part labeled IV represents the A. colon B. ileum C. caecum D. duodenum (2005:Q15)
61. The bile is stored in the part labeled A. I B. II C. III D. IV. (2005:Q16)
62. The pancreas secretes enzymes for the digestion of A. fats, proteins and carbohydrates B. fats, vitamins and cellulose C. fats, carbohydrates and vitamins D. proteins, cellulose and minerals. (2007:Q26)
63. The order of passage of food in the digestive system is A. ileum - caecum - large intestine - rectum B. ileum - colon - caecum - rectum C. large intestine - ileum - rectum D. colon - caecum - ileum - rectum. (2008:Q14)
64. In the alimentary system of a bird, the function of teeth is carried out by A. crop B. beak C. gizzard D. tongue (2008:Q18)
65. Chewing the cud is an adaptation peculiar to A. herbivores B. omnivores C. rodents D. ruminants. (2009:Q12)
- Use the diagram below to answer questions 66 and 67



66. Emulsification of fats takes place in the part labeled A. I B. II C. III D. IV. (2009:Q16)
67. The content of the part labeled III is usually A. neutral B. alkaline C. acidic D. saline. (2009:Q17)
68. The part of the alimentary system of a bird where food is ground into small particles is the A. cloaca B. stomach



- C. crop D. gizzard. (2009:Q18)
69. The part of the human gut that has an acidic content is the  
A. duodenum B. ileum C. colon D. stomach. (2010:Q26)
70. The conversion of a nutrient into a molecule in the body of a consumer is referred to as  
A. absorption B. inhibition C. digestion D. assimilation. (2011:Q14)
- Use the information below to answer questions 67 and 68**
- I. Test tube containing cane sugar and water  
II. Test tube containing cane sugar and dilute acid.  
III. Test tube containing cane sugar and its degrading enzyme
71. In which of the test tubes will glucose be detected after complete hydrolysis? A. I only B. I, II and III C. I and II only D. II and III only. (2011:Q19)
72. The enzyme involved in the hydrolysis is  
A. sucrase B. maltase C. rennin D. erepsin. (2011:Q20)
73. An example of a filter-feeding animal is  
A. whale B. mosquito C. shark D. butterfly. (2011:Q30)
74. A function of the hydrochloric acid produced in the human stomach during degestion is to  
A. neutralise the effect of bile B. coagulate milk protein and emulsify fats C. stop the action of ptyalin D. break up food into smaller particles. (2012:Q17)
75. The process in which complex substances are broken down into simpler ones is referred to as  
A. catabolism B. metabolism C. tropism D. anabolism. (2013:Q2)
76. The enzyme that is present in the saliva is  
A. lipase B. pepsin C. ptyalin D. rennin. (2013:Q18)
77.  $2[i^1, c^0, pm^3, m^3]$ . The dental formula above represents that of  
A. an omnivore B. a detritus feeder C. a carnivore D. a herbivore. (2014:Q14)

#### CHAPTER 11 ANSWERS

- 1D. Sequence of protein hydrolysis (breakdown):  
Protein → Proteoses → Peptones → Polypeptides → Peptides → Amino acids.  
All proteins are in fact polypeptide chains of amino acids.
- 2A. Options A and E are correct.  
A - Stomach has only digestive and storage roles - also absorption. E - Stomach secretes only rennin and pepsin but not trypsin (of the pancreatic juice).
- 3C. The anus is only the exit (or entry?) of the rectum and understandably not in the options.
- 4B. Gastrin is a hormone produced by the stomach.
- NOTES:**
- Enzyme in the saliva: Ptylin requires alkaline PH.  
Gastric Juice Enzymes: Renin and pepsin - acidic PH.  
Pancreatic Juice Enzymes: Amylopsin, Steapsin, Trypsin, Chemotrypsin, Carboxypeptidase - alkaline PH.  
Intestinal Juice Enzymes: Invertase, maltase, lactase, erepsin - alkaline PH.
  - Amylase - An enzymes which digests carbohydrate.  
Protease - Digests protein  
Lipase - Digests lipid (fat/oil)
  - All sites of digestion require alkaline PH except the stomach where PH is even as low as 1.0 (extremely acidic).
  - Some enzymes are in fact activated forms of original enzymes secreted: Renin is activated Pro-renin; Pepsin is activated Pepsinogen; Trypsin is activated Trypsinogen; Chymotrypsin is activated Chymotrypsinogen.
- 5C. Renin curdles milk by converting the soluble caseinogen (a protein) to the insoluble casein (precipitated form) and casein is then acted upon by pepsin.
- NOTES:**
- Rennin is highly important in infants.
  - Protein in milk - caseinogen.

- Sugar in milk - lactose.
  - Milk also contain fat, salts, vitamins and water hence it is balanced diet for neonates and infants.
- 6D. Some steps are omitted (See Q1)
- 7D. Bile is produced by the liver, stored in the gall bladder and used in the duodenum - avoid option (A).
- 8D. See Qs 4 and 5
- 9C. Dental Formulae  
Man:  $2[i^2, c^1, pm^2, m^3]$  = 32  
Rabbit:  $2[i^1, c^0, pm^3, m^3]$  = 28  
Sheep:  $2[i^0, c^0, pm^3, m^3]$  = 32  
Dog:  $2[i^1, c^1, PM^4, M^2]$  = 42
- NOTES:**
- Man is an omnivore hence he has moderately sharp canines.
  - Rabbit and sheep are herbivores hence they have a wide gap in their cheek called diastema which allows the manipulation of food by the tongue.
  - Dog is a carnivore hence it has two pairs of sharp, prominent canine for tearing flesh. They are also used for offence and defence and also to hold prey.
  - The last upper premolar (LUP) and the first Lower Molar (FLM) are called carnassial teeth in the dog.
  - Carnassial teeth produce scissors-like effect against one another to shear through flesh and bone and to crush food.
- 10B. See Q9
- 11B. Renin only does the coagulation (or curdling), pepsin the hydrolysis (or digestion) - See Q5
- 12A. See Q4

#### Functions of the Bile

- Being alkaline (bitter), it neutralizes the acidity of Chyme hence stops the action of rennin and pepsin from stomach.
  - It provides enabling PH atmosphere for pancreatic enzymes.
  - It emulsifies fats/oils by reducing their surface tension i.e. it increases surface area for enzymatic actions.
  - It adds water to the Chyme.
- 13A. The alimentary canal (without missing out any part):  
Mouth → Oesophagus → Stomach → Duodenum → Jejunum → Ileum → Colon → Rectum → (Anus)
- NOTES:**
- Mouth = Oral cavity = Buccal cavity.
  - Oesophagus = Gullet
  - Duodenum + Jejunum + Ileum = Small intestine.
  - Colon = Large Intestine.
  - In human the colon has four parts:  
Ascending colon → Transverse colon → Descending colon → Sigmoid colon.
  - The anus guarded by the ever-tonic anal sphincter is the exit of the rectum.
  - Accessory glands and organs related to the alimentary canal: salivary glands, the gastric wall, the pancreas, gall bladder, intestinal world.
  - Digestive system = alimentary canal + accessory glands
- 14A. The substance acted upon by the enzymes is the substrate (C) while sugar (B) is the product.
- 15A. See Q7 and 12
- 16D. Produces enzymes (for digestion) and hormones insulin and glucagon (for regulating blood glucose).
- 17D. See Q9 18E. See Q9
- 19A. The housefly digests its solid food by putting saliva on it. The proboscis is then used as a sponge to lap the dissolved food.
- 20E. Since enzymes are (all) proteins, they are denatured by high temperature hence lose their biological functions.

**NOTES:** This is one of the reasons why fibrile illnesses (fever) kill.

21C. Cooked starch ptylin maltose  
Cellulose cellulase maltose  
Sucrose invertase/sucrose glucose  
Protein pepsin proteases + peptones

22B. See Q4

23A. Diastema in herbivore more than compensates for the canine necessary for tearing.

back **NOTES:** Incisors – for nibbling/gnawing.  
Molar/Premolars – for grinding.

24D. See Q1

25A. Chyme – Ready to leave the stomach.  
Chyle – Ready to leave the duodenum

Study tip: Order of chyme and chyle not alphabetical

**NOTES:**

1. Chyle is of a more watery consistency than chime.
2. To avoid dehydration water is absorbed at the colon from the faecal material (faeces) left after absorption (in the ileum).
3. Faeces – undigested food passed to the exterior through the anus and it is technically not an excretory waste.

26D. Gall bladder – embedded in a lobe of the liver close to the stomach.

Spleen – Attached length wise to the stomach's undersurface.

Pancreas – Found in the U-shaped loop of the duodenum.

27B. The cavity contains blood vessels (capillaries) and nerve to supply nourishment and feeling respectively.

28D. Only option D contains no odd structure.

Salivary glands – production of saliva for digestion of food.

Teeth – For chewing or mastication.

Liver – Metabolism of food substances.

Stomach – Digestion/storage of food.

Villi – Absorptive structures in the intestinal (ileal) wall.

Colon – Absorption of water from faeces to prevent diarrhoea and dehydration.

29B. See Q22

30C. See Qs 11 and 14

31B. Cooked starch is digested in the mouth by ptylin.

32A. Incisors (4) – Identified by its having one root.

Canine (3) – One root.

Premolar (2) – One/two roots

Molar (1) – Two/three roots.

33B. See Q9 and 23 34C. See Q4

35C. Pancreas is both exocrine and endocrine.

36A. Villi (plural) are finger-like projections in the lining of the ileum increasing its surface area manifold.

37C. Small intestine, specifically ileum.

38B. The pancreas in the duodenal loop.

39C. See Q13

40D. The enamel, a non-living material, caps and protects the dentine of the crown and the pulp cavity within.

**NOTES:**

1. Hardest part of the tooth – enamel.
2. Living component of tooth – pulp cavity
3. The three parts of tooth.
  - a. Crown – above the gum.
  - b. Neck – at the level of the gum.
  - c. Root – below the gum.
4. The dentine is capped by the:
  - a. Enamel – at the crown region.
  - b. Cement – in the region of the root.
5. The cement is surrounded by the periodontal membrane that fixes the tooth to the jaw.
6. Dental caries (C) is unnatural discolouration of the

tooth arising from bacterial activities consistent with poor oral hygiene.

7. Two types of tooth:

a. Closed tooth – With opening into the pulp cavity just wide enough to keep the teeth alive but not enough to allow continual growth of the tooth.

b. Open tooth – Opening is very wide to allow sufficient amount of blood into the pulp chamber to allow continual growth.

8. Open tooth is common in animals whose teeth are subject to wear e.g. rabbit (a constantly gnawing or nibbling animal)

41D. See Q4

42B. The empty space between the incisors and premolar of herbivores.

43A. The diastema in the lower jaw of the sheep (unlike in others) is between a non-functional canine (3) and premolar (see dental formula in Q9).

44D. The end product of digestion in

a. carbohydrate – glucose.

b. Proteins – amino acids.

c. Fats/oils – fatty acid and glycerol.

45D. See Q9

46D. Only gastric enzymes tolerate acidity (see Q4)

47B. This is actually the cardia or cardiac region whose entry is guarded by the cardiac sphincter.

**NOTES:**

1. The part nearer the duodenum is the pylorus or pyloric region.

2. The exit of the pylorus leading to the duodenum is guarded by the pyloric sphincter.

3. Cardiac sphincter prevents regurgitation of acid into the gullet to prevent the ulceration of the lower oesophageal endothelium.

4. Pyloric sphincter regulates the passage of partially digested food (Chyme) into the duodenum to allow enough time for digestion.

48C. Dentine and cement are bone-like.

49A. I → enamel II → dentine III → gum IV → Pulp cavity/chamber.

50C. The mouth parts of the aphid (greenfly) is modified into a beak which pierces into a plant (usually to the vascular tissue level) while those of mosquito and tse-tse fly are modified into probosces.

51C. See Q20

52A. Last upper premolar (LUP)  
First lower molar (FLM)

53D. Digestion taking place outside the body.

**NOTE:** The enteron of hydra is considered part of its exterior.

54B. See Q37

55A. Digestion also stops here.

56A. Including grasshopper, cockroach and termite.

57B. In man, the bile duct and the pancreatic duct coalesce and open at a point in the proximal part of the duodenum while in other animals the two ducts enter the duodenum separately.

58A. Lipases for lipids.

59D. The incisors.

60D. First part of the small intestine.

61B. II → Gall bladder. I → Liver. III → Pancreas.

62A. See Q4.

**NOTE:** Mineral salts, vitamins and water require no digestion.

63A. Caecum (not included in answer to Q12) is an addition to, and adaptation of, the alimentary canal of herbivores.

**NOTES:**

- 1. Caecum is a thin-walled, sacculated blind tube which ends in a finger-like structure called appendix or vermiform appendix.
  - 2. Resident in the caecum are (mutualistic) bacteria that express cellulase which helps herbivores to digest cellulose.
  - 3. The appendix has no apparent function and it is less prominent (i.e rudimentary) in man.
  - 4. Although man cannot digest cellulose, the latter is added in our diet to aid the contraction of the gut as it adds bulk to the food— cellulose acts as a roughage.
- 64C. The bird swallows its food whole, stores it in the crop where it is softened by secretions from the wall of the crop and then passed to the gizzard, a stone-laden muscular bag which churns the food into small pieces (analogous to chewing).
- 65D. Ruminants are called polygastric animals because they have Four-chamber stomach:
- 1. Chamber 1 → Rumen (paunch)
  - 2. Chamber 2 → Reticulum (honeycomb bag)
  - 3. Chamber 3 → Omasum (psalterium)
  - 4. Chamber 4 → Abomasum (reed)

**NOTES:**

- 1. Rumen temporarily stores the undigested food; bacteria that digest cellulose live here.
  - 2. Cuds are formed at the reticulum.
  - 3. Abomasum is the true stomach.
- 66D. Bile which emulsifies fats is released from I (gall bladder) to IV (the duodenum).
- 67C. Due to its release of hydrochloric acid whose functions are:
- 1. To stop the enzymatic action of ptylin.
  - 2. To kill bacteria in food (as the first line of body immune system).
  - 3. To provide acidic pH for the activities of gastric enzymes.
- 68D. See Q63      69D. See Q66
- 70D. Using food to build up body structures is assimilation.  
Ingestion → Digestion → Absorption → Circulation → Assimilation.
- 71D. See chapter 10
- 72A. Cane sugar = Sucrose  
Enzymes = Sucrose
- 73A. Others are oysters, copepods, and flamingoes.  
**NOTE:** Mosquito larvae (but not adult mosquito) are filter feeders.
- 74C. See Q66
- 75A. Digestion and respiration are therefore catabolic.

**NOTES:**

- 1. Anabolism, the reversal of catabolism is the building up of a complex substance from simpler ones.
  - 2. All biochemical reactions or changes in organisms are called metabolism. Anabolism + Catabolism = Metabolism
  - 3. Photosynthesis is anabolic
- 76C. See Qs 4 and 30.
- 77D. Absence of canine is confirmatory of a herbivore (See Q9)

**CHAPTER 12:**

**SUPPORTING TISSUES. MUSCULO SKELETAL SYSTEM. MOVEMENT**

- 1. One of the functions of the xylem is A. strengthening the stem B. manufacturing food C. reducing loss of water (1978:Q4) D. conducting manufactured food E. storing unused sugar
- 2. The cilia in paramecium are used for A. respiring B. locomotion C. protection D. regulating food intake E. excretion. (1978:Q6)
- 3. Which of these skeleton is most appropriate to the cockroach? A. Hydrostatic skeleton B. Exoskeleton C. Endoskeleton D. cartilaginous skeleton E. Bony skeleton (1978:Q9)

- 4. Which of these is not associated with the movement of toad, reptile or birds? A. Hopping B. Bopping C. Flapping D. Gliding E. Pecking. (1978:Q30)
- 5. Which of these tissues serves the function of support and water conduction? A. Parenchyma B. Collenchyma C. Sclerenchyma D. Xylem E. Phloem. (1979:Q3)
- 6. Which of the structures listed below is peculiar to the Axis vertebra? A. Odontoid process B. Anterior zygapophysis C. Posterior zygapophysis D. lateral spine E. Centrum. (1979:Q8)
- 7. The joint between the atlas and axis vertebrae allows for A. rotary movements only B. up and down or nodding movements only C. rotatory and nodding movements D. no movement at all E. slight movement (1980:Q14)

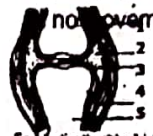
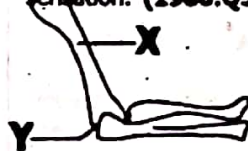
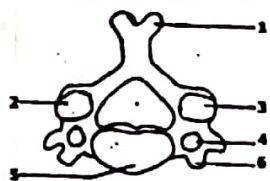


Fig. 1 Section through a joint

- 8. In fig.1 the structure which prevents friction between the bones is A. 1 B. 2 C. 3 D. 4 E. 5 (1980:Q17)
- 9. In animals, cilia, flagella, pseudopodia, and chaetae, can be used for A. reproduction B. fighting enemies C. attachment to plants D. locomotion E. locating sensation. (1980:Q50)
- 10. The bone labeled X in the fig is the A. ulna B. fibula C. radius D. humerus E. tibia (1981:Q19).
- 11. The joint at Y in the fig is A. ball and socket B. hinge C. pivot D. rivet E. none of the above (1981:Q20).



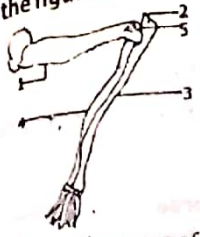
- 12. The tissue which connects a muscle to a bone is A. cartilage B. Muscle fibre C. Tendon D. ligament E. connecting fibre (1981:Q34).
- 13. The thoracic vertebrae of a mammal is characterized by the A. vertebral canal B. prominent neural arch C. prominent transverse process D. prominent neural spine E. prominent centrum. (1981:Q50)
- 14. Which vertebra has a projection called odontoid process? A. Atlas B. Axis C. Thoracic D. Caudal. (1982:Q19)



- 15. Which of the parts are used to recognize the bone in the above fig? A. 1 and 4 B. 2 and 3 C. 3 and 5 D. 1, 2 and 6 E. 4 and 5. (1982:Q46)
- 16. Starting from the skull end, the vertebrae are arranged in the following order: A. axis, atlas, cervical, thoracic and lumbar B. atlas, cervical, axis, thoracic and lumbar C. atlas, axis, thoracic, cervical and lumbar D. atlas, axis, cervical, thoracic and lumbar E. atlas, thoracic, cervical, axis and lumbar. (1983:Q32)
- 17. Which of the following types of vertebrae occur in equal numbers in the rabbit, rat and man? A. Caudal B. Thoracic C. Lumbar D. Cervical E. Sacral (1984:Q26)
- 18. The axial skeleton of a mammal does not include the bones of the A. skull B. tail C. limbs D. back E. neck (1984:Q39).
- 19. The appendicular skeleton is made up of the A. limbs B. skull and limbs C. phalanges D. ulna and radius E. girdles and limbs. (1985:Q29)
- 20. Two main distinguishing features of the cervical vertebra are the presence of A. short neural spine and vertebral canal B. prezygapophysis and cervical ribs C. large centrum and cervical ribs D. vertebral canal and large centrum (1986:Q32)
- 21. Sclerenchyma cells are lignified to A. strengthen and support the plant B. transport synthesized food C. conduct

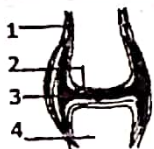
22. water and salt D. protect the plant from injury (1987:Q27)  
 Parenchyma cells serve as supporting tissue when they  
 A. contain chloroplasts B. have crystals C. become flaccid  
 D. become turgid. (1988:Q26)

Use the figure below to answer questions 23-25



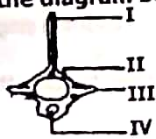
23. The type of joint at the point labelled 5 is the A. pivot joint B. gliding joint C. ball and socket D. hinge joint. (1989:Q24)
24. Which of the labelled bones is the ulna? A. 1 B. 3 C. 4 D. 5 (1989:Q25)
25. What is the name of the structure labelled 2? A. Odontoid process B. Olecranon Process C. Patella D. Condyle (1989:Q26)
26. The lumbar vertebra when compared with a thoracic vertebra has a A. longer neural spine B. wider neural canal C. thicker centrum D. shorter transverse process (1989:Q27)
27. Muscles are indirectly attached to bones by means of A. ligaments B. membranes C. tendons D. sutures. (1990:Q26)
28. Which of the following vertebrate lays a centrum? A. Atlas B. Axis C. Thoracic D. Lumbar (1991:Q31)
29. The bone of the neck on which the skull rests is known as the A. odontoid process B. axis C. atlas D. occipital condyle. (1992:Q21)

Use the figure below to answer questions 29 and 30



30. The part labeled 3 is the A. cartilage B. ligament C. synovial fluid D. bone. (1992:Q23)
31. The function of the part labeled 1 is to A. secrete a fluid which lubricates the joint B. attach muscles to the bones at the joint C. bend the bones at the joint D. hold the joint in place. (1992:Q24)
32. Which of the following is the correct order of the vertebrae along the spinal column? A. Axis atlas thoracic lumbar cervical sacral B. Atlas cervical axis thoracic lumbar sacral. C. Atlas axis cervical thoracic lumbar sacral D. Axis cervical thoracic sacral lumbar. (1993:Q24)
33. The phloem parenchyma is sometimes used for A. food storage B. supporting the stem C. production of the sieve tube D. transporting water. (1994:Q17)

Use the diagram below to answer questions 34 and 35



34. The vertebra illustrated is A. lumbar B. thoracic C. caudal D. cervical (1994:Q23)
35. The neural arch is labelled A. I. B. II C. III D. IV (1994:Q24)
36. During the bending of the arm, the biceps muscle A. contracts and the triceps muscle relaxes B. relaxes and the triceps muscle contracts C. and the triceps muscle contract D. and the triceps muscle relax (1995:Q19)
37. A band of connective tissue linking two bones in a joint is known as A. tendon B. cartilage C. synovial membrane D. ligament (1997:Q22)
38. The appendicular skeleton is composed of the pectoral girdle A. pelvic girdle, fore and hind limbs B. pelvic girdle and fore limbs C. lumbar vertebrae and pelvic girdle D. lumbar vertebrae, fore and hind limbs. (1997:Q23)
39. Which of the following is not a function of the mammalian skeleton? A. Protection B. Respiration C. Transportation D. Support (1998:Q21)
40. The organism that has a hydrostatic skeleton is A. Tilapia

- B. Hydra C. Mosquito larva D. Earthworm (1999:Q2)
41. The chitin in the exoskeleton of many arthropod is strengthened by A. calcium compounds B. organic salts C. lipids D. proteins (1999:Q32)

Use the diagram below to answer questions 42 and 43



42. The structure labelled II articulates with III to form a A. sliding joint B. hinge joint C. pivot joint D. ball-and-socket joint (1999:Q33)
43. Which of the bones is the radius? A. I B. II C. III D. IV (1999:Q34)
44. The scapula and the ischium are part of the A. pectoral girdle B. pelvic girdle C. appendicular skeleton D. hind limb (2000:Q16)
45. The structure above represents a A. caudal vertebra B. lumbar vertebra C. thoracic vertebra D. cervical vertebra (2001:Q25)
46. Blood vessels usually pass through the structure labelled A. III B. II C. V D. IV (2001:Q26)



47. The bones labeled II are called A. cervical vertebrae B. sacral vertebrae C. thoracic vertebrae D. lumbar vertebrae (2004:Q22)
48. The type of joint between adjacent bones in the part labeled II is the A. ball-and-socket joint B. sliding joint C. hinge joint D. suture joint (2004:Q23)
49. The transition from amphibians to mammals involves the limbs becoming arranged to support the weight more effectively requiring modifications in the A. collar bones and coccyx B. pectoral and pelvic girdles C. scapulae and clavicles D. vertebrae and sternum (2005:Q12)
50. Hydrostatic skeleton is the type of supporting system found in A. mammals B. reptiles C. oligochaete D. arthropods. (2005:Q24)
51. A unique characteristic of the cervical vertebrae is the process of A. large centrum B. long transverse processes C. zygapophysis D. vertebralarterial canal. (2006:Q8)
52. A plant parenchyma cell also acts as a supporting tissue when it A. becomes flaccid B. contains crystals C. becomes turgid D. is pigmented (2008:Q22)
53. The axial skeleton is found in the A. skull, ribs, vertebral column and breast bone B. skull, humerus, vertebral column and ribs C. breastbone, clavicle, ribs and vertebral column E. femur, sternum, ulna and skull (2009:Q22)
54. The two halves of the pelvic girdle are joined together at the A. ileum B. pubis C. obturator foramen D. pubic symphysis (2010:Q33)
55. The main structures in vertebrates that supports and protects the body is the A. ligament B. muscle C. joint D. skeleton. (2013:Q30)
56. The chitin in the exoskeleton of many arthropods is strengthened by A. proteins B. calcium compounds C. organic salts D. lipids. (2013:Q31)

### CHAPTER 12 ANSWERS

- 1A. Xylem (or wood) strengthens stem and also conducts salts and water.
- Supporting Tissues in Plants**
- |                      |                 |
|----------------------|-----------------|
| 1. Turgid parenchyma | 2. Collenchyma  |
| 3. Sclerenchyma      | 4. Xylem (wood) |
- 2B. **Locomotory Structures**
- Cilia – Paramecium  
 Flagella – Chlamydomonas/Euglena  
 Pseudopodia – Amoeba.

### 3B. Types of Skeleton

Hydrostatic – as in earthworm

Exoskeleton – arthropods, snails, turtles

Endoskeleton – vertebrates including man

#### Skeletal Materials

1. Body fluid – hydroskeleton
2. Chitin – exoskeleton in arthropods
3. Cartilage – trachea, pinnae, cartilaginous fish etc.
4. Bone – endoskeleton of most vertebrates.

4E. Pecking (in birds) is related to feeding (as in woodpecker)

5D. See Q1

6A. Odontoid process is believed to have been formed by the fusion of the centra (singular: centrum) of the atlas and axis vertebrae.

#### NOTES:

1. The atlas and axis are the first and second cervical vertebrae respectively.
2. When atlas and axis are separated, the supposed location of centrum in the atlas is an empty space – Atlas has no centrum.

7A. The odontoid process of the axis provides a pivot for the atlas to provide the rotatory movement (shaking) of the head.

#### NOTES:

1. Atlas – axis joint is a pivot joint.
2. The joint between the atlas and the base of the skull allows nodding movement of the head.
3. The atlas through a pair of facets makes contact with the skull at the occipital condyles.

8B. The synovial fluid (2) is a lubricant for the joint as it prevents

wear and tear of the bones.

- 1 → Bone
- 2 → Synovial fluid
- 3 → Articular (contact) cartilage
- 4 → Ligament
- 5 → Tendon

#### NOTES:

1. The articular cartilage also contributes to the frictionless contact of bones.
2. A ligament joins bone to bone.
3. A tendon joins a muscle to a bone.

9D. Chaetae in earthworm (See Q2)

10D. Bone of the upper arm X = humerus

#### NOTES:

1. The other two bones in the diagram are the bones in the forearm (between the elbow and the wrist)
  - a. Bigger one – ulna (also longer)
  - b. Smaller one – radius
2. Now compare the bones of the forelimb and hindlimbs.

Forelimb versus	Hindlimb
Humerus	Femur
Ulna	Tibia

Radius	Fibula
Carpals	Tarsals
Metacarpals	Metatarsals
Phalanges	Phalanges

11B. Like the hinge of a door, the joint allows movement of the bones in one direction only.

#### NOTES:

1. Examples of hinge joint – knee and elbow joints.
2. Other joint types:
  - a. Ball-and-socket joint – The ball-like head of a bone fits exactly into the cup-like depression (cavity) in another thereby allowing movement in several

directions e.g. shoulder and hip joints.

b. Gliding/Sliding joint – Where a bone slides over another thereby allowing up-and-down or rotational movement e.g. wrist and ankle joints and intervertebral joints.

c. Pivot Joints – See Q7

3. The joint types above are called movable joints or synovial joints.

4. Immobile joints allow practically no movement e.g. sutures (of the skull) and pubic symphysis (joining the two halves of the pelvic girdle).

12C. See Q8

### 13D. Characteristic Feature of Vertebrae.

1. Atlas
  - \* Large neural canal, no centrum.
  - \* Small, reduced neural spine.
  - \* Prominent transverse processes as cervical ribs.
  - \* Facets for articulating with occipital condyle.
2. Axis
  - \* Large centrum projecting forward as odontoid process.
  - \* Large neural spine, flat cervical ribs.
3. Cervical vertebrae (in general)
  - \* Presence of vertebral arterial canals for the

passage

of vertebral arteries.

\* Flattened transverse process as cervical rib whose outer part is split into two.

\* Short neural spine.

4. Thoracic vertebra

\* Large centrum, large neural canal.

\* Long, prominent neural spine which projects upwards and backwards.

\* Very short transverse process.

5. Lumbar vertebra

\* Thick centrum, large neural spine

\* A pair of large transverse processes directed forwards

\* Large processes for attachment of abdominal muscles.

6. Sacral vertebra

\* Large centrum, narrow neural canal

\* Neural spine reduced to a notch.

7. Caudal vertebra

\* No neural canal, no neural arch, no neural spine and no transverse process.

\* The entire bone is a solid piece of centrum.

#### NOTES:

1. In adult mammals sacral vertebrae fuse to form a single bone called the sacrum.
2. In man, caudal vertebrae fused together to form the coccyx (tailbone)
3. Vertebrae by location and in the following order:
  - a. Cervical → Neck
  - b. Thoracic → Chest
  - c. Lumbar → Upper abdomen
  - d. Sacral → Lower abdomen
  - e. Caudal → Tail.

14B. See Q13

15. 1 → Neural spine

2 & 3 → Zygapophysies

4 → Vertebral arterial canal

5 → Centrum

6 → Transverse process or cervical rib:

This bone is a typical cervical vertebra by 4 and 6 (See Q13)

No option was right.

16D. See Qs 6 and 13

### 17D. Vertebrae in Numbers:

	Man	Rat	Rabbit
Cervical	7	7	7
Thoracic	12	13	12
Lumber	5	6	7
Sacral	5	4	3-4
Caudal	4	27-30	16
<b>Total</b>	<b>33</b>	<b>57-60</b>	<b>45-46</b>

#### NOTES:

- In fact, all mammals have the same number of cervical vertebrae irrespective of the length of their necks (including the neck of the famous giraffe).
- The caudal vertebrae (tail bone) of man are few and they fused as coccyx and the coccyx does not project out of the body – man has no tail.
- Rat has longer tail compared to the rabbit.

### 18C. Axial Skeleton

The skull	The vertebral column
The sternum	The ribs
Appendicular	Skeleton
The pectoral girdle	The pelvic girdle.
The fore limbs.	The hind limbs.

#### NOTES:

- The skull comprises
  - v The cranium or brain box
  - v The snout or facial bones
  - v The mandible or lower jaw
  - Cranium + Snout + Mandible = Skull
- The cranium comprises
  - v Frontal bone (fore head)
  - v Temporal bones (temples)
  - v Parietal bone (Upper surface)
  - v Occipital bone (posterior part)
- The lobes of the brain under the cranial bones above are similarly named.
- The snout comprises
  - v The zygomatic arches (cheek bones)
  - v Nasal bone and eye socket.
  - v Maxilla (upper jaw)
- The mandible is joined to the rest of the skull at the temporo mandibular joint and the mandible moves during speech making and eating while the maxilla does not.
- At the base of the skull is the foramen magnum which is the opening of the spinal cord into the neck.
- The vertebral column is a stack of small bones of the neck and back called vertebrae (See Q17)
- The sternum = Breastbone
- The sternum has 3 parts
  - The manubrium – handle
  - Body of sternum
  - The xiphoid process
- The ribs (12 pairs in man) articulate with the vertebrae posteriorly and with the sternum anteriorly.
- Three types of ribs:
  - True ribs – 1st – 7th ribs having vertebral and sternal attachments.
  - False ribs – 8th and 9th ribs having indirect sternal attachment via the 7th rib.
  - Floating ribs – 10th -12th ribs having neither direct nor indirect sternal attachment.
- The pectoral girdle comprises:
  - v The scapulae (singular: scapula)
  - v The caracoid processes.
  - v The clavides
- The pelvic girdle comprises:

- v The Ilium
- v The Ischium
- v The pubis

- Scapula – shoulder blade
  - Clavide – collar bone
  - Sternum – breast bone

19E. See Q18

20A. See Q13

21A. The cells are thickened with deposits of lignin at the cell walls (see also Q1)

#### NOTES:

- Sclerenchyma:
  - Cell types: fibres/sclereids.
  - Cell are dead and lignified.
  - Fibres are narrow and polygonal.
  - Sclereids are heavily lignified almost spherical and slightly elongated.
- Concerning parenchyma.
  - v Cells are unspecialized, widely distributed and roughly spherical.
  - v Cells are living.
- Concerning collenchymas.
  - v Living cells thickened at the corners by the extra deposits of cellulose.
  - v Polygonal and elongated.
- Concerning xylem.
  - v Four types of cell
    - Tracheids
    - Vessels
    - Fibres
    - Xylem parenchyma, unlike the others, is not lignified hence provides no mechanical support – cells are dead.

22D. See Q1      23D. See Q11

24B. The ulna (3) is bigger and longer than the radius (4) as reflected by the jutting out of the ulna as the olecranon process (2) →

- Head of humerus. →
- Olecranon process. →
- Trochlea of the humerus

25B. See Q24

26C. See Q13

27C. See Qs 8 and 12

28A. See Q6

29C. On (C) through (D) See Q7

30C. See Q8

31D. See Q

32C. See Qs 6, 13 and 17.

33A. Also as packing tissue.

34D. Note the flattened cervical rib(III) and the vertebralarterial canals.

35B. Surrounding the neural canal.

36A. Also during the straightening of the arm, the biceps relaxes while the triceps contracts.

#### NOTES:

- A pair of bones whose similar actions produces opposite effects or whose different actions produce similar effect at a joint are said to be antagonistic.
- Contraction of biceps brings about bending of the arm hence it is a flexor.
- The contraction of the triceps causes straightening of the arm hence it is an exterior (emphasis on contraction not extension, please)

37D. See Q8

38A. See Q18

39C. Do not confuse transportation with movement.

#### Functions of Skeleton

- Protection – To protect vulnerable internal organs e.g heart, brain, spinal cord, lungs, great vessels
- Support – To provide supporting framework for the body.
- Rigidity and shape – To provide definite shape and rigidity for the animal.
- Movement – To provide a pulling background for

muscles to facilitate movements.

5. Respiration – The ribs play a vital role in breathing.
6. Haemopoiesis – Blood cells are produced in the bone marrow especially the red marrows of long bones.
7. Calcium Metabolism – The bones are large reservoirs of calcium (as calcium phosphate) from which calcium can be mobilized to compensate for low blood calcium level or where excess calcium in the blood can be deposited.

40D. See Q3

41A. Chitin is a nitrogen – containing polysaccharide closely related to cellulose and usually fortified with calcium salts; proteins usually provide flexibility or elasticity.

42B. See Q11 43D. See Q24 44C. See Q18

45D. As revealed by the presence of vertebral canal (V).

46C. See Q13

47D. I → Cervical Between I and II → thoracic.

48B. See Q11

49B. To which the limbs are attached.

50C. Earthworm is an oligochaete (See Q9)

51D. See Q13

52C. Turgid parenchyma (Q1)

53A. See Q18

54D. An immovable joint See Q11

55D. See Q39

56B. See Q41

### CHAPTER 13

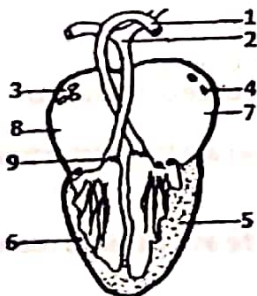
#### TRANSPORT. CIRCULATORY SYSTEM

1. A carbohydrate molecule in the right ventricle of the heart is pumped into the cell of the toe of man. Which of these structures is it unlikely to pass through en-route?

- A. Pulmonary artery B. Lungs C. Heart D. Liver E. Aorta. (1978:Q43)

2. The hepatic portal vein is characterized by A. Beginning and ending with capillaries B. connecting the liver and kidney C. carrying deoxygenated blood D. ending with large capillaries E. having no capillaries. (1979:Q35)

3. The blood vessel which carried digested food from the small intestine to the liver is the A. renal vein B. renal artery C. hepatic artery D. hepatic portal vein E. coeliac artery (1978:Q37)



4. Why is the part labeled 5 thicker than 6? A. 5 is the left ventricle and 6 the right ventricle B. 6 is the left ventricle and 5 the right ventricle C. 5 receives blood from the left auricle and 6 from the right D. 5 pumps blood round the body and 6 pumps blood only into the lungs E. 5 deals with oxygenated blood and 6 deoxygenated blood (1980:Q19)

5. Which of the labeled parts is the vena caval opening? A. 1. B. 2. C. 3. D. 4. E. 9. (1980:Q20)

6. If the bark and phloem tissues of a woody shoot are peeled off by ringing, the whole plant will eventually die because A. water does not reach the leaves B. water and salts remain below the ringed portion C. there is a withdrawal of water from the root by soil D. manufactured food does not reach the roots E. the roots store too much water. (1980:Q30)

7. The hepatic portal vein is unique because it A. carries deoxygenated blood B. begins and ends with capillaries C. is the largest vein in mammals D. carries digested food E. is the shortest vein in mammals. (1981:Q46)



8. What is the part marked X in Fig 7 called? A. Pulmonary artery B. pulmonary vein C. Vena cava D. Main aorta E. ureter (1981:Q47)

Fig. 7.15. Mammalian Heart

9. Which of the following is NOT a function of mammalian blood? A. engulfing bacteria B. production of hormones C. transporting urea D. distribution of heat E. Transporting glucose. (1982:Q31)

10. The three blood vessels that supply the mammalian alimentary canals are A. segmented artery, hepatic artery and coeliac artery B. coeliac artery, anterior mesenteric artery and posterior mesenteric artery C. coeliac artery, segmented artery and hepatic artery D. hepatic artery, anterior mesenteric E. hepatic portal vein anterior mesenteric artery and posterior mesenteric artery. (1982:Q44)

11. Which of the following statements is NOT true of Mammalian erythrocytes? A. They have haemoglobin B. They appear yellow when looked at singly C. They are disc-shaped D. The cells are more numerous than leucocytes E. They are at maturity. (1983:Q11)

12. In woody plants, gases and water vapour are transported across the stems by the A. xylem fibres B. medullary fibres C. medullary rays D. phloem fibres E. phloem parenchyma. (1983:Q12)

13. Which of the following statements on the mammalian circulatory system is NOT true? A. Blood in the pulmonary artery is richer in oxygen content than blood in the pulmonary vein B. The blood in the hepatic portal vein is the richest in food substances. C. Blood flow is controlled by valves in the veins D. Arteries are generally thicker and larger than veins. E. Fibrin helps in the formation of blood clot. (1983:Q36)

14. The path taken by glucose from the ileum to the heart is A. ileum hepatic portal vein hepatic artery vena cava heart. B. ileum hepatic portal artery hepatic artery vena cava heart C. ileum hepatic portal vein vena cava heart D. ileum hepatic vein vena cava heart. E. ileum hepatic portal vein hepatic vein (1983:Q50)

15. Blood clotting is initiated by A. leucocytes B. platelets C. haemolymph D. haemoglobin E. erythrocytes (1984:Q16)

16. Normally the flow of blood is NEVER from A. artery to arterioles B. arterioles to capillaries C. capillaries to venules D. arterioles to the artery E. venules to the vein (1984:Q37)

17. Which of the following sequences represents the process of blood clotting? 1. Fibrin forms a network of threads 2. Red blood cells are caught and a clot is formed 3. Fibrinogen in plasma changes into soluble fibrin 4. Blood is exposed to air. A. 4,3,2,1 B. 4,3,1,2 C. 3,1,4,2 D. 1,2,3,4 E. 3,1,2,4. (1984:Q40)

18. The function of lymph nodes is to A. supply oxygen B. filter out bacteria C. form red blood D. supply amino acids E. supply simple sugars (1985:Q18)

19. The vein which returns blood from the head and arms to the heart is called A. aorta B. inferior vena cava C. superior vena cava D. pulmonary vein E. pulmonary artery. (1985:Q19)

20. Blood platelets are important because they A. are amoeboid and nucleated B. produce antitoxins C. produce antibodies D. digest harmful bacteria E. release thrombin for blood clotting. (1985:Q20)

21. Blood circulation in a mammal is said to be double because A. it passes twice through the heart in the complete circuit B. it moves in both arteries and veins C. it circulates in both the heart and other organs D. the heart contains auricles and ventricles (1986:Q23)

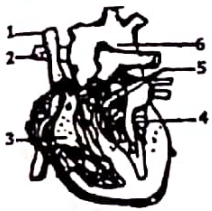
22. Which is the correct order of water loss from the leaf? 1. Mesophyll 2. Veins 3. Substomatal cavity 4. Stomata A. 3 2 1 4 B. 2 3 1 4 C. 2 1 3 4 D. 1 2 3 4. (1986:Q24)

23. The aperture between the left auricle and the left ventricle is guarded by the A. auricular valve B. tricuspid valve C. ventricular valve D. bicuspid valve. (1986:Q25)

24. One cubic centimeter of lymph is richer than an equal volume of blood in A. erythrocytes B. leucocytes C. amino acid D. glucose. (1987:Q21)

25. Aged erythrocytes are destroyed in the A. pancreas B. liver

- C. lymph nodes D. kidney. (1989:Q20)
26. Which of the following is the function of lymph? A. Carries hormones round the body B. Transports nutrients and oxygen from blood capillaries to the cells. C. Distributes heat uniformly round the body D. Conveys amino acids and glucose from the small intestine to the liver (1989:Q23)
27. If a ring of bark and phloem is removed from a stem, the A. plant dies immediately B. plant dies after two days C. movement of food is not affected D. movement of mineral salts is hardly affected (1990:Q22)
28. Fibrinogen and prothrombin play important roles in the A. deamination of proteins B. clotting of blood C. detoxication of substances D. storage of vitamins. (1991:Q27)
29. Deoxygenated blood flows into the right and left lungs through the A. pulmonary vein B. vena cava C. pulmonary artery D. subclavian vein. (1991:Q28)
30. The blood vessel which carries blood from the alimentary canal to the liver is the A. hepatic artery B. hepatic vein C. hepatic portal vein D. mesenteric artery. (1992:Q15)
31. Manufactured food in the plants is transported through the A. xylem B. phloem C. cambium D. cortex. (1993:Q13)



32. Blood is pumped into the right ventricle by the contraction of the auricle wall through A. 1 B. 3 C. 5 D. 6. (1993:Q19)
33. After circulation in the lungs, the blood returns to the left auricle through A. 1 B. 4 C. 5 D. 6 (1993:Q20)
34. The main function of blood in mammals is to transport A. excretory materials from tissues B. carbon dioxide from lungs to tissues C. digested food from all the body tissues. D. oxygen to the lungs. (1993:Q21)
35. A circulatory system that does not allow mixing of oxygenated and de-oxygenated blood in mammalian heart is referred to as A. open B. haemocoelic C. single D. closed (1994:Q21)
36. Which of the following is NOT involved in the transport of substances in the body? A. Lymph B. Plasma C. Leucocytes D. Erythrocytes (1995:Q15)
37. In mammals, the exchange of nutrients and metabolic products occurs in the A. lymph B. lungs C. heart D. liver (1997:Q11)
38. The companion cells are part of the A. pericycle B. phloem C. pith D. xylem (1997:Q24)
39. Unicellular organisms transport essential nutrients directly to all parts of their bodies by the process of diffusion because, they have A. a large volume to surface area ratio B. a large surface area to volume ratio C. their bodies immersed in the nutrients D. their outer membrane made of cellulose (1998:Q16)
40. The heart of the adult frog consists of A. two auricles and two ventricles B. one auricle and one ventricle C. one auricle and one ventricle D. one ventricle and two auricles. (1998:Q17)
41. In adult mammalian blood, the cells which lack nuclei are the A. erythrocytes B. lymphocytes C. leucocytes D. phagocytes (1998:Q18)
42. Substances manufactured by the leaves are transported to other parts of the plant through the A. xylem B. companion cells C. sieve tubes D. cambium (1999:Q14)
43. After a meal of yam has been digested the highest concentration of glucose is to be found in the A. hepatic artery B. pulmonary vein C. hepatic portal vein D. posterior vena cava (1999:Q15)
44. The force that holds water together in the form of a stream within the xylem tube is the A. cohesion of water molecules to one another by hydrogen bonds B. force of gravity attracting the water molecules through the hydrogen bonds C. attraction between the water and xylem by osmotic force D. normal flow of water from the ground with the help of gravitational force. (1999:Q20)

45. The lymphatic system of mammals rejoins the blood circulatory system at the A. hepatic vein B. subclavian vein C. renal vein D. common iliac vein (1999:Q22)
46. The chamber of the mammalian heart with the thickest wall is the A. right ventricle B. left auricle C. right auricle D. left ventricle (2000:Q23)
47. Serum differs from blood plasma because it A. contains blood cell and fibrinogen B. contains soluble food and mineral salts C. lacks the blood protein fibrinogen D. lacks blood cells and albumin (2000:Q24)
48. The transportation of oxygen and carbon (IV) oxide in mammals is carried out by A. leucocytes B. thrombocytes C. phagocytes D. erythrocytes (2001:Q20)
49. The veins of the leaf are formed by the A. vascular bundles B. cambium cells C. palisade tissue D. spongy mesophyll (2001:Q21)
50. The mammalian erythrocytes differ from leucocytes are A. discoid and nucleated B. discoid and anucleated C. amoeboid and nucleated D. amoeboid and annucleated (2002:Q29)
51. If water that has been coloured red is poured at the base of a wilting plant, it will appear as a red stain in the cells of the A. xylem B. epidermis C. phloem D. parenchyma (2003:Q13)
52. Organisms I, II, III and IV have surface/volume ratios of 1:2, 1:3, 1:4 and 1:5 respectively. The organisms that is likely to have the most complex transport system is A. IV B. III C. I D. II. (2003:Q19)
53. In the root vascular system, the xylem is directly surrounded by the A. pericycle B. cortex C. endodermis D. parenchyma (2005:Q14)
54. The only vein that carries pure oxygenated blood is the A. renal vein B. pulmonary vein C. hepatic vein D. sciatic vein. (2005:Q17)
55. The function of the fluid-filled pericardium is to A. reduce the friction caused by the pumping movements of the heart B. supply the heart with oxygen and nutrients C. prevent disease organisms from attacking the heart D. reduce the intensity of the pumping action of the heart. (2005:Q18)
56. The organ situated in the pericardial cavity of a mammal is the A. heart B. liver C. stomach D. spleen. (2006:Q7)
57. In rabbits, the chamber of the heart that receives oxygenated blood from the lungs is the A. left ventricle B. left auricle C. right ventricle D. right auricle. (2006:Q9)
58. The mammalian vein which starts with and ends in a capillary network is the A. pulmonary vein B. Mesenteric vein C. renal vein D. hepatic portal vein. (2006:Q16)



59. Oxygenated blood is pumped to the entire body from the part labeled A. IV B. III C. II D. I (2007:Q29)
60. The part labeled I is the A. pulmonary artery B. vena cava C. aorta D. bicuspid valve. (2007:Q30)
61. Water reabsorption takes place in A. II and III B. III and IV. C. I and IV D. I and III. (2008:Q16)
62. The vessel that carried blood from I to II is the A. pulmonary artery B. pulmonary vein C. carotid artery D. jugular vein. (2008:Q17)
63. In plants, the structures that play roles similar to the arteries and veins of animals are the A. xylem and phloem B. root and stems. C. lenticels and phloem D. roots and stems. (2009:Q6)
64. Which of the following describes the sequence of blood flow from the heart to a tissue? A. Heart - artery - arteriole - tissue B. Heart - vein - venule - tissue C. Heart - venule - vein - tissue D. Heart - arteriole - artery - tissue. (2009:Q19)





65. The movement of material in the xylem and phloem tissues of the plant are represented by the arrows labeled A. II and I respectively B. I and II respectively C. IV and III respectively D. III and IV respectively (2010:Q12)

66. During photosynthesis, the arrow labeled II represents the  
 A. absorption of energy from the sun B. release of carbon(IV) oxide C. release of oxygen as a by-product D. escape of mineral salts. (2010:Q13)
67. The primary structure responsible for pumping blood for circulation through the mammalian circulatory systems is the  
 A. right auricle B. arteries C. left ventricle D. veins (2010:Q17)
68. Circulation of blood to all parts of the body except the lungs is through  
 A. systematic circulation B. The lymphatic system C. pulmonary circulation D. the pulmonary artery (2010:Q18)
69. The blood component that has the greatest affinity for oxygen is the  
 A. leucocytes B. erythrocytes C. thrombocyte D. lymphocytes. (2010:Q31)
70. Which of the following is true of leucocytes? A. They are large and nucleated B. They are involved in blood clotting C. They are respiratory pigments D. They are most numerous and ramify all cells. (2011:Q13)
71. In mammals, the exchange of nutrients and metabolic products occurs in the  
 A. trachea B. lymph C. lungs D. oesophagus (2011:Q16)
72. The vascular tissues in higher plants are responsible for  
 A. transpiration pull B. the transport of gases and water C. the movement of food and water D. suction pressure. (2011:Q24)



73. Transportation in the Xylem is represented by  
 A. I B. II C. III D. IV (2012:Q19)

74. The arrow labeled II represents the  
 A. release of Oxygen B. Intake of Carbon (iv) Oxide C. Movement of Photosynthesis D. Movements of Nutrients. (2012:Q20)

75. Movement of minerals and chemicals compounds within a plant occurs during  
 A. translocation B. transpiration C. diffusion D. osmosis. (2013:Q17)
76. Which blood cells are involved in the immune response of vertebrates? A. Lymphocytes B. Erythrocytes C. Monocytes D. Phagocytes. (2013:Q23)
77. The blood circulatory system of vertebrates consists of  
 A. heart, aorta, capillaries and veins. B. heart, aorta, arteries, veins. C. heart, vena cava, arteries and veins D. heart, arteries, capillaries and veins. (2013:Q24)
78. A plant tissue that carries water and mineral salts is the  
 A. xylem B. cortex C. phloem D. cambium (2013:Q25)
79. Which of the following helps in the clotting of blood? A. White blood cells B. Plasma C. Platelets D. Red blood cells (2013:Q26)
80. Which of the following forms about 55% of the volume of the blood in a man  
 A. Platelets B. Plasm C. Erythrocytes D. Leucocytes. (2013:Q27)
81. A circulatory system is very essential in mammals but not in smaller organisms like Amoeba because  
 A. Amoeba lives in freshwater B. diffusion is sufficient to transport to transport materials in Amoeba C. Amoeba lacks blood, containing haemoglobin D. Amoeba exhibits anaerobic respiration (2014:Q15)
82. In vascular plants, the sieve tubes and companion cells are present in the  
 A. cambium B. cortex C. xylem D. Phloem (2014:Q16)

## CHAPTER 13 ANSWER

- 1D. Right ventricle → Pulmonary artery → Lungs → Pulmonary vein → Left article → Left ventricle → aorta → Femoral artery → Toe.
- 2A. "Portal" system suggests starting and ending with capillaries.  
**NOTES:**  
 1. Ordinarily, an artery ends in capillaries to supply an organ with blood (arterial supply)  
 2. A vein starts with capillaries to take blood away from an organ (venous drainage)  
 3. Hepatic "portal" vein, however, performs both roles – draining the small intestine of food - laden blood and supplying the liver with same where food is toxicologically screened for poison.
- 3D. See Q2
- 4D. The left ventricle(5) pumps blood farther afield and to a larger area than right ventricle (6).
- 5C. The venae cavae take blood to the right auricle having received drainage from body veins (except the pulmonary veins).  
**NOTES:**  
 1. In man, superior vena cava (SVC) drains the head and arms while  
 2. Inferior vena cava (IVC) drains the rest of the body.  
 3. Hence IVC is bigger than the SVC and by extension is the largest vein.  
 4. In comparative anatomy of other animals which are "on all four":  
 a. SVC as Anterior Vena Cava (AVC).  
 b. IVC as Posterior Vena Cava (PVC).  
 1 → aorta. 2 → pulmonary artery. 4 → openings of pulmonary veins. 5 → left ventricle. 6 → right ventricle. 7 → left auricle or atrium 8 → right auricle or atrium 9 → tricuspid valve.
- 6D. Accumulation of the manufactured food above the ring (as a swelling) is observed before the dying.
- 7B. See Q2 and 3 8D. See Q5
- 9B. Hormones are produced by endocrine organs and transported by blood.
- 10B. Coeliac artery gives branches to the stomach, liver, pancreas and spleen; anterior mesenteric sends branches to anterior portion of intestine; posterior mesenteric to the posterior portions.  
**Organs and their Arterial supplies.**  
 1. Liver – hepatic artery 2. Lungs – pulmonary artery  
 3. Heart – coronary artery 4. Stomach – gastric artery  
 5. Colon – colic artery 6. Kidney – renal artery  
 7. Spleen – splenic artery etc.  
**NOTES:** Most time, similarly named veins drain the organs e.g. hepatic vein versus hepatic artery.
- 11E. Erythrocytes (red blood cells) are annucleated at maturity yet they are living cells like the sieve tube element (cell) of plant's phloem.
- 12A. Xylem transport water and salts; phloem transports manufactured food.
- 13A. Pulmonary artery, unlike other arteries in the body carries deoxygenated blood from the right ventricle to the lungs while pulmonary vein, unlike other veins, carries oxygenated blood from the lungs to the left auricle.
- 14E. Hepatic artery supplies the liver rather than drains it of blood.
- 15B. This is why platelets are called thrombocytes (clotting cells)  
**NOTES:**  
 1. Erythrocytes – contain haemoglobin, an oxygen - carrying protein/pigment.  
 2. Leucocytes – They fight invading bacteria and other microbes i.e they confer immunity on the body.  
 3. Thrombocytes – Help in blood clotting (without any injury clotting is pathological as in disseminated intra vascular

coagulation, DIC).

4. Erythrocytes – Red blood cells/corpuscles (RBC)  
Leucocytes – White blood corpuscles (WBC)  
Thrombocytes – Platelets.  
5. Low blood level of erythrocyte is called anaemia.  
6. Overpopulation (proliferation) of leucocytes is called leukaemia – cancer of the blood.

16D. Artery → Arterioles → Capillaries → Venules → Vein

**NOTES:**

1. Arterioles – Small arteries. 2. Venules – Small veins.  
17B. Exposure of blood to air when the integrity of the wall of a blood vessel is breached initiates a cascade of reactions which culminate in the conversion of soluble fibrinogen to the insoluble fibrin and the latter forms a network of threads like a mesh across the wounds. Fibrinogen (oq) Fibrin(s)

- 18B. Lymph nodes are swellings at regular intervals along lymphatic vessels and they contain special leucocytes (RBC) called lymphocytes which destroy invading bacteria.

NOTE: The spleen and tonsil larger aggregates of lymph nodes lymphocytes (lymphoid follicles)

- 19C. See Q5

- 20E. Platelet releases thromboplastin (not thrombin) and this converts prothrombin to active thrombin (see Q17)

- 21A. The first round of circulation is to and fro the lungs (pulmonary/minor circulation) while the second round is to and fro the rest of the body (systemic/major circulation)

**NOTES:**

1. Pulmonary circulation: Heart → Pulmonary artery → Lungs → Pulmonary vein → Heart  
2. Systemic circulation: Heart → Aorta → Aortic branches → venous tributaries → SVC/IVC → Heart.  
22C. The veins contain xylems (and phloem) which transport water from plant root.  
23D. Between the Right auricle and ventricle is the Bicuspid valve.

**NOTES:**

1. Bicuspid valve is also known as mitral valve.  
2. The two valves allow only unidirectional movement of blood (auricles to ventricles):  
3. Blood on the right is deoxygenated and it is not allowed to mingle with the oxygenated blood on the left side of the heart by a partition called septum.

- 24B. See Q18

- 25B. Majority by the liver; also by the spleen

**NOTES:** The haemoglobin inside the RBC is metabolized by the liver into:

1. Bilirubin – A component of bile and the iron part of the haem portion can be used to make another haemoglobin.  
2. Amino acids – The globin portion of haemoglobin is converted to amino acids.

- 26B. As part of the circulatory system.

- 27B. Dying is not immediate (D); See Q6

- 28B. See Qs 17 and 20.

- 29C. The only artery which carries deoxygenated blood. See Qs 1 and 21.

- 30C. See Qs 2 and 3

- 31B. See Q12

- 32B. 3 → Tricuspid valve

- 33B. 5 → Pulmonary vein (from lung)

Also: 1 → SVC 2 → Pulmonary artery (to lung)  
4 → Left ventricle 6 → Aorta

- 34A. "... to excretory organs" e.g. carbondioxide from the tissues to the lungs (B) but not the lungs to tissue.

- 35D. Closed and Double

- 36C. Leucocytes only to kill bacteria and other invading pathogens;  
37A. Exchange between the lymph, interstitial space and body cells.

- 38B. See Q28

- 39B. Surface area to volume ratio diminishes in larger, multicellular organism hence direct diffusion is limited and the need to develop efficient transport system arises.

- 40D. Pisces → One Auricle/One ventricle

Amphibians → Two Auricles/One ventricle.

Reptiles → Two Auricle/One partially divided ventricle.

Aves/mammals → Two auricles/Two ventricles.

**NOTES:** Based on evolutionary trend from Pisces to mammals, we move from single circulation to full-blown double circulation.

- 41A. See Q11

- 42C. Conducting parts of phloem accompanied by companion cells (See Qs 12 and 28)

- 43C. See Q2

- 44A. While adhesion of water molecule to the wall of xylem vessel constitutes the capillary action which enables water to rise within the xylem.

- 45B. All lymphatic vessels coalesce into two main lymphatics – thoracic duct and right lymphatic duct – and these empty their contents into subclavian and jugular veins in the neck.

- 46D. See Q4

- 47C. Serum is a pale liquid left after clotting has occurred.

**NOTES:**

1. The liquid matrix of blood (a liquid tissue) is called plasma.

Blood = Plasma (55%) + Blood cells (45%)

Plasma = Water + Plasma proteins + Others.

Plasma proteins = Globulins + Albumins + Fibrinogen + Prothrombin + Enzymes.

2. Other components of blood (i) Mineral ions (ii) Products of digestion. (iii) Vitamins (iv) Excretory products. (v) Hormones.

Serum differs from whole blood for lack of blood cells and fibrinogen. Serum = Blood – (cells + fibrinogen).

But plasma = Blood – blood cells.

Serum = Plasma – Fibrinogen.

- 48D. See Q15

**NOTES:**

1. Erythrocytes lack nuclei (Q11) and mitochondria so as to:  
a. Provide extra room for accommodating haemoglobin.  
b. Ensure that the cells respire anaerobically or else they will use part of the oxygen they carry.

2. Erythrocytes have a short life span of about 3 months because they lack nuclei needed for repair.

3. Erythrocytes also contain the enzyme carbonic anhydrase involved in carbon dioxide transport.

4. Erythrocytes are yellow when viewed singly and red when accumulated in groups.

The red colour of blood is due to haemoglobin content of RBC and haemoglobin contains iron in ferric form ( $Fe^{3+}$ )

- 49A. For transport (See Q22)

- 50B. ... while leucocytes are amoeboid and nucleated.

- 51A. Since xylem transports water.

- 52A. The one with the least ratio (IV) is most complex and the highest ratio (I) allows simple diffusion See Q41.

- 53C. The stele or inner cylinder comprises the pericycle, vascular bundles and pith. Outer cylinder = Piliiferous layer + Cortex + endodermis. Inner cylinder = Pericycle + Vascular bundles + Pith.

- 54B. See Q13

- 55A. ... as pericardial fluid acts as a lubricant.

**NOTES:** Inflammation of the Pericardium is Pericarditis and it results in painful contraction of the heart.

- 56A. See Q55 57B. See Qs 1 and 13 58D. See Qs 2 and 3  
 59D. Aorta, the largest and "mother" of all arteries (except pulmonary artery).  
 60C. See Q59  
 61B. Colon (See chapter) and the renal tubule (see chapter).  
 62A. See Q1 63A. See Q12  
 64A. A tissue is ramified with a network of capillaries and the tissue is drained as follows:  
 Tissue → Venule → Vein → Heart (See Q16)  
 65C. Xylem conducts water and salts upwards from the soil while phloem conducts manufactured food from leaves downwards.  
 66C. See chapter 67C. See Q21 68A. See Q21  
 69B. Erythrocytes contain the oxygen-carrying protein pigment; haemoglobin.  
 70A. Leucocytes.  
 1. Larger than other blood cells.  
 2. Fewer than others – about 7000/mm<sup>3</sup>  
 3. They are amoeboid – shapeless  
 4. They have nucleus.  
 5. Help to fight bacteria and others as part of immunity.  
 Erythrocytes.  
 1. Larger than platelets  
 2. Most numerous – 5m/mm<sup>3</sup>  
 3. Biconcave discs – discoid.  
 4. They have no nucleus.  
 5. Help to transport Oxygen and carbon dioxide.  
 Platelets.  
 1. Smallest blood cells – in fact, they are cell fragments.  
 2. More numerous than leucocyte – 250,000/mm<sup>3</sup>  
 3. No nucleus.  
 4. Help in clotting.  
 71B. See Q37 72C. See Q65 73D. See Q65 74A. See Q66  
 75A. Translocation through the vascular bundles  
 76A. Lymphocytes produce specific antibodies in response to antigens produced by microbes.  
 77D. The list is more generalizing than the rest.  
 78A. See Q12 79C. See Q70 80B. See Q47  
 81B. See Qs 39 and 52 82D. See Q38.

#### CHAPTER 14: EXCRETION. EXCRETORY PRODUCTS

- The function of lenticels is A. to remove excess water in the plant B. to absorb water from the atmosphere C. for gaseous exchange D. to absorb light E. to store light. (1978:Q11)
- Which one of the following statements about the mammalian kidney is false? A. The glomerulus is formed by a branch of the renal artery B. The glomerulus is a part of uriniferous tubules C. The Bowman's capsule is in the cortex of the kidney D. The uriniferous tubules are richly supplied with blood vessels E. The glomerulus is lodged in the Bowman's capsule. (1978:Q19)
- A potometer with a leafy shoot weighed 18.9g initially and 17.9g after 1 hour. From this it follows that A. the shoot absorbed 1g of water per hour B. 1g of water per hour evaporates from the potometer C. the shoot lost 1g of water per hour D. the potometer water receded at the rate of 1g per hour E. the shoot was respiring and lost weight at the rate of 1g per hour. (1978:Q20)
- Which of these is not a function of the mammalian skin? A. Protection against bacterial infection B. Excretion of wastes and water C. Production of vitamin D when exposed to light D. Production of pigments to reduce temperature E. Regulation of body temperature. (1978:Q32)
- A potometer was used to compare the rate of loss of the same volume of water from a plant under different

- environmental conditions as under a fan, at the sea shore under the sun, in the airy laboratory and in cupboard. which of the items was likely to have been obtained in a cupboard? A. 15 secs B. 30 secs C. 25 secs D. 20 secs E. 28 secs. (1978:Q38)
- Which of these products obtained from analyzing sweat from the skin is not an excretory product? A. water B. salts C. Dust D. Urea E. Urates. (1978:Q47)
  - Which of the following is not an excretory organ? A. Lungs B. Kidney C. Leaf D. Large Intestine E. Skin (1979:Q16)
  - Which one of the following is not an excretory product? A. Urine B. Sweat C. Faeces D. Salts E. Carbon dioxide. (1979:Q30)
  - The major function of contractile vacuole in Amoeba is A. to secrete enzymes to digest food particles B. to store excess food materials C. to excrete nitrogenous wastes D. to absorb water from the surroundings E. to collect and expel excess water in the cytoplasm. (1979:Q42)
  - Which one of the following parts of the mammalian body is most closely associated with the production of urine A. Malpighian capsule B. urinary bladder C. Ureter D. vas deferens E. Urethra. (1980:Q22)
  - A potometer is used to determine the rate at which a shoot A. respire B. sucks air bubbles C. loses weight D. absorbs water E. transpires. (1980:Q25)
  - During excretion of urea there is also a corresponding re-absorption of water into the blood. This re-absorption takes place in the A. uriniferous tubules B. Bowman's capsule C. glomerulus D. Malpighian capsule E. renal artery. (1980:Q29)
  - The amount of water loss from a leaf can be detected using A. lime-water B. red litmus paper C. blue litmus paper D. blue cobalt chloride paper E. pink cobalt chloride paper. (1980:Q49)
  - The rate of transpiration of a leafy shoot would be highest under A. damp, cold, still air B. damp, warm, moving air C. dry, warm, moving air D. dry, cold, moving air E. dry, warm, still air (1981:Q21)
  - The functional unit of a mammalian kidney is the A. urethra B. malpighian capsule C. glomerulus D. nephron E. ureter (1981:Q48)
  - Which of the following is not associated with excretion in mammals? A. Glomerulus B. Urea C. Faeces D. Carbon dioxide E. Bowman's capsule. (1982:Q43)
  - Which of the following substances is NOT found in urine? A. Water B. Sodium chloride C. Nitrogenous compounds D. Calcium chloride E. Nitrogenous salts. (1983:Q13)
  - The kidneys of all vertebrates act as osmo regulators. This means that they A. keep the composition of the plasma constant B. regulate osmotic processes C. Control the volume of blood entering the kidneys D. decrease the osmotic pressure of blood E. increase the osmotic pressure of blood. (1983:Q14)
  - Which of the following statements about the rate of transpiration is INCORRECT? It is A. dependent on temperature B. affected by changes in light intensity C. unaffected by humidity D. dependent on air movement E. affected by Availability of water. (1983:Q44)
  - Urea is produced in the A. liver. B. Ladder. C. spleen D. kidneys. E. gallbladder (1983:Q48)
  - Which of the following is NOT a waste product of plants? A. Tannins B. Oxygen C. Carbon dioxide D. Sap E. Alkaloids (1984:Q30)
- Use the diagram below to answer questions 22 and 23 Fig. 1
- Bowman's capsules are located in the part labelled A. 1 B. 2 C. 3 D. 4 E. 5 (1985:Q26)
  - Reabsorption of useful materials are located in the part

labelled A. 1 B. 2 C. 3 D. 4 E. 5 (1985:Q27)

24. A major limitation in the use of the potometer for measuring the rate of transpiration is that A. it is made of breakable glass material B. it measures the rate of water intake C. it measures the rate of water loss through the stem only D. the movement of the air bubble in the potometer cannot be timed accurately (1986:Q26)
25. In the mammalian skin, melanin and keratin are contained in the A. sebaceous gland B. sweat gland C. subcutaneous layer D. malpighian layer. (1986:Q31)
26. The function of the loop of Henle is to A. increase the flow of urine B. concentrate amino acids in the kidney tissue C. concentrate sodium chloride in the medulla of the kidney D. increase the volume of urine. (1987:Q24)
27. The main waste products formed in plant are A. alkaloids, tannins and resins B. water, alkaloids and carbon dioxide C. water, carbon dioxide and oxygen. (1988:Q23)
28. In the kidney the malpighian corpuscle is located in the A. medulla B. pelvis C. cortex D. pelvis. (1987:Q24)
29. The skin, through the sweat glands, functions as A. an excretory organ B. a respiratory organ C. a sensory organ D. a protective organ. (1987:Q25)
30. The nephridia in the earthworm form part of the A. reproductive system B. respiratory system C. circulatory system D. excretory system. (1990:Q14)
31. Transpiration can be measured with a A. photometer B. hygrometer C. potometer D. barometer. (1990:Q23)
32. Excretory products responsible for the red, purple and blue colours of flowers are called A. alkaloids B. tannins C. anthocyanins D. resins. (1990:Q24)

Use the figure below to answer questions 33 and 34

33. Which structure is the glomerulus? A. 5 B. 3 C. 2 D. 1. (1990:Q27)
34. If the blood is too concentrated, more water is absorbed from A. 5 B. 4 C. 3 D. 1 (1990:Q28)
35. Which of the following is a plant excretory product? A. Oil B. Cytokinin C. Resin D. Amino acids. (1991:Q29)
36. The excretory organ in insect is the A. kidney B. malpighian tubule C. flame cell D. nephridium. (1992:Q18)

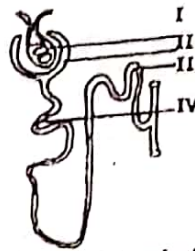
Use the figure below to answer questions 37 and 38.



37. The structure labelled 5 is the A. sweat gland B. sebaceous gland C. blood vessel D. nerve fibre. (1992:Q19)
38. Melanin and keratin are produced in the part labelled A. 2 B. 3 C. 4 D. 5. (1992:Q20)
39. Flame cells are the A. excretory system of worms B. excretory and respiratory system of flatworms C. excretory system of flatworms D. excretory system of flatworms (1993:Q8)
40. Which of the following waste products in plant is excreted through the stomata and lenticels? A. Carbon dioxide B. Alkaloids C. Tannins D. Anthocyanins (1994:Q22)
41. The excretory structure in the earthworm is the A. malpighian tubule B. flame cell C. nephridium D. kidney. (1995:Q18)
42. The nitrogenous substance that is excreted by birds in order to conserve water is A. ammonia B. urea C. uric acid D. nitric acid (1997:Q10)
43. Oozing out of water from the leaves of plants in a humid environment is known as A. transpiration B. osmosis C. pinocytosis D. guttation (1997:Q17)
44. The process of deamination is essential for the A. digestion of protein B. secretion of bile C. formation of urea D. formation of antibody. (1997:Q21)

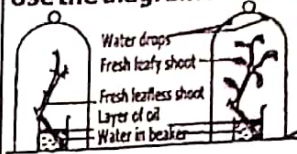
45. In which of the following groups of animals is the Malpighian tubule found? A. Lizards, snakes and frogs B. Crickets, houseflies and grasshoppers C. Millipedes, centipedes and scorpions D. Earthworms, roundworms and flatworms (1998:Q20)

Use the diagram below to answer questions 46 and 47



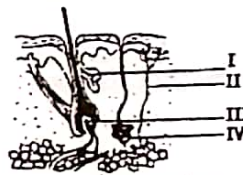
46. The parts labelled I and II make up the A. glomerulus B. convoluted tubules C. malpighian body D. Bowman's capsule (2000:Q10)
47. In mammals, re-absorption of salt takes place in A. IV B. III C. II D. I (2000:Q11)

Use the diagram below to answer questions 49 and 50



48. The experiment is used to demonstrate that A. plants lose water through guttation B. transpiration occurs through the leaves C. water is necessary for photosynthesis. D. leaves are important to photosynthesis. (2003:17)
49. In the experiment, the layer of oil serves to prevent water loss by A. transpiration B. evaporation C. osmosis D. guttation (2003:Q18)
50. The opening of the stoma is controlled by the A. presence of a pore B. increase in solute concentration in the guard cells C. presence of guard cells D. decrease in solute concentration in the guard cells (2004:Q19)

Use the diagram below to answer questions 50 and 51



51. The sweat gland is the structure labeled A. I B. II C. III D. IV. (2004:Q20)
52. The function of the part labeled III is to A. contract to pull the hair erect B. conduct nervous impulses C. carry blood and nitrogenous waste D. produce oil for the skin. (2004:Q21)
53. The urinary tubules of the kidney function through A. osmosis and diffusion B. active transport and osmosis C. ultra filtration and selective reabsorption D. active transport and cytoplasmic streaming. (2005:Q21)
54. Excess water in plants is excreted as water vapour and droplets respectively through A. respiration and guttation B. transpiration and guttation C. photosynthesis and guttation D. guttation and condensation. (2005:Q22)
55. The product of excretion common to the mammalian kidney, lung and skin is A. mineral salt B. carbon (IV) oxide C. water D. urea (2006:Q2)
56. Mammals are capable of producing hypertonic urine mainly because of reabsorption in the A. Bowman's capsule B. urethra C. ureter D. loop of Henle. (2006:Q15)
57. The correct sequence of the movement of urea during urine formation is A. Glomerulus → Bowman's capsule → convoluted tubule → Henle's loop → collecting tubule B. glomerulus → Bowman's capsule → convoluted tubule → Henle's loop → collecting tubule C. convoluted tubule → glomerulus → Henle's loop → Bowman's capsule → collecting tubule D. convoluted tubule → Bowman's capsule → Henle's loop → glomerulus → collecting tubule. (2007:Q28)
58. The waste product of plants used in the conversion of hide to leather is A. gum B. alkaloid C. tannin D. resin. (2007:Q31)
59. In the mammalian kidney, the Bowman's capsule is located in the A. ureter B. pelvis C. cortex D. medulla. (2008:Q21)

60. In insects, the structure that performs the same function as the kidney in man is the A. nephridium B. flame cell C. Malpighian tubule D. trachea. (2009:Q21)
61. The oily substance that lubricates the mammalian hair to keep it flexible and water repellent is secreted by the A. sebaceous glands B. fatty cells C. granular layer D. sweat glands (2010:Q21)
62. The outer layer of the kidney where the Bowman's capsules are found is the A. pelvis B. medulla C. pyramid D. cortex. (2010:Q22)
63. I. stomata → Spirogyra II. alveoli → earthworm III. Malpighian tubule → Mammal IV. Contractile vacuole → protozoa  
Which of the above structures is correctly matched with the organisms in which it is found? A. II B. I C. IV D. III (2010:Q27)
64. In the kidney of mammals, the site of ultrafiltration is the A. uriniferous tubule B. Bowman's capsule C. Loop of Henle D. renal tubule. (2012:Q21)
65. The part of the mammalian skin involved in excretion is the A. Malpighian layer. B. sebaceous gland C. horny layer D. sweat gland. (2013:Q28)
66. Which of the following is a waste product of an insect? A. Uric acid B. Sweat C. Mucilage D. Alkaloids. (2013:Q29)
67. Water in plants is removed as water vapour through the process of A. diffusion B. osmosis C. evaporation D. transpiration. (2014:Q19)

#### CHAPTER 14 ANSWER

- 1A. Lenticel → Through the stem; stoma → through the leaves.
- 2B. Stricto sensu, the glomerulus is not part of the nephron. Later in your career you might come across terms such as glomerulonephritis (Inflammation of the glomerulus and nephron)
- NOTES:**
- The tubule comprises
    - Proximal convoluted tubule.
    - Helen's loop
    - Distal convoluted tubule.
  - The glomerulus is a tuft of capillaries formed from an afferent arteriole of renal artery origin.
  - Efferent arteriole emanating from the glomerulus later entwines the uriniferous tubule for reabsorption and secretion.
  - Glomerulus, Bowman's capsule, distal convoluted and distal convoluted tubules are found in the cortex of the kidney.
  - Henle's loop lies in the medulla.
- 3C. Potometer is used to measure the rate of transpiration – loss of water from the shoot.
- 4D. The pigments produced are not meant for temperature regulation.

#### NOTES:


- The skin regulates temperature in two ways:
  - Vasodilation/Vasoconstriction – To lose excessive heat, blood is brought near the surface of the skin by vasodilation and heat is lost majorly by radiation; to conserve heat in extreme cold, vasoconstriction occurs.
  - Sweating – Sweat glands in the skin produce sweat which causes cooling when evaporated from the skin surface.
- The skin pigments:
  - Keratin – Responsible for skin flexibility and toughness.
  - Melanin – Determines the colour of the skin and prevent the penetration of light amount is

- genetically and racially determined,
- 5B. Sun → 15sec Fan → 20secs Lab → 25secs  
Seashore → 28secs Cupboard → 30secs  
The above order is constructed vis-à-vis the factors which determine the rate of transpiration namely:
- Wind - Transpiration is rapid in a windy environment (under the fan).
  - Temperature – The higher the temperature the faster the rate (under the sun).
  - Humidity – Transpiration is very slow in humid air (at the seashore).
- NOTES:**
- The lab is less windy than under the fan.
  - The cupboard has the least rate hence the largest time period because it is an enclosure.
- 6C. Dust is from outside the body.
- 7D. The faeces which passes through the colon is not even an excretory product.
- 8C. See Q7. Hence "excreta" to mean faeces is a misnomer.
- 9E. This helps osmoregulation too.
- 10A. Malpighian corpuscle or Malpighian body is involved in the ultra filtration of blood.  
Malpighian Corpuscle = Glomerulus + Bowmans capsule.
- 11E. See Q3 12A. See Q2
- 13D. The blue paper turning pink is positive test for water loss (transpiration)
- 14C. Now compare Q5
- 15D. Nephron = Urinary tubule nephron = Malpighian corpuscle + Convoluted tubules + Helens's loop + Collecting duct.
- 16C. See Qs 7 and 8
- 17D. Calcium is excreted in the urine only in the event of high concentration of  $Ca^{2+}$  in the blood.
- 18A. Keeping internal environment (including the plasma) constant is called homeostasis and constant osmotic pressure is part of it.  
**Note:** Other organs involved in homeostasis include  
1. Skin 2. Liver 3. endocrine organs of the brain
- 19C. Factors affecting the rate of transpiration  
1. Temperature 2. light intensity  
3. humidity 4. wind (air movement) 5. soil water
- 20A. Produced in the liver, excreted (filtered) by the kidneys and stored in the urinary bladder before micturition
- 21D. The cell vacuoles contain cell sap.
- Waste products in plants:**
- Water - from respiration / transpiration.
  - Oxygen: from photosynthesis.
  - Carbon dioxide - respiration
  - Glycosides - Sugar - containing compounds
  - Tannins/Alkaloids - poisonous nitrogenous compounds
  - Latex - As in rubber tree
  - Resins - As in pines
  - Gums/Mucilages - As in Acacia and okra.
  - Anthocyanin - Responsible for the colours of flowers.
- 22B. 2 => cortex (see Q2)
- 23E. Cortex (2) and medulla (4)  
1 => Renal capsule  
3 => Renal pelvis  
5 => ureter  
6 => Renal Artery  
7 => Renal vein
- 24D. The timing might post a challenge hence long time intervals are taken as the experiment is repeated a number of times and mean value found
- 25D. Malpighian layer is the third layer of the skin epidermis.  
**Notes:**  
1. Cells of the Malpighian layer is always dividing to replenish the upper layers.

2. Epidermal Layers  
 (a) Malpighian layer - Inner most  
 (b) Granular layer - middle  
 (c) Cornified layer - upper most
3. Cells of the cornified layer are dead
4. The dermis contains  
 (a) Sweat gland - produces sweat for cooling the body.  
 (b) Sebaceous gland - produces sebum for keeping the skin supple and waterproof (sebum, a water repellent)  
 (c) Hair follicle - plays a role in insulating the body.  
 (d) Blood vessels - to supply the cells of the skin with nutrient and oxygen.
5. Beneath the dermis is the subcutaneous fatty layer - adipose tissue.
- 26C. This produces concentrated urine in order to conserve water.  
**Note:**  
 1. Loop of Henle's is an adaptation for terrestrial life and it is seen only in bird and mammals where urine is more concentrated than blood have longer loops.
- 27D. These are the primary waste products, others are secondary.
- 28C. See Q2.
- 29A. **Functions of the Skin:**  
 1. Excretion - production of sweat through sweat glands.  
 2. Sensitivity - through its nerve endings.  
 3. Protection - prevents entry of germs.  
 4. Thermoregulation - through sweating and other methods.
- 30D. **Excretory Structures:**  
 1. Flame cell - Tape worm (plathelmenthes)  
 2. Contractile vacuole - Amoeba (protozoan)  
 3. Nephridium - earthworm (annelids)  
 4. Malpighian Tubule - grasshopper (insect)  
 5. Kidneys - man (Mammals)  
 6. Stomata and Lenticels - Plants (leaf/stem)  
**Note:** Lungs and Skin are also Excretory in Mammals
- 31C. See Q3.  
 32C. See Q21  
 33B. Lodged in the concavity of the Bowman's capsule (2)  
 34B. 4 => distal convoluted tubule  
**Notes:**  
 1. This reabsorption also occurs at the collecting duct.  
 2. The reabsorption is mediated by the posterior pituitary hormone called ADH (see chapter) whose secretion is triggered by low water content of blood.  
 3. Reabsorption at the proximal convoluted tubule is triggered by the absorption of the osmotically active glucose as water follows suit (obligate water).  
 4. Blood solute concentration might rise in the following situations  
 (a) hen too little water is drunk.  
 (b) Excessive sweating from exercise or hot weather.  
 (c) High salt intake
- 35C. Turpentine, a plant oil, is a resin.  
**Notes:**  
 1. Plants oils - Cinnamon, enclayptus, turpentine and camphor  
 2. Alkaloid - morphine, quinine and cocaine.  
 3. Excess mineral salts are excreted as calcium oxalate and calcium carbonate.
- 36B. See Q.30  
 37A. 1 => Hair 2. Malpighian layer 3 => sweat duct leading to sweat pore 4 => sebaceous gland 5 => sweat gland.  
 38A. See Q25 and 37 39D. See Q30  
 40A. Gaseous waste 41C. See Q30  
 42C. Uric acid is a nitrogenous waste (like urea) but unlike urea it is practically insoluble and not osmotically active.

- 43D. Transpiration is loss of water in gaseous form; guttation is in liquid form (dew-like) as in tomato, potato, cabbage and certain grasses.
- 44C. Deamination is the removal of the amino group from molecules of excess amino acids in the body.  
**Notes:**  
 1. The NH<sub>2</sub> group in conjunction with carbondioxide (as carbonate) is processed into urea.  
 2. The rest of the molecule is metabolised into glucose (gluconeogenesis).
- 45B. See Q30 46C. See Q10  
 47B. Salt and water are reabsorbed here (distal convoluted tubule)  
 48B. The set-up on the left (test) produces no water droplets while the set-up on the right (control) does.  
 49B. Evaporation => Liquid to gas  
 50B. This causes in flow of water into the cells making them turgid.  
**Notes:**  
 1. Guard cells cause te stoma to open when they are turgid.  
 2. Flaccid cells close the stoma
- 51D. See Q37  
 52B. Hair papilla, a conical structure at the base of each hair follile and nerves blood capillaries and nerves. This is why pulling one's hair is a painful experience.  
 53B. Three processes are involved in urine formation  
 1. Ultra filtration.  
 2. Selective reabsorption  
 3. Tubular Secretion  
 However, the principles which underline them all are  
 1. **Active transport** - transporting salts (ions) across membranes against their concentration gradients and powered by energy derived from cellular respiration.  
 2. **Passive diffusion:** ions across membrane as propelled by concentration gradients only.  
 3. **Osmosis** - movement of water as powered by osmotic difference on both sides of membrane.  
 4. **Varying permeability of tubule** - this depends on the part of the tubule involved or the influence of hormone especially ADH and aldosterone
- 54B. See Q43  
 55C. Water in urine and sweat and also in gaseous form (water vapour) through the lungs enroute to the mouth  
 56D. Only birds and mammals are capable of producing a hypertonic urine (more concentrated than plasma) because loop of Helen's is lacking in other vertebrates.  
 57B. Convoluted tubule twice i.e. one proximal, one destal.  
 58C. Tannin or tannic acid is a yellowish or broom substance found in the bark of some trees and the fruits of many plants used in converting animal skins (hides) into leather.
- 59C. See Q22 60C. See Q30 61A. See Q25  
 62D. See Q59 63C. See Q30  
 64B. Contents of blood except plasma proteins and blood cells are filtered from the glomerulus into the Bowman's capsule.  
 65D. See Q29 66A. Also in birds (see Q42)  
 67D. See Q43

## CHAPTER 15: RESPIRATION

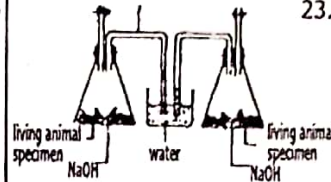
1. In anaerobic respiration, glucose is converted to one of the following: A. Carbon dioxide and water B. Carbon dioxide only C. Carbon dioxide and alcohol D. Alcohol and water E. Water and acetic acid (1980:Q28)
2. The lime water in container C turned milky because A. Carbon dioxide was produced by plant B during respiration B. carbon
- 

dioxide entered C through the filter pump C. oxygen reacts with lime water to produce milkiness D. soda line did not remove carbon dioxide from air E. the delivery tubes were not well connected. (1980:Q35)

3. Oxygen from the atmosphere reaches the mammalian bloodstream through one of the paths indicated below. Indicate the correct path, a = mouth, b=trachea, c=bronchiole, d=nostril, e= bronchus, f = alveoli  
A. a→b→e→f→d B. b→d→f→e→c C. d→b→e→c→f  
D. b→a→f→e→c E. f→e→c→d→c (1980:Q46)
4. What is the name of the respiratory organ of the crab?  
A. Tubules B. Trachea C. Spiracles D. Lungs E. Gills (1981:Q22)
5. In a bakery, yeast is added to flour to make bread rise. This is possible because yeast produces A. alcohol B. oxygen C. carbon dioxide D. energy E. ethanol (1981:Q25)
6. The glottis is the opening which leads to the A. oesophagus B. larynx C. nostrils D. pharynx E. mouth. (1982:Q12)
7. A grasshopper respire by means of its A. lung books B. gills C. lungs D. antennae E. tracheal tubes. (1982:Q14)
8. When freshly tapped palm wine was kept overnight it was found to be more alcoholic. This effect must have been due to  
A. the addition of saccharin B. the addition of sugar  
C. the addition of whisky or local gin D. some complex hydrolytic reactions E. anaerobic respiration of an organism. (1982:Q34)
9. Which of the following statements is TRUE of inhalation of air by man?  
A. The ribs are not raised B. Diaphragm is raised  
C. Intercostal muscles relax D. Pressure of the thoracic cavity increases E. Size of thoracic cavity increases. (1982:Q38)
10. Anaerobic respiration in yeast produces A. carbon dioxide and ethanol B. carbon dioxide and water C. carbon dioxide and oxygen D. carbon dioxide and glucose E. ethanol and water (1984:Q18)
11. Heat produced in tissue respiration in plants is  
A. a chemical form of energy B. the only form of energy C. the main form of energy D. a useful form of energy E. a waste form of energy (1984:Q38)
12. Which of the following events does NOT occur during anaerobic respiration of glucose?  
A. Muscle cells produce lactic acid B. Carbon dioxide is produced C. Milk produce lactic acid D. Energy is not produced E. Germinating seeds produce alcohol (1985:Q22)
13. Identify which of the following are characteristics of the vertebrate respiratory surface. 1. Moist 2. Vascularized 3. Semipermeable 4. Freely permeable 5. Dry A. 1,2,3 B. 1,2,5 C. 2,3,5 D. 2,4,5 E. 1,3,5. (1985:Q23)
14. Which of the following statements is NOT correct with respect to inhalation in mammals?  
A. intercoastal muscles contract B. diaphragm is raised C. ribs are raised  
D. pressure of the thoracic cavity decreases. (1986:Q27)
15. The equation that can be used to summarize the process of anaerobic breakdown of sugar is  
A.  $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$  B.  $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$  C.  $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$  D.  $C_2H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + \text{energy}$ . (1986:Q28)
16. Fatigue of leg muscles may occur after riding many kilometers on a bicycle because of  
A. Insufficient glucose B. excess carbon dioxide C. excess protein D. insufficient oxygen. (1987:Q23)
17. Lung books are used for respiration in  
A. spiders B. insects C. millipedes D. snails. (1988:Q13)
18. In the mammalian respiratory system, exchange of gases occurs in the  
A. lungs B. bronchi C. bronchioles D. alveoli (1988:Q22)

19. In living cells, insufficient oxygen may cause a breakdown of glucose into  
A. fatty acids B. lactic acids C. glycogen. D. carbon dioxide. (1991:Q23)
20. Which of the following can bring about the greatest increase in the rate of transpiration?  
A. Increased humidity B. Reduced temperature C. Reduced wind speed D. Reduced humidity. (1991:Q24)
21. Gaseous exchange in Aves occurs in the  
A. tracheoles B. bronchi C. air sacs D. trachea. (1992:Q16)
22. In the absence of oxygen, the pyruvic acid produced during glycolysis is converted to  $CO_2$  and  
A. water B. glycerol C. ethanol D. citric acid. (1992:Q17)

Use the diagram below to answer questions 23 and 24



23. The most appropriate title for the set up is  
A. quantitative measurement of respiration in plants and animals  
B. measurement of respiratory rates in living organisms  
C. comparison between photosynthesis and respiratory  
D. comparison of respiratory rates in plants and animals. (1994:Q19)
  24. The part labeled J is called  
A. porosimeter B. porometer C. manometer D. auxanometer. (1994:Q20)
  25. The end product of glycolysis in plants and animals is  
A. pyruvic acid B. citric acid C. aspartic acid D. malic acid. (1995:Q16)
  26. During respiration, air circulates round plant tissues via the  
A. lenticels B. stomata C. guard cells D. intercellular spaces. (1995:Q17)
  27. Anaerobic respiration differs aerobic respiration by the production of  
A. less amount of energy and water  
B. greater amount of energy and alcohol C. less amount of energy and alcohol. D. Greater amount of energy water. (1997:Q19)
  28. Which of the following movement occur during exhalation?  
A. The diaphragm contracts and the intercostals muscles relax  
B. The thoracic cavity increases in volume C. The diaphragm and intercostal muscles contract  
D. The diaphragm contracts and the intercoastal muscles relax (1998:Q19)
  29. In woody stems, gaseous exchange take place through the  
A. micropyles B. stomata C. lenticel D. vessels (1999:Q13)
  30. The gas produced during tissue respiration can be identified by using  
A. calcium hydroxide B. copper sulphate C. calcium carbonate D. sodium hydroxide (2001:Q16)
  31. When yeast respire anaerobically, it converts simple sugar to carbon (IV) oxide and  
A. oxygen B. acid C. alcohol D. water (2001:Q19)
  32. Tissue respiration is important for the  
A. absorption of oxygen into the alveoli B. release of carbon (IV) oxide into the lungs  
C. release of energy for body use D. exhalation of carbon (IV) oxide from lungs. (2002:Q40)
- Use the diagram below to answer questions 33 and 34
33. The aim of the experiment is to demonstrate  
A. that in mammals gaseous exchange takes place in the lungs  
B. the part played by the pleural cavity and diaphragm in respiration  
C. that a large amount of oxygen is absorbed by the lungs.  
D. the presence of carbon(IV) oxide in exhaled air. (2003:Q14)
  34. In the experimental set-up, the rubber sheet represents the organ called  
A. pleural cavity B. lungs C. diaphragm D. intercostal muscle. (2003:Q15)
  35. The surface of an alveolus in a mammal is well supplied with tiny blood vessels known as  
A. arterioles B. venules C. arteries D. capillaries (2004:Q17)
  36. The anaerobic fermentation of a glucose molecule yields  
A. 38 ATP molecules B. 2 ATP molecules and alcohol

1C. It is sometimes called alcoholic fermentation  
 $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

**Anaerobic**

- C. pyruvic acid and alcohol D. water and carbon (IV) oxide. (2004:Q18)
37. The mammalian lung is made airtight by the A. pleural cavity B. mucous membrane C. pleural membrane D. diaphragm (2005:Q19)
38. A test tube containing yeast in glucose solution was suspended in a covered conical flask containing alkaline pyrogallol. The bubbles of carbon (IV) oxide produced indicate that the yeast cells are A. respiring in the absence of oxygen B. liberating oxygen on their own C. living and consuming oxygen D. being killed by the alcohol produced (2005:Q20)
39. An increase in air pressure in the lungs is due to the A. increase in the volume of the thoracic cavity B. upward movement of the ribs C. relaxation of the diaphragm D. contraction of intercostal muscles. (2006:Q5)
40. The formation of water in the tissue respiration results from the A. breakdown of water molecules B. reduction of oxygen by hydrogen C. reduction of carbon(IV) oxide D. combination of water molecules (2006:Q12)
41. Which of the following uses diffusion as the principal method of gaseous exchange? A. Lizard. B. Grasshoppers C. Rat. D. Earthworm (2007:Q32)
42. Which of the following has the most primitive respiratory system? A. Snail. B. Fish. C. Insect. D. Mouse (2007:Q35)
43. Exhaled air differs from inhaled air in that it A. contains less amount of carbon (IV) oxide B. is usually lower in temperature C. often has more oxygen D. usually has more water vapour. (2008:Q20)
44. The enzymes of the glycolytic pathway are located in the A. mitochondria B. gastric juice C. plasma D. cytoplasm (2009:Q20)
45. Yeast respire anaerobically to convert simple sugar to carbon (IV) oxide and A. acid B. oxygen C. water D. alcohol (2010:Q19)
46. The sheet of muscle that separates the thoracic and the abdominal cavities is the A. intercostal muscle B. pleural membrane C. pericardium D. diaphragm. (2010:Q20)
- Use the diagram below to answer questions 47 and 48.**
47. The gas evolved in the process is A. oxygen B. carbon(II)oxide C. carbon (IV) oxide D. nitrogen (2011:Q10)
48. The experimental set-up above is used to demonstrate the process of A. fermentation B. plasmolysis C. diffusion D. photosynthesis (2011:Q11)
49. The path followed by air as it passes through the lungs in mammals is A. trachea → bronchioles → bronchi → alveoli B. bronchioles → alveoli → bronchi → trachea C. trachea → bronchi → bronchioles → alveoli D. bronchi → trachea → alveoli → bronchioles. (2011:Q22)
50. The sequence of the one-way gaseous exchange mechanism in a fish is A. mouth → operculum → gills B. mouth → gills → operculum C. operculum → gills → mouth D. gills → operculum → mouth (2011:Q26)
51. The process of transforming the chemical energy of cellular fuels into high energy bonds of ATP in plants is A. photosynthesis. B. photolysis. C. respiration D. autotrophism. (2013:Q20)
52. The stomata of leaves are similar in function of the A. pharynx of humans. B. scales of fish C. spiracle of insects. D. trachea of toads. (2014:Q17)
53. The use of moist skin for respiration in amphibians is known as A. cellular respiration B. cutaneous respiration C. buccal respiration D. pulmonary respiration (2014:Q18)

1. Oxygen is not used
2. Carbon dioxide and water as products
3. Relatively large amount of energy produced (38ATP)
4. Common in large organisms
5. Occurs partly in cytoplasm, partly in mitochondria

1. No oxygen needed
2. Carbon dioxide and alcohol produced
3. Relative small amount of energy (2ATP)
4. Common in microbes
5. Occurs only in the cytoplasm mitochondria

2A. Aerobic respiration (See Q1) produces carbon dioxide (and water)  $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$   $CO_2$  turns lime water milky

**NOTE:** The lime water in A removes all  $CO_2$  from air coming to plant B hence  $CO_2$  which turns C milky comes from respiration only.

3C. Note that mouth and nostril are alternative routes although the nostril is primary. The respiratory pathway at a glance: Mouth/Nostrils → pharynx → larynx → trachea → bronchi → bronchioles → alveoli

**NOTES:**

1. Epiglottis prevents food from entering the airway via the glottis
2. Larynx is commonly called voice box because it contains vocal cords
3. Trachea = wind pipe
4. The trachea bifurcates into bronchi (Singular: bronchus) each going to left or right lung.
5. Alveoli (Sing: alveolus) are the simplest sub-division of the respiratory tree where gaseous exchange occurs

**4E. Respiratory Structures**

1. Unicellular organisms - cell membrane or surface e.g amoeba
2. Crustaceans (e.g crab) - gills
3. Tadpoles - gills (external/internal)
4. Mollusc (e.g snail) - gills
5. Fish - gills
6. Annelids (e.g earthworm) - moist body surface
7. Amphibians (e.g toads) - mouth, skin, lungs
8. Arthropoda (e.g insect/spiders) - trachea
9. Arachnids (e.g spider) - Lung books in addition to the trachea system.
10. Reptiles/Birds/Mammals - lungs
11. Flowering plants - stomata/lenticels/root hair cells.

**5C. Anaerobic respiration (Q1) in yeast produces**

1. Carbon dioxide - Needed in bakery to make the dough rise
2. Alcohol - Needed in brewery to produce alcoholic drinks like beers and wines

6B. See Q3

7E. The external openings of the trachea tubes are called spiracles (also see Q4)

8E. Compare Q1 and 5

9E. Events in Inhalation

1. The diaphragm contracts, loses its dome shape and flattens out.
2. External intercostal muscles contract while internal intercostals relax.
3. Since the backbone is fixed, the ribs move upwards and outwards (a diagonal movement)
4. All these events cause the thoracic volume to increase thereby creating a vacuum (reduced pressure)
5. Thus air rushes from the outside (higher pressure) to



the interior of the lungs (lower pressure.)

#### Events in Exhalation

1. The diaphragm is raised, assuming its dome shape.
2. External intercostals relax, Internal intercostals contract
3. The ribs move inwards and downwards
4. All these reduce the thoracic volume and elevate its pressure above the atmospheric pressure
5. Air then rushes outside

#### NOTES:

1. Inhalation = Inspiration = breathing in.
2. Exhalation = Expiration = breathing out.

10A. See Q 1 and 5

11E. Heat energy cannot be harnessed to do useful work here and this is very common during the interconvertibility of energy (Law of thermodynamics)

12D. Small amount of energy is produced (Q1)

#### NOTES:

1. Vigorously exercising muscle cells produce lactic acid instead of alcohol - lactic acid fermentation.
2. When exercise stops, panting continues and oxygen "debt" incurred during exercise is paid back and the lactic acid is channeled towards aerobic respiration to generate  $\text{CO}_2$  and  $\text{H}_2\text{O}$  and more energy.
3. Muscle cramps associated with strenuous exercise is due to accumulation of lactic acid in muscles.

#### 13A. Characteristics of Respiratory Surface

1. Moist - Gases must dissolve first hence dry surface is not ideal
2. Thin - Surface is normally one-cell thick to favour simple diffusion
3. Large surface area to volume ratio
4. Vascularized - This ensures adequate perfusion (rich supply of blood)
5. Ventilated - This implied adequate supply of oxygen.
6. Semi-permeable - The surface is not an all-comer affair as it is selectively permeable to gases to be exchanged.

14B. See Q9

15D. B is Photosynthesis C is Aerobic respiration  
D is Anaerobic respiration  
A is wrong as it does not reflect energy release however small)

16D. See Q 12 17A. See 14

18D. The respiratory functional units of the lungs (See Q3)

19B. See Qs 12 and 16 20D. See Chapter 14

21C. Air sacs are found at all available spaces in the bird including the marrow of the large bones and the sacs are limited by narrow tubes to the lungs

#### 22C. Events in Glycolysis

1. Glucose (a 6C compound) is phosphorylated and then split into two 3C Compounds as powered by 2 molecules of ATP.

**NOTE:** Glycolysis = sugar splitting

2. One of the two compounds is converted to the other thereby generating 2 molecules of the same 3C compound.
3. This compound then undergoes many steps of chemical change until it forms pyruvate (or pyruvic acid) and in the process 4 molecules of ATP are generated

**NOTE:** Net ATP generated at substrate level = 2ATP  
Fate of the Pyruvate: The following conditions determine the fate of pyruvate of glycolysis

1. Absence of oxygen - Glycolysis occurs in the cytoplasm of the cell and if oxygen is absent in a microbes (e.g yeast), pyruvate is converted to carbon dioxide and alcohol. Overall reaction in alcoholic fermentation:  
 $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$

b. Muscle cells of multi-cellular organism - pyruvate is converted to lactic acid (lactate) - lactic acid fermentation  
overall reaction:  $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{CH}_3\text{CH}(\text{OH})\text{COOH}$

2. Presence of oxygen - pyruvate is converted to acetyl CoA and the latter enters the mitochondrion of the cell to join the Krebs' cycle (citric acid cycle) eventually generating  $\text{CO}_2$  and  $\text{H}_2\text{O}$  and enormous energy

See standard text for illustration.

23D. Respiration is faster in animals (as indicated by the higher level of water in the manometric tube) than in plant

**NOTE:** The higher level of water in J means less pressure inside the conical flask on the left as a result of faster rate of using up oxygen for respiration in animals than in plants

24C. Remember how a manometer looks and works in your physics class?

Potometer - For rate of transpiration

Auxanometer - for growth rate

25A. See Q 22

26D. i.e spaces between cells

27C. See Q 1

28A. Diaphragm contracts when it flattens out, and relaxes when it regains its dome-like shape. Take intercostal muscles here to mean the external intercostal (see Q 9)

29C. Lenticels in stems, stomata in leaves.

30A. Calcium hydroxide known as lime water produces a positive test for carbon dioxide ( $\text{CO}_2$ ) when it turns milky (Q2)

31C. See Q5

32C. The aim of respiration is to obtain energy for physical and metabolic work

33B. Bell jar represents the thorax; the interior of jar is the pleural cavity; the two balloons are the lungs; the tubing stands for the trachea.

34C. When the sheet is pulled down (by the thread) the balloons inflate (inspiration) and when sheet is released, balloons deflate (expiration)

35D. Capillaries for pulmonary artery

36B. See Q1

37C. Pleural membrane, or simply the pleura, lines the thorax as external pleural membrane and then the lungs as internal pleural membrane while the space between them (pleural cavity) is filled with a fluid which lubricates the lungs. The lungs are also waterproof for same reason

38A. Alkaline pyrogallol absorbs oxygen; it deprives the surroundings of oxygen hence anaerobic respiration ensues.

39C. See Qs 9 and 28

40B. Or oxidation of hydrogen by oxygen into water

41D. Through the moist body surface (See Q4)

42C. Tracheal system is simpler than gills (fish/snail) and lungs (mouse)

43D. Exhaled air has more  $\text{CO}_2$  and  $\text{H}_2\text{O}$ , less oxygen and is hotter than inhaled air

44D. See Q 22 45D. See Q 5

46D. Found only in mammals.

47C. See Q 5 48C. See Q 22 49C. See Q

50B. Water containing dissolved air is taken into the mouth, passed over the gills and it exits the operculum to the surrounding water after being deoxygenated.

51C. Respiration, a chemical process, is different from breathing because the latter is a physical process meant to make oxygen available to the cells for the purpose of cellular respiration

**NOTE:** Internal Respiration = Cellular/Tissue Respiration

External Respiration = Breathing + Gaseous Exchange

52C. Both are external openings of the respiratory pathways

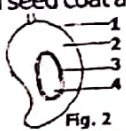
53B. Amphibians respire through three routes

1. Skin - cutaneous respiration
2. Mouth - buccal respiration
3. Lung - pulmonary respiration

However, tadpole stage was through gills.

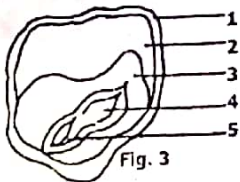
**CHAPTER 16**  
**REPRODUCTION IN FLOWERING PLANTS.**  
**GERMINATION, FRUIT AND SEED DISPERSAL**

- Which of these is not a characteristic of wind pollinated flowers? A. Smaller quantities of sticky pollen produced B. Feathery styles of stigmas pendulously hang outside the flower. C. Small, inconspicuous scentless flowers. D. Large anthers which are loosely attached to filaments E. Light pollen grains produced in large quantities from anthers. (1978:Q45)
- A germinating seed requires oxygen which is essential for A. converting carbohydrate into glucose B. transporting energy from one part of the plant to another C. the production of energy by oxidizing essential carbohydrates D. hydrolysis of proteins E. the formation of water molecules within the germinating seed. (1978:Q46)
- The region of cell division in a root is A. root cap B. endodermis C. xylem D. piliferous layer E. meristem (1979:Q14)
- Which of the statements below is not characteristic of wind pollinated flowers? A. Stigmas are usually large and feathery B. Nectary is usually absent C. The pollen grains have rough spiny surfaces D. The flowers are not scented E. The pollen is light and smooth. (1979:Q15)
- The plumule is best described as A. part of the cotyledon B. part of the endosperm C. a miniature shoot D. structure near the micropyle E. structure opposite the hilum (1979:Q24)
- A dry indehiscent, winged fruit formed from one carpel is known as a A. schizocarp B. caryopsis C. samara D. nut E. foliide (1979:Q25)
- In which of the following tissues do the cells have the ability to divide? A. Meristem B. Sclerenchyma C. Phloem D. Collenchyma E. Pith (1979:Q29)
- The maize grain is regarded as a fruit and not a seed because A. it is covered by a sheath of leaves B. the testa and fruit wall fuse after fertilization C. it has both endosperm and cotyledon D. it has coleorhiza and coleoptile E. the pericarp and seed coat are separate (1979:Q38)



9. Figure 2, is a section of a drupe. The part numbered 2 is A. epicarp B. endocarp C. mesocarp D. seed E. pericarp (1979:Q40)

- The one-seeded fruit in which the pericarp and seed coat have become fused together is known as A. achene B. samara C. caryopsis D. legume E. drupe. (1979:Q41)
- A true fruit is formed from A. a fertilized ovary and other floral parts B. a fertilized ovary C. a fertilized ovary and calyx D. a fertilized ovary and fleshy receptacle E. an unfertilized ovary and other floral parts. (1980:Q11)
- Water is required for seed germination to take place because it A. activates the enzymes B. softens the testa C. liberates energy for growth D. permits radicle growth E. allows oxygen to diffuse into the seed. (1980:Q12)
- For pollination and fruit formation, the essential part(s) of the flower should be the A. corolla B. ovary C. pistil (gynoecium) D. ovules D. receptacle (1980:Q21)



14. The testa A. is normally absent B. is included in the part numbered (1) C. is fused with the part numbered (3) D. is the part numbered (1) E. surrounds the parts numbered (4) and (5). (1980:Q23)

- Reserved food material is A. stored in the parts numbered (2) and (3) B. stored in the part numbered (3) only C. stored in the parts numbered (4) and (5) D. not concentrated in any particular part E. found in all the except (1) (1980:Q24)



Fig. 1 A vertical section of onion bulb.

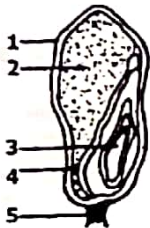
- The correct figured sequence for the following labelled parts (stigma, ovary wall, embryo sac, integument and micropyle) is A. 12453 B. 24135 C. 21435 D. 14325 E. 31425 (1981:Q1)
  - Which structure becomes the seed coat after fertilization? A. 1 B. 2 C. 3 D. 4 E. 5 (1981:Q2)
  - Which of the following is NOT true of wind-pollinated flowers? A. Large amount of pollen produced B. Light smooth pollen grains C. Small inconspicuous flowers D. Scented petals E. Large pendulous anthers. (1981:Q3)
  - Where is the food stored in a yam plant? A. Stem B. Bud C. Adventitious root D. Leaves E. Tap root. (1981:Q6)
  - A fruit formed from a single flower having several free carpels is A. a multiple fruit B. a dry dehiscent fruit C. a dry indehiscent fruit D. a simple fruit E. an aggregate fruit. (1981:Q35)
  - If the anthers of a flower mature before the stigma, the condition is termed A. epigyny B. hypogyny C. protogyny D. protandry E. perigyny. (1981:Q36)
  - A plant which has a horizontal underground stem is A. rhizome B. corm C. creeper D. tuber E. bulb. (1981:Q44)
  - An onion bulb stores its food in the A. stem B. leaves C. roots D. cotyledon E. branches. (1982:Q15)
  - Any dry fruit which can break into several parts each containing one seed is a A. capsule B. aggregate fruit C. legume D. schizocarp E. foliide. (1982:Q30)
  - The maize grain is regarded as a fruit and not a seed because A. it has a coleorhiza B. it has a coleoptile C. of the relatively large endosperm D. there is the remains of a style E. of the relatively small scutellum. (1982:Q32)
  - In an epigeal germination, it is the A. epicotyl that elongates fast B. hypocotyl that elongates fast C. hypogeal that elongates fast D. plumule that elongates fast E. roots that elongate fast (1982:Q47)
- Fig. 1 vertical section of onion bulb.**
- Which of the labelled parts in Fig 2 will develop into a new bulb? A. 1 B. 4 C. 2 D. 3 E. 5. (1983:Q17)
  - In the onion bulb, food is stored in the A. stem B. lateral buds C. cotyledons D. outer scale leaves E. leaf base (1983:Q18)
  - Groundnut is not really a 'nut' in the biological sense because A. it is harvested from inside the ground B. its pericarp is not hard and tough. C. the fruit is succulent E. it is an achene. (1983:Q19)
  - What type of fruit is formed from a single flower having several free carpels? A. multiple fruit B. Simple fruit C. Aggregate fruit D. Dehiscent fruit E. Indehiscent fruit. (1983:Q20)
  - Banana, plantain and pineapple can be group together because they A. produce small seeds B. are multiple fruits C. produce suckers D. have runners E. have bulbils. (1983:Q26)
  - The tuber of cassava is NOT a stem tuber because it A. is distended with food reserve B. has an aerial shoot portion C. has other structures that could be called roots D. lacks axillary buds E. has a bark over its stored food. (1983:Q38)
  - Underground stems which grow horizontally through the soil are A. bulbs B. rhizomes C. runners D. corms E. stolon (1984:Q19)
  - A flowering plant is monoecious if A. the androecium is found on one plant B. the gynoecium is monocarpous C. it produces essential organs D. the gynoecium and roecium

are on the same plant E. the flowers are unisexual. (1984:Q28)

35. How many nuclei are found in a pollen tube during fertilization? A. 2 B. 3 C. 5 D. 6 E. 7 (1984:Q29)
36. The maize grain is a fruit and not a seed because it A. has a large endosperm B. is formed from an ovary C. is a monocotyledon D. has no plumule and radicle E. has a hypogeal germination. (1985:Q30)
37. If a flower is protandrous then it A. must be unisexual B. has an undeveloped androecium C. has no androecium D. must be insect pollinated E. can prevent self pollination. (1985:Q31)
38. For pollen to be released in *Crotalaria* the insect must depress the A. wing B. keel C. standard D. antepetalous stamen E. antesepalous stamen. (1985:Q32)
39. Irish potato is a A. bulb B. taproot C. rhizome D. root tuber E. stem tuber. (1985:Q33)
40. Germination which results in the cotyledons being brought above ground is called A. hypocotyl B. epicotyl C. epigeal D. hypogeal E. plumule (1985:Q37)

Use the figure below to answer questions 34 to 36

Vertical section of a maize grain



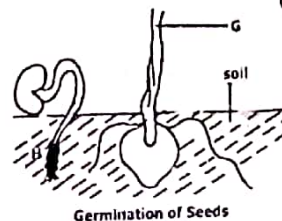
41. Which of the labelled parts will develop into a New maize plant? A. 2 B. 3 C. 4 D. 5. (1986:Q34)
42. The structure labelled 1 is the A. plumule B. radicle C. cell membrane D. seed coat (1986:Q35)
43. The main function of the structure labelled 2 is to A. protect the inner parts of the seed B. nourish the embryo and the growing parts C. keep the inner parts moist D. maintain the shape of the seed. (1986:Q36)
44. The pineapple fruit is best described as A. aggregate, succulent and indehiscent B. aggregate, succulent and indehiscent C. multiple, succulent and indehiscent D. multiple, succulent and dehiscent. (1987:Q28)
45. The flower shown above is A. complete, regular, hermaphroditic with inferior ovary B. incomplete, regular, terminate with inferior ovary C. complete regular, hermaphroditic with inferior ovary D. incomplete, irregular, pistillate with superior ovary. (1987:Q29)
46. A flower showing radial symmetry is said to be A. pentamerous B. protandrous C. protogynous D. actinomorphic (1987:Q30)
47. A samara differs from a cypsela by having A. an extended pericarp B. a hard pericarp C. a pericarp fused with the seed coat D. some hairy outgrowths on the pericarp (1987:Q31)
48. The plantain reproduces asexually by A. suckers B. buds C. fragments D. spores. (1987:Q32)
49. A dry dehiscent fruit which breaks up into one seeded parts is a A. schizocarp B. capsule C. follicle D. legume. (1988:Q28)
50. Airspaces are characteristic of seeds or fruits dispersed A. birds B. water C. wind D. explosive mechanism. (1988:Q29)
51. In vegetative propagation, which of the following requires part of another plant to develop? A. Scion B. Bulb C. Rhizome D. Sucker (1988:Q30)
52. Which of these plant groups are normally propagated by asexual means? A. Banana, yam, pineapple and cassava B. Yam, cassava, rubber and banana C. Yam, cassava, orange and banana D. Banana, cassava, coffee and pineapple. (1988:Q31)
53. The radicle of a bean seedling grows most rapidly in the

region A. of the root tip B. just above the root tip C. just around the root tip D. just below the root tip. (1988:Q33)

54. Wind-pollinated flowers usually have A. rough pollen grains B. sticky stigmas C. small and short stigmas D. long styles. (1989:Q28)
55. The components of castor oil seed and the maize grain are similar EXCEPT for the A. number of cotyledons B. location of the embryo C. number of radicles D. number of plumules. (1989:Q29)
56. A corm differs from a bulb in that A. its stem is the main food storage organ B. it has a flattened disc-shaped stem C. buds are absent in the axils of the leaves D. adventitious roots are present (1989:Q30)
57. The type of placentation shown in the figure above is A. parietal B. marginal C. axile D. free-central. (1990:Q30)
58. Fruits which develop without fertilization are described as A. simple B. parthenocarpic C. aggregate D. compound (1990:Q31)

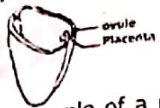
59. The elephant grass is propagated vegetatively by means of A. corms B. bulbs C. suckers D. solon. (1990:Q32)
60. A collection of achenes formed from several carpels of a flower is A. a multiple fruit B. an aggregate fruit C. a schizocarp D. a simple fruit. (1991:Q33)
61. Vegetative propagation is described as asexual reproduction because A. reproductive organs are not involved B. new individuals are not formed C. many new plants are produced D. there is no exchange of genetic materials. (1991:Q34)
62. Epigeal germination can be found in A. sorghum B. maize C. millet D. groundnut. (1991:Q35)
63. An onion is a bulb because it A. has a tuberous stem B. has a reduced stem and thick fleshy leaves C. has adventitious roots D. bears many buds at the nodes. (1992:Q10)
64. Double fertilization in higher plant is significant because it ensures the A. formation of a fertile embryo B. formation of a fertile embryo and the endosperm C. development of the seed D. development of the fruit. (1992:Q25)
65. Hypogeal germination is characterized by the A. emergence of the plumule out of the ground B. provision of nourishment by the endosperm C. elongation of the hypocotyl D. elongation of the epicotyl. (1992:Q27)
66. Fruits which develop without fertilization of the ovule are A. false B. multiple C. aggregate D. parthenocarpic (1992:Q28)
67. The main function of the petal of a flower is to A. attract pollination agents. B. protect the flower while still in bud C. serve as landing stage for insects D. protect the inner parts from desiccation. (1993:Q27)

Use the diagram below to answer questions 61 and 62



68. In H, the cotyledons are carried above the soil because A. the epicotyl grows faster than the hypocotyl B. the hypocotyl grows faster than the epicotyl C. both grow at the same rate D. the epicotyls out grows the radicle (1993:Q29)
69. The function of the structure labeled G is to A. carry out initial photosynthesis for the seedling B. protect the young leaves from mechanical damage C. protect the young leaves from sunlight. D. protect the young leaves from insect. (1993:Q30)
70. The fleshy base of a flower to which the different floral parts are attached is known as A. calyx B. sepals C. thalamus D. hypothalamus. (1994:Q26)

Use the diagram below to answer questions 71 and 72



71. The type of placentation shown is A. axilal B. marginal C. parietal D. central (1995:Q21)
72. An example of a plant having the placentation shown is A. allamander B. hibiscus C. water lily D. pride of Barbados. (1995:Q22)
73. The term caryopsis is used to describe a fruit in which the A. testa and pericarp are separate B. seed and endocarp are fused C. testa and pericarp are fused D. seed coat and fruit wall are impermeable. (1995:Q23)

Use the diagram below to answer questions 74 and 75



74. The function of the part labeled V is for the passage of A. pollen tube and pollen nucleus B. air, water and pollen nucleus C. air, antipodal cells and ovum D. synergids and egg cell. (1997:Q26)
75. The female gamete is represented by A. I B. II C. III D. IV. (1997:Q27)



76. The type of vegetative reproduction illustrated in the diagram above is A. grafting B. adventitious bud C. sucker D. aerial layering. (1997:Q28)
77. Coconut and oil palm fruits can be grouped as A. berry B. legume C. Capsule D. drupe. (1997:Q29)
78. Which of the following is the youngest plants tissue? A. Meristem. B. Phloem C. Epidermis. D. Xylem. (1997:Q3)

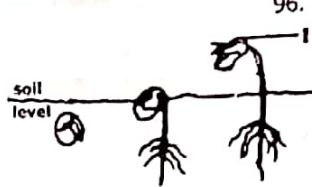
Use the diagram below to answer question 79 and 80



79. The ovary represented is A. half-superior B. inferior C. superior D. half-inferior. (1998:Q22)
80. The corolla is partly represented by A. I B. II C. III D. IV (1998:Q23)
81. A dry fruit formed from two or more carpels containing several seeds is a A. follicle B. legume C. capsule D. schizocarp (1998:Q25)
82. Insects visit flowers in order to A. feed on the nectar B. deposit pollen on the stigma C. pollinate the flowers D. transfer pollen from anthers (1999:Q25)
83. In epigeal germination, the cotyledons are A. carried above the ground by the elongating hypocotyls B. pulled underground by the elongating hypocotyls C. pulled underground by the elongating epicotyl D. carried above the ground by the elongating epicotyl (1999:Q26)
84. The part labelled II is the A. mesocarp B. pericarp C. endocarp D. epicarp (2000:Q25)
85. The fruit represented is mainly dispersed by A. animals B. water C. wind D. birds (2000:Q26)
86. Which of the following is likely to encourage inbreeding in plants A. Dioecious B. Protandrous C. Monoecious D. Hermaphrodite (2001:Q41)
87. In corns food is usually stored in the A. leaves B. stems C. roots D. buds (2002:Q2)
88. A flower that has both stamens and pistil is said to be A. staminate B. pistillate C. perfect D. imperfect (2002:Q5)
89. Plants tend to prevent overcrowding by means of efficient A. water uptake B. seed germination C. pollination D. seed dispersal (2002:Q14)
90. In which of the following groups of fruits is the pericarp inseparable from the seed coat? A. Nut B. Follicle C. Cypsela D. Caryopsis (2002:Q38)

91. The best method of propagating sugarcane is by A. grafting B. seed sowing C. layering D. stem cuttings (2003:Q21)
92. An example of a caryopsis is A. coconut B. maize grain C. guava D. tomato (2003:Q27)
93. The part labeled II is the A. style B. filament C. stigma D. anther. (2004:Q25)
94. The process of pollination involves the transfer of pollens from A. I to II B. II to III C. III to IV D. IV to I (2004:Q26)
95. Epigeal germination of a seed is characterized by A. more rapid elongation of the hypocotyl than the epicotyl B. more rapid elongation of the epicotyl than the hypocotyl C. equal growth rate of both the hypocotyl and epicotyl D. lack of growth of the hypocotyl. (2004:Q28)

Use the diagram below to answer question 96 and 97

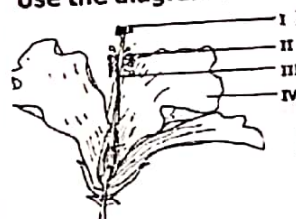


96. The main function of the structure labeled I is to A. store food for the young part B. pull the young shoot above the ground C. store water for the seedling. D. protect the young plumule. (2005:Q27)
97. The type of germination illustrated is termed A. hypogeal B. epicotyl C. epigeal D. hypocotyl (2005:Q28)
98. Water is necessary for a germinating seed because it A. promotes aerobic respiration B. activates the enzymes C. wets the soil for proper germination D. protects the seed from desiccation. (2006:Q13)
99. In plants, the structure that performs a similar function with the testis in mammals is the A. stigma B. filament C. anther D. receptacle. (2008:Q6)

Use the diagram below to answer question 91 and 92

100. The illustration is a typical example of a plant pollinated by A. wind. B. man C. insects D. birds. (2008:Q23)
101. The male inflorescence is labeled A. I B. II C. III D. IV. (2008:Q24)

Use the diagram below to answer question 93 and 94



102. The male sex cells are contained in the part labeled A. I B. II C. III D. IV (2009:Q23)
103. The likely pollinating agent of the flower is A. wind B. water C. insect D. man (2009:Q24)
104. In a bean seed, absorption of water at the beginning of germination is through the A. hilum B. micropyle C. testa D. plumule. (2009:Q26)
105. An example of an endospermous seed is A. cotton seed B. bean seed C. maize grain D. cashew nut. (2011:Q17)
106. An example of a fruit that develops from a single carpel is A. okro B. tomato C. beam D. orange. (2012:Q23)
107. The transfer of pollen grains from the anther to a receptive stigma is A. placentation B. pollination C. fertilization D. propagation. (2013:Q32)
108. The male reproductive organ of a flower is the A. stamen B. petal C. sepal D. carpel. (2013:Q33)
109. An example of an organ of perennation in plants is A. rhizome B. seed C. petal of a flower D. calyx of flower. (2014:Q20)
110. I. Growth is mainly apical  
II. Growth is specific with definite shape  
III. Growth is throughout life.  
Which of the above correctly describes the growth pattern in plants? A. I, II and III only B. II and III C. I and II only D. I and III only. (2014:Q22)

## CHAPTER 16: ANSWERS

1A. Wind-pollinated	Insect Pollinated
1. Small, Inconspicuous dull flower	1. Large brightly coloured flower (petals)
2. Absence of scent	2. Presence of scent to attract pollinators
3. Absence of nectary	3. Presence of nectary
4. Light, smooth, numerous, powdery	4. Heavy, sticky, rough, few pollens
5. Large, feathery,	5. Short styles stigmas, long styles
6. Long, thin,	6. Short filament pendulous filament

2C. Aerobic Respiration (See Chapter 15)

3E. Meristem contain cells capable of cell divisions to cause growth at the apices of root and stem (apical meristem)

4C. See Q1

5C. Plumule = future shoot Radicle = future Root

6C. Presence of wing is diagnostic of samara

### NOTES:

1. Caryopsis is diagnosed by the fusion of fruit wall (pericarp) and seed coat
2. Cypselas may have persistent calyx as a tuft of hair called pappus
3. Dry indehiscent fruits
  - a. Samara e.g. Dipterocarpus
  - b. Achene e.g. sunflower, rose
  - c. Cypselas e.g. Tridax
  - d. Caryopsis e.g. maize
  - e. nut e.g. walnut, oak, almond
4. Dry dehiscent fruits
  - a. legume (pod) e.g. flamboyant and cassia
  - b. Follicle e.g. periwinkle
  - c. Capsule e.g. okra
  - d. Siliqua e.g. tecomara
  - e. Schizocarp e.g. castor, mimosa

7A. See Q3

8B. See Q6

9C. 1 → epicarp                      2 → mesocarp  
3 → endocarp                      4 → seed

10C. See Q6

11B. True fruit - From fertilized ovary only e.g. mango

False Fruit - from fertilized ovary and other floral part(s) e.g. apple, cashew nut.

### NOTE:

1. Fruit developing from whole inflorescence is also tagged false fruit e.g. pineapple, fig.
2. **Parthenocarpic fruits** develop without being fertilized and such fruits are usually seedless e.g. banana and pineapple.

12A. Why water?

1. Primarily to dissolve and activate the enzymes in the cells
2. To dissolve the stored food and provide medium for enzymatic activities to proceed
3. Water also softens the seed coat (testa, tegmen) for easy sprouting of radicles (root) and plumules (shoot)
4. Water also necessary to transport dissolved food to growing regions (radicle and plumule)

13C. Pistil (C) is more encompassing than (B) and (D)

Pistil = stigma + style + ovary

Ovary = ovary wall + ovule

Fruit = pericarp + seed.

### NOTES:

1. Essential parts of flower
  - a. Androecium (of stamens) - Male part of the flower
  - b. Gynoecium of pistil (of carpels) - female part of flower.
2. Non-essential parts of flower
  - a. calyx (of sepals)
  - b. corolla (of petals) them

**NOTE:** Reproduction proceeds without the non-essential parts.

14B. A caryopsis of course

15A. 2 → Endosperm (Primary site of storage)

3 → cotyledon (scutellum) - some food also stored here

1 = pericarp + seed coat (testa + tegmen)

4 → plumule 5 → Radicle

16C. 1 = Ovary wall becomes fruit wall

2 → stigma (has received the pollen now bringing its pollen tube through the style.

3 → integument becomes the seed coat → Embryo sac (containing the ovules)

5 → Micropyle (entrance for male nuclair during fertilization and water for germination)

17C. See Q 16                      18D. See Q 1

19A. Yam (edible part of the plant) is a stem tuber

### SITES OF FOOD STORAGE

1. Cassava/sweet potato - Root tubers
2. Cocoyam - Corm
3. Ginger - Rhizome
4. Onion - Leaf bases
5. Sugar cane - Stem

20E. Such **polycarpous** flower whose carpels are separate is said to have an **apocarpous** pistil e.g. strawberry.

### NOTES:

1. If the carpels are fused, it is a syncarpous pistil.
2. Pistil is monocarpous if it has only one carpel bean
3. A compound (multiple) fruit is formed from a branch or inflorescence e.g. fig, pineapple.
4. Compound fruits are usually false fruits.

21D. This condition favours cross pollination and discourages self-pollination. Its food in root tubers.

22A.

23B. See Q19

24D. A schizocarp is a many seeded fruit which dehisces into one-seeded units called mericarps.

25D. This remains of the style constitutes one of the two scars characteristic of a fruit

a. Scar 1: Where style is attached to the ovary

b. Scar 2: Where ovary is attached to the receptacle (point of attachment to the cub in case of maize grain)

Seed	Fruit
1. Developed from a fertilized ovule	1. From a ripe ovary.
2. Contains embryo	2. Contains seeds
3. One scar (see below)	3. Two scars (see above)
4. Pore in the seed coat	4. No pore as
5. Two-layered seed coat	5. Three-layered fruit wall or pericarp.

### NOTES:

1. The seed scar is called hilum.
2. Seed stalk (or funicle) attaches the seed to the fruit wall via the placenta and form the site of seed scar.
3. The two layers of the seed coat
  - a. Thick outer testa and...
  - b. Membranous inner tegmen.
4. Testa and tegmen developed from the integument of the ovule.

30D. **EPI**geal germination → **HYPO**cotyl elongates faster  
**HYPO**geal germination → **EPI**cotyl elongates faster

**NOTES:**

1. Epigeal germination → cotyledons are brought above the soil surface.
2. Hypogeal germination → cotyledons remain beneath the soil surface
3. **Epicotyl** → Part of the embryo just above the cotyledons but below the plumule
4. **Hypocotyl** → Just below the cotyledon but above the radicle
5. In grasses and palms,
  - a. coleoptile (plumule sheath) - covers and protect the plumule
  - b. coleorhiza (**R**adicle sheath) - covers and protects the Radicle. (Epi → above; Hypo → below)

27D. 3 → Axillary bud

**NOTES:**

1. Terminal bud (unlabelled here) too develops into a new bulb.
2. 1 → A very recently developed leaf base  
2 → fleshy leaf base      4 → Adventitious root  
5 → Reduced stem
3. Excluding the adventitious root, the bulb is an underground shoot.

28E. See Q19

29B. Besides, groundnut is usually many-seeded while nuts are one-chambered, one-seeded fruits

30C. See Q20

31C. The bulbils of pineapple are slender suckers

32D. It is a root tuber; a stem tuber would have scaly leaves and auxiliary buds (or eyes) which might generate a new plant. Cassava is propagated by cutting its aerial woody stem.

33B. See Q22

34D. A **monoecious plant** bears both male (staminate) flowers and female (pistillate) flowers but at different levels on itself e.g. the maize axial inflorescence is male flowers while the female inflorescence are at the leaf axils.

**NOTES:**

1. A **Dioecious plant** bears either male or female flowers but not both.
2. Therefore only female pawpaw plants bear fruits while the male ones do not

35B. Two **generative nuclei** (male gametes) lagging one **tube nucleus**

36B. See Q 25      37E. See Q 21

38B. Stamens and pistil are enclosed within the keel petal

39D. Irish potato - Stem tuber; Sweet potato - root tuber (See Q 22)

40C. See Q 26      41B. 3 → embryo

42D. Plus fruit wall

43B. The nutritive Endosperm

**NOTES:**

1. The nutritive endosperm(2) of the grain is enormous and such seed is described as endospermous, albuminous or non-cotyledonous seed e.g. maize grain.
2. A seed with prominent cotyledons stores food therein and it is described as cotyledonous or exalbuminous or non-endospermous seed e.g. cotton, bean and cashew nut seeds

44C. Pineapple is a compound, fleshy, non-splitting fruit

**NOTE:** Each hexagonal unit in a pineapple represents a flower.

45C. **Complete/Incomplete Flowers**

1. All the four floral parts are present in a complete or perfect flower.
2. A complete or imperfect flower lacks one or more floral part.

**Regular/Irregular Flowers**

1. A regular or **actinomorphic flower** radially symmetrical
2. An irregular or **zygomorphic flowers** are bilaterally symmetrical

**Unisexual/Bisexual Flowers**

1. A bisexual or hermaphrodites flower has both stamens (male) and carpels (female).
2. A unisexual flower has either but not both.

**Inferior ovary/Epigynous Flower**

An ovary is said to be inferior if it is embedded in a fleshy receptacle such that other floral parts are (apparently) higher than the carpel while the entire flower itself is described as epigynous - the condition is called epigyny.

**Superior Ovary/Hypogenous Flower**

Hypogenous flower has a superior ovary which arises from the receptacle at the same level or below the ovary - a condition called hypogyny.

**Half inferior ovary/perigynous flower**

The ovary is on a cup-shaped receptacle such that outer floral parts are apparently above the centrally placed ovary; flower is perigynous - perigyny.

46D. See Q45

47A. The extended pericarp in samara is modified into a wing while the persistent calyx in cypsela is modified into a tuft of hairs or pappins.

**NOTE:** The wing in some samara are persistent calyx not pericarp e.g. shorea

48A. Vegetative Propagation/Asexual Reproduction

1. Adventitious buds - Bryophyllum, Begonia, Kalanchoe
2. Sucker - Plantain/banana
3. Stem cutting - Cassava/Sugar cane
4. Rhizome - Ginger
5. Stolon - Elephant grass/ Passion flower
6. Runners - Axonopus compressus
7. Offset - Water lettuce/Water hyacinth
8. Bulbs - Onion
9. Stem tuber - Yam/ Irish potato
10. Bulbils - Garlic/ Pineapples

49A. See Q 24

50B. Airspaces reduce their density so that they are kept afloat over a very long distance from the parent plant e.g. coconut

51A. The scion requires a (root) stock to develop.

52A. Asexual reproduction means propagation from any part of a plant other than seed (See Q 18)

53D. Just below the tip is the region of cell division which contains actively dividing cells (meristem) that give rise to the protective root cap (root tip)

**Regions of Root Apex**

1. **Root cap** - Protects the growing root from being damaged.
2. **Region of cell division** - Causes the lengthening of the root
3. **Region of elongation** - The cells here enlarge to their maximum size
4. **Region of maturation** - The cells here attain their permanent size and become specialized

54D. See Q1

**NOTES:**

1. Wind-pollinated flower are also called **anemophilous flower** (Remember anemometer?)
2. Insect-pollinated = **Entomophilous flower**

55A. Castor oil seed - dicotyledonous

Maize seed - monocotyledonous

56A. While a bulb stores its food in leaf bases

57A. The arrangement of the ovules and the placenta within the ovary is called **placentation**

**NOTES:**

1. The ovule is attached to the placenta through the funnicle (ovule stalk)
  2. **Types of Placentation**
    - a. Parietal - pawpaw
    - b. Marginal - cowpea, flamboyant, crotalaria, ditoria, pridet, barbadoss
    - c. Axile or Axial - tomato, canna lily
    - d. Basal - sunflower
    - e. Superficial - water lily
    - f. free-central - primrose, water leaf, carnation.
- 58B. See Q 11  
59D. See Q 48
- 60B. Aggregate of achenes contain apocarpous pistil (separate carpels) while schizocarp has syncarpous pistil (fused carpels)
- 61D. Since only one individual plant is involved
- 62D. All cereals (including A, B and C) are hypogeal
- 63B. The thick fleshy leaves from concentric rings
- 64B. There are two generative nuclei in the pollen tube
1. The first one fuses with the definitive (endosperm) nucleus to form the endosperm
  2. The second one fuses with the egg cell (or ovum) to form the zygote (later as embryo)
- NOTES:**
1. There are 8 nuclei or cells within the embryo sac of an ovule
    - a. 3 antipodal cells - opposite side of the micropyle - no function.
    - b. One definite nucleus - centre of the sac; forms the endosperm
    - c. Three micropylar cells - Near the micropyle; two of which are synergid cells (no function) and the other is the ovum (egg cell) to form embryo
  2. All the cells are haploid except the endosperm nucleus which is diploid (2n)
  3. Since generative nuclei (male gametes) of the pollen are haploid we can conclude that
    - a. Embryo is diploid:  $n + n = 2n$  (diploidy)
    - b. Endosperm is triploid:  $n + 2n = 3n$  (triploidy)
- 65D. See Q 26  
66D. See Q 11
- 67A. Primarily as pollinator attractant.
- NOTES:**
1. Petals may act as landing platform for insect e.g wing petals of crotalaria refusa (rattlebox)
  2. It is sepals (calyx) that protect inner whorls especially during the bud stage.
- 68B. EPIgeal - HYPOgeal (Q 26)
- 69A. It is itself the young leaf called first foliage leaf involved in early photosynthesis (being green) and protection of the grooming apical bud and it loses its protective role when it finally unrolls.
- 70C. Thalamus or receptacle
- NOTE:** The thalamus itself is attached to the parent plant by the flower stalk called pedicel.
- 71B. Compare Q 57  
72D. See Q 57  
73C. See Q 6
- 74B. V - micropyle
- Functions of Micropyle**
1. Passage of air and water into seed during germination
  2. Passage of pollen nuclei into embryo sac during fertilization
  3. The radicle grows through the micropyle in some plants e.g. castor oil seed.
- 75C. i - integument (later become the seed coat)  
ii - definite nucleus

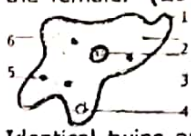
- iii - female gamete (ovum)  
iv - synergids
- 76B. As in Bryophyllum (see Q 48)
- 77D. Features of a Drupe
1. Thin epicarp
  2. Fleshy or fibrous mesocarp
  3. Hard, strong endocarp
- Endocarp + seed = stone (of the fruit)
- NOTES:**
1. Examples: Mango, oil palm fruit and coconut.
  2. Mesocarp is the edible part in mango while it is the hook in coconut.
- Other Fleshy, succulent fruits**
1. Berry e.g tomato, guava, date
  2. Pome e.g apples and pears
  3. Hesperidium e.g lime, lemon, orange
  4. Sorosis e.g pineapple, jackfruit
  5. Syconus e.g fig
- NOTES:**
1. Berry has well-developed pericarp and non-stony endocarp.
  2. Hesperidium is a special berry whose epicarp and meso have fused into a single unit called rind (or skin)
  3. A hesperidium has distinct chambers separated by sheets of endocarp and the chambers are filled with succulent hairs
  4. True fruits - Drupe/Berry/Hesperidium
- 78A. Apical Meristem (See Q3 and 53)
- 79B. See Q45
- 80A. The 4 floral whorls of a flower
1. **Calyx (IV):**
    - a. Outermost whorl; units as sepals
    - b. Usually dull and green (may photosynthesize)
    - c. Protects inner whorls especially in bud stage
  2. **Corolla (I):**
    - a. A next to calyx; each unit as petals
    - b. Usually brightly coloured
    - c. Serves as attractant of pollinators
  3. **Androecium (II):**
    - a. Male part of a flower, each unit as stamen
    - b. Each stamen has two parts
      - i. elongated filament
      - ii. bilobed anther
    - c. An anther contains pollen grains (male gametes) inside pollen sacs
  4. **Gynoecium (or pistil) (III):**
    - a. Female part-innermost whorl.
    - b. Each unit is a carpel
    - c. A carpel has 3 parts
      - i. bulbous ovary
      - ii. elongated style
      - iii. stigma - tip of the style
- NOTE:**
1. If the sepals are colourful, they are called **petaloids** (petal-like)
  2. If petals are dull and green, they are called **sepaloids** (sepal-like)
  3. If petals and sepals look alike, they form a **perianth** and each unit is a **tepale**.
- 81C. A capsule is formed from a superior, syncarpous pistil and dehisces in more than two places e.g okra, castor oil Other Dehiscent fruits
1. **Legume or pod**
    - a. Pistil is superior and non-carpons
    - b. Fruit is elongated and flattened sideways
    - c. Dehisce along two sides
    - d. Marginal plantation
  2. **Follicles**
    - a. Pistil is superior and monocarpous

- b. Dehisce along one side only
3. **Silique**  
 a. A long narrow capsule  
 b. Formed from a bicarpillary ovary  
 c. Has 2 chambers separated by a false septum called replum.
4. **Schizocarp** (See Q24)
- 82A. Pollinating the flower is inadvertent on the part of the insect and besides B, C and D are essentially the same and more than one correct option is not possible  
**NOTE:** C = D + B
- 83A. See Q26
- 84A. The fibrous mesocarp of a drupe (coconut) - See Q77
- 85B. Presence of air spaces in the mesocarp (See Q50)
- 86D. In breeding (lest taken as self pollination) is most likely when a plant bears hermaphroditic flowers (which are homogamous - stamens and carpels ripening simultaneously)  
**NOTE:** Monoecious (where stamens and carpels are separate on the same plant) is less likely than hermaphrodite.
- 87B. The corm which is an underground stem stores the food produced by the aerial shoot
- 88C. See Q45
- 89D. ... or else seedlings will compete among themselves and with the parent plants for (1) air or space (2) light (3) water (4) mineral salt (5) other soil constituents.
- Agents of Dispersal**
- Wind - Wind - Dispersed seeds are usually small and light are dispersed by three mechanisms
    - Censer method - seeds are scattered from the dehisced fruit when it sways in the wind but seeds are not far from the parent plant e.g poppy
    - Parachute method - presence of pappus or of floss increases air resistance and seeds carried far away e.g elephant grass, tridax, oleander and cotton.
    - Wings - They are dry extension of the pericarp making them air-borne e.g Dipterocarpus, Shorea, Angsana
  - Water - Fruits or seeds have fibrous or spongy water proof coat e.g coconut, lotus, water lily.
  - Animals - Birds and mammals
    - brightly coloured fruit. e.g. mango, pawpaw and orange
    - Fruits or seeds into hooks e.g Mimosa and Urena
  - Man - When dispersed by man it is deliberate when it is called farming or agriculture e.g Rubber growing in tropical Africa was brought from its native Brazil.
  - Explosive mechanism - This is forceful ejection of seeds from a dehisced fruits especially legumes e.g acacia caesalpinia and balsam.
- 90D. See Qs 6 and 14. 91D. See Q48 92B. See Q 6
- 93D. Anther in the filament
- 94B. Anther (II) to stigma (III) 95A. See Q26
- 96D. The first foliage leaves protecting the plumule
- 97C. Cotyledons (unlabelled) are brought above the soil.
- 98B. See Q 12
- 99C. They contain male gametes
- 100A. I → The terminal male inflorescence contains numerous light pollens
- 101A. III → Axial female inflorescence.  
 II → Styles (a tuft of silky thread)  
 IV → Parallel veined leaves
- 102B. Anthers in hibiscus are borne on a staminal tube formed by the fusion of filaments. The flower is also syncarpous
- 103C. The petals (IV) are large and conspicuous.
- 104B. See Q74 105C. See Q43
- 106C. Legumes e.g beans are usually developed from monocarpous ovules. (See Q20)
- 108A. staMEN (See Q 80)

- 109A. The rhizome persists year in, year out to produce new aerial shoot.
- 110D. Branching in plant is haparzd thereby producing indefinite shape

**CHAPTER 17  
 REPRODUCTION IN ANIMALS. DEVELOPMENT AND GROWTH**

1. At fertilization A. one chromosome from the male joins another from the female B. one gene from the male combines with another from the female C. the male nucleus fuses with the female C. the male nucleus fuses with the female nucleus  
 D. one set of chromosomes combines with another set from the female E. one cell from the male fuses with another from the female. (1978:Q21)

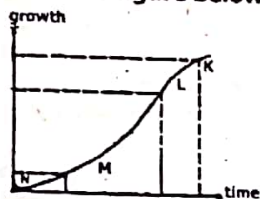


2. During reproduction of the organism in this Fig, the first structure to divide is A. 1 B. 2 C. 3 4. 5 (1978:Q24)
3. Identical twins are produced under one of the following conditions: A. Two ova fertilized at the same time by two sperms B. one ovum fertilized, divides to give two embryos C. one ovum fertilized, twins formed shortly before birth D. Two ova fertilized by one sperm E. One ovum fertilized by two sperms. (1978:Q39)
4. The organ through which food and oxygen are supplied to the human embryo and which also prevents harmful materials from reaching the embryo is the A. amnion B. uterus C. placenta D. umbilical cord E. fallopian tube.
5. Which of the following statements is NOT true of menstruation? A. it occurs monthly B. The discharge contains amniotic fluid C. It signifies no conception D. It involves the lining of uterus E. It may cause pains. (1981:Q33)
6. In human reproduction, the zygote formed as a result of fertilization gets attached to the wall of the uterus. The process is called A. sexual reproduction B. cohesion C. pregnancy D. implantation E. viviparity. (1982:Q5)
7. In man identical twins occur when A. an ovum is fertilize by a sperm and then divided into two each forming a separate embryo B. an ovum is fertilized forming an embryo C. two ova are fertilized at the same time each forming an embryo D. two ova are fertilized by a single sperm each forming an embryo after fertilization E. one ovum first divided into two and each half is fertilized by a sperm before developing into an embryo (1982:Q24)
8. In what order do the following structures develop During the metamorphosis of the toad? 1.External gills 2.Internalgills 3.Forelimbs 4.Hindlimbs 5.Mouth. A.1 2345 B.1 5243 C.13 45 D.534 1 2 E.54321. (1983:Q28)
9. The mammalian organ through which nourishment and oxygen diffuse into a developing embryo is called A. amnion B. chorion C. umbilical cord D. oviduct E. placenta (1984:Q10)
10. Gestation in mammals is the period A. required for growth after birth B. between the formation of the foetus and birth C. of development from zygote to birth D. before the formation of the zygote. (1986:Q37)
11. Growth can best be determined in a population of Spirogyra by measuring the A. total lengths of the filaments B. total widths of the filaments C. rate of photosynthesis in the population D. dry weight of the organism. (1987:33)
12. In a mammal, the placenta performs functions similar to those of the A. lungs, kidneys and digestive system B. lungs, heart and nervous system C. liver, intestines and reproductive system D. intestines, heart and digestive system. (1988:Q32)

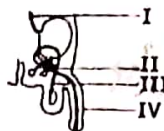


13. Exponential increase in the population of an organism is a characteristic feature of A. binary fission B. sexual reproduction C. budding D. vegetative propagation.
14. The irreversible life process by which new protoplasm is added to increase the size and weight of an organism can be termed A. anabolism B. catabolism C. growth D. development (1989:Q32)
15. During cell division, the two strands of chromosomes are joined at a point called A. spindle B. chromatid C. centromere D. aster. (1989:Q36)
16. During mammalian embryo development, large amount of oestrogen and progesterone are produced in the A. umbilical cord B. amnion C. placenta D. amniotic fluid. (1990:Q29)
17. The function of the epididymis in mammals is the A. expulsion of urine B. storage of sperms C. circulation of blood D. activation of sperms (1991:Q32)
18. In mammalian development, the function of the yolk is to A. supply nutrients to the embryo B. acts as the shock absorber to the foetus C. supply air to the embryo D. facilitate the process of excretion in the foetus. (1992:Q26)

Use the figure below to answer question 19 and 20



19. Which part of the curve represents the fastest rate of growth? A. K B. L C. M. D. N. (1992:Q29)
20. The grand period of growth is represented by A. N B. M C. L D. K. (1992:Q30)
21. In animals, meiosis comes A. after fertilization B. after every mitotic division C. before fertilization D. before every mitotic division. (1994:Q25)
22. The sex of a foetus is determined during A. meiosis B. copulation C. fertilization D. placentation. (1995:Q24)
23. Biological growth refers strictly to an increase in the A. protoplasm of an organism B. number of organisms C. size of an organism D. development of form. (1995:Q25)
24. During binary fission in lower organisms, the nucleus is known to undergo A. mitosis B. meiosis C. fragmentation D. mutation. (1997:Q42)
25. The most reliable estimate of growth is by measuring changes in A. length B. volume C. surface area D. dry weight. (1998:Q24)
26. The outermost embryonic membrane in the mammal is the A. amnion B. chorion C. allantois. D. yolk sac. (1998:Q26)
27. Fertilization in humans usually takes place in the A. lower part of the uterus B. upper part of the uterus C. lower part of the oviduct D. upper part of the oviduct (1999:Q24)
28. Bacteria multiply rapidly by means of A. budding B. fragmentation C. binary fission D. spore formation (1999:Q27)
29. For growth to occur in organisms, the rate of A. food storage must be low B. catabolism must exceed that of anabolism C. anabolism must exceed that of catabolism D. food storage must be high (2000:Q20)
30. In mammalian males, the excretory and reproductive systems share the A. Ureter B. Vas deferens C. Urethra D. Testes (2003:Q22)
31. The type of reproduction that leads to variation in animal and plant populations is A. budding B. sexual C. vegetative D. asexual (2003:Q43)
32. The type of reproduction that is common to both Hydra and yeast is A. conjugation B. binary fission C. grafting D. budding. (2004:Q24)



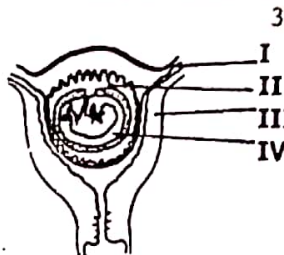
33. The structure labeled I originates from the A. liver B. kidney C. small intestine D. stomach. (2005:Q25)
34. Birth control by vasectomy is achieved by severing the structure labeled A. I B. II C. III D. IV. (2005:Q26)

Use the diagram below to answer questions 35 and 36



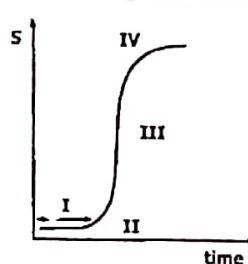
35. Sexual reproduction is illustrated in A. I B. I C. III D. IV (2006:Q3)
36. A plant that exhibits the type of reproduction shown in IV is A. Cola B. ginger C. Bryophyllum D. sugarcane. (2006:Q4)

Use the diagram below to answer questions 37 and 38.



37. The part labelled IV is for A. excretion B. nourishment C. protection D. respiration (2006:Q10)
38. The organ through which the embryo receives food, water and oxygen is labelled. A. III B. IV C. II D. I (2006:Q11)
39. During ovulation, an egg is released from the A. corpus luteum B. ovarian funnel C. Graafian follicle D. fallopian tube. (2008:Q25)

Use the diagram below to answer questions 40 and 41



40. The part labeled I represents the A. stationary phase B. lag phase C. log phase D. steady phase. The part labeled IV indicates that the yeast population has A. reached its maximum size. B. reached senescence C. stopped metabolizing food D. started dying. (2008:Q26)
41. The labelled IV indicates that the yeast population has A. reached its maximum size B. reached senescence C. stopped metabolizing food D. started dying. (2008:Q27)
42. The reproductive system of a male mammals is made up of A. claspers, prostate gland, sperm duct and vas deferens B. testis, prostate gland, sperm duct and vas deferens C. oviduct, urethra, testis and sperm duct. D. testis, uterus, prostate gland and sperm duct. (2009:Q25)
43. In the male reproductive system of a mammal, sperm is stored in the A. urethra B. epididymis C. seminiferous tubules D. vas deferens. (2010:Q24)
44. The barrier between material and foetal blood is the A. liver B. umbilical cord C. uterine wall D. placenta. (2010:Q50)
45. The type of asexual reproduction that is common to both Paramecium and protists is A. fragmentation B. fission C. budding D. sporulation. (2011:Q27)
46. In the mammalian male reproductive system, the part that serves as a passage for both urine and semen is the A. urethra B. ureter C. bladder D. seminal vesicle. (2012:Q14)

Use the diagram below to answer questions 47 and 48.

47. The developing embryo is usually contained in the part labeled A. IV B. III C. II D. I. (2012:Q24)
48. The function of the part labeled III is to A. produce egg cells B. protect sperms during fertilization C. secrete hormones during coitus D. protect the developing embryo. (2012:Q25)

49. When the adults have reached a certain degree of weakness, the process of binary fission is replaced by conjugation in  
 A. Paramecium B. Euglena C. Amoeba D. Plasmodium.  
 (2014:Q41)

### CHAPTER 17 ANSWER

- 1C. Combination of nuclear materials ensues  
 2C. The nucleus (3) divides before the cytoplasm (2) does in binary fission or cell division generally  
 3B. Identical twins are also called monozygotic twins because the two embryos are developed from a single zygote (fertilized ovum) while fraternal twins are dizygotic twins as two ova are separately fertilized by two separate sperm cells

#### Identical twins

1. Monozygotic
2. One ovum, one
3. One placenta; two umbilical cords
4. Twins resemble each others in all respects
5. Twins are genotypically identical
6. Twins are of the same sex

#### Fraternal twins

1. Dizygotic
2. Two ova, two sperm cells sperm cell
3. Two placentas; two umbilical cords
4. Twins resemble each other within the bounds of normal familial identity
5. Twins have different genetic constitution because of different combination of genes
6. Same or different sexes

4C. The placenta (or afterbirth) is connected to the foetus by the umbilical cord

#### NOTE:

1. The placenta is unique in that it is contributed by 2 organisms - mother and foetus - hence it has maternal and foetal parts.
  2. Maternal and foetal bloods are closely apposed in the placenta but they never mix.
  3. However, materials cross selectively between the two blood streams to constitute the so-called placental barrier.
- 5B. Menses is a periodic (monthly) index of no-conception involving the shedding of the uterine lining (or endometrium) and it causes muscle (myometrial) cramps in many people. If there is conception, the amnion (one of the embryonic membrane) secretes amniotic fluid
- 6D. Implantation of the zygote in the blood-rich endometrium of the uterus.

#### NOTE:

1. The uterus has 2 layers
    - a. endometrium - The endometrium is shed in menstruation
    - b. myometrium - The muscular wall of the uterus capable of contraction during labour.
  2. Fertilization occurs in the upper portion of the oviduct but implantation in the uterus.
- 7A. See Q3  
**NOTE:** Fertilization of a single ovum by more than one sperm (called polyspermy) is not even compatible with life - the zygote dies
- 8B. See chapter
- 9E. An exchange organ (See Q4)
- 10C. Gestation → period from conception to birth  
 parturition → The process of birth itself.  
**NOTE:** Zygote → embryo → foetus
- 11A. The longer the filaments, the larger the size and number of cells present.  
 Respiratory, excretory and nutritive functions of the placenta. It also has endocrine function.

13A. Binary fission involves a cell dividing into two repeatedly and the pattern follows a geometric progression e.g. bacteria.

14C. Growth is achieved in two ways.  
 1. Increase in sizes of cells by the incorporation of more protoplasm into them - hypertrophy  
 2. Increase in the number of cells by repeated cell division - hyperplasia.

15C. The chromosomes are now called chromatids

16C. See Q12

17B. Epididymis, a long, coiled tube, stores sperms made by the actively dividing cells lining the seminiferous tubules.

#### NOTES:

1. The epididymis lies on the outside of each testis and is connected to the sperm duct (or vas deferens)
  2. The two vasa deferentia open into the urethra or ejaculatory duct
  3. The urethra is urogenital in male mammals which means it performs urinary and reproductive functions
  4. Female urethra is only urinary - conveying only urine.
- 18A. The yolk sac which is one of the (extra) embryonic membrane provides the food during the early stages of embryonic development but this is later taken over by the placenta later.

#### Other Embryonic Membranes

1. Chorion - outermost, contributes to forming the placenta.
2. Allantois - forms a sac with excretory, respiratory and nutritive functions; contributes to placenta (as chorioallantois)
3. Amnion - forms a sac and secretes a fluid called amniotic fluid in which the embryo (later foetus) lies

**NOTES:** The amniotic fluid acts as a buffer or shock absorber to cushion the effects of traumatic events or onslaught against the foetus.

19C. Phase N → slow growth. Phase M → fast growth.  
 Phase L → slow growth (again)

20D. The 3 phases combined to constitute the grand period of growth represented by the total time interval K.

**NOTE:** This is the growth curve of an (annual) plant.  
 21C. Gametogenesis (formation of gametes) arises from meiosis while fusion of gametes later causes fertilization

22C. This is because the male and female gametes involved in fertilization had predetermined sex chromosomes X or Y.

XX → Female zygote XY → Male zygote

23A. See Q14

24A. Mitosis for binary fission in lower animals and then growth in higher animals while meiosis is for gametogenesis

25D. Although it involves killing the organism.

26C. See Q18 27D. See Q6 28C. See Q13

29C. Anabolism is constructive; catabolism is destructive

30C. See Q17

31B. Sexual reproduction involves recombination of genes hence the offspring (called hybrid) is genetically different from both parents

#### NOTES:

1. Sexual reproduction in lower organisms is conjugation as in paramecium
2. In asexual production e.g. Paramecium, the offspring is a "clone" of the single parent as both of them are identically genetically constituted.
3. Asexual reproduction include
  - a. Binary fission e.g. bacteria/amoeba
  - b. Budding e.g. hydra/yeast
  - c. fragmentation e.g. spirogyra

d. vegetative propagation as in stem cutting of cassava

32D. See Q31

33B. I → ureter from kidney

34C. III → sperm duct II → seminal vesicle IV → Urethra

**NOTES:**

1. The direct equivalent of vasectomy in the female is unilateral or bilateral tubal ligation which involves tying up either or both of the oviducts (Fallopian Tubes)
2. Contraceptive methods or birth controls -
  - a. Barrier methods: condom, femidom, diaphragm /cap, sponge, IUD
  - b. Chemical/Hormonal Methods: Spermicide, pills/ minipill
  - c. Natural Methods: Abstinence, Rhythm method, Temperature method, Billings method, Coitus Interruptus (or withdrawal method)
  - d. Sterilization: Vasectomy, Tubal ligation
  - e. Termination: Morning - after pill, abortion.

35B. Conjugation involving paramecia (See Q31)

36C. Adventitious buds in bryophyllum (also in Kalanchoe and Begonia)

37C. Amnion → Amniotic fluid → shock absorber → protection

38C. Placenta (Q 12) I → oviduct III → myometrium of uterus

39C. Graafian follicle → mature follicle

**NOTE:** The remnant of the follicle after ovulation is called corpus luteum (or yellow body)

40B. As organism prepares for growth.

II → acceleration phase (rapid growth)

III → steady phase (rapid, constant rate)

IV → stationary phase (when growth ceases)

41A. See Q40

42B. But note the tautology as sperm duct = vas deferens

Accessory sex Glands

1. These are seminal vesicles, prostate gland and Cowper's glands.
2. Their secretions constitute the seminal fluid
3. Seminal fluid + sperms = semen
4. Seminal fluid
  - a. Protects the sperm cells against the acidity of the female reproductive tract (vagina) which is also filled with microbes (as normal flora of the birth canal)
  - b. Nourishes the sperms
  - c. Enhances their propulsion through the canal

43B. See Q17

44D. The placental Barrier (See Q4)

45D. Binary fission in paramecium and protists like Chlamydomonas

46A. See Q 17

47C. II → Uterus III → ovary (Produces egg/ovum)

I → oviduct (or fallopian tube where fertilization occurs and it also conveys the zygote to the uterus).

IV → vagina (a long, muscular tube particularly necessary for coitus to receive the erectile (turgid) penis since fertilization is internal.

48A. See Q47

49A. Paramecium undergoes sexual (under unfavourable conditions) and asexual reproduction (under favourable conditions). See Q 31 and 45

**CHAPTER 18**

**HOMEOSTASIS. ENDOCRINE SYSTEM. PLANT HORMONE**

1. The hormone which tones up the muscles of a person in time of danger is from the A. thyroid gland B. pancreas C. adrenal gland D. liver E. spleen. (1978:Q17)
2. A gland in the human body secretes two hormone, one of which causes a disease called diabetes when there is a

deficiency. Which of these organs produces the hormones?

A. Spleen B. parathyroid C. Adrenal body D. Thyroid E. Pancreas. (1979:Q28)

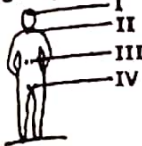
3. The conversion of excess amino acids into urea occurs in the A. kidney B. pancreas C. villi D. liver E. spleen. (1980:Q16)
4. Which of the following hormones is produced during fright or when agitated? A. insulin B. adrenalin C. Thyroxine D. Pituitrin E. Progesterone (1980:Q33)
5. Which of the following is NOT a function of the liver? A. regulation of blood sugar B. storage of iron C. Formation of bile D. Breakdown of excess amino acids E. Excretion of urea from the blood. (1981:Q15)
6. Which of the following organs regulates the amount of amino acids and glucose in the body? A. Kidney B. Liver C. Pancreas D. Spleen E. Stomach (1985:Q25)
7. The mammalian endocrine system is responsible for A. transmitting impulses B. regulating body temperature C. regulating osmotic pressure of blood D. chemical co-ordination E. the manufacture of blood. (1985:Q38)
8. Deamination occurs in the A. kidney B. pancreas C. spleen D. liver. (1986:Q30)
9. The hormone which regulates the amount of glucose in the blood is called A. adrenalin B. auxins C. insulin D. thyroxin (1986:Q40)
10. A severe deficiency of thyroxin results in A. diabetes mellitus B. sexual underdevelopment C. cretinism D. gigantism. (1987:Q35)
11. Unlike auxins, gibberellins A. induce the formation of adventitious roots B. do not affect leaf and fruit abscission C. cannot stimulate stem elongation D. are quite effective as herbicides. (1989:Q39)
12. Fruit enlargement can be induced by spraying young ovary with A. cytokinin, abscisic acid and ethylene B. gibberellin, ethylene and abscisic acid C. auxin, abscisic acid and ethylene D. auxin, cytokinin and gibberellin. (1989:Q33)
13. A fundamental similarity between nervous and hormonal system is that both A. involve chemical transmission B. have widespread effects C. shed chemicals into the blood stream D. evoke rapid responses. (1989:Q34)
14. A dwarf plant can be stimulated to grow to normal height by the application of A. thyroxin B. gibberellin C. insulin D. kinnin (1991:Q36)
15. When it is cold, the blood vessels of the skin A. dilate to increase the amount of blood flowing to the skin B. constrict to reduce the amount of blood flowing to the skin. C. dilate to reduce the amount of blood flowing to the skin D. constrict to increase the amount of blood flowing to the skin (1993:Q31)
16. What would happen to a man whose pancreas has been surgically removed? A. The level of blood sugar would increase B. The glycogen content of the liver would increase. C. His blood pressure would decrease. D. His weight would increase appreciably. (1993:Q33)
17. In Amoeba, osmoregulation is carried out by the A. pseudopodium B. food vacuole C. contractile vacuole D. nucleus. (1994:Q6)
18. The gland directly affecting metabolic rate, growth and development is known as A. adrenal gland B. thyroid gland C. mammary gland D. parathyroid gland. (1995:Q27)
19. The substance that is responsible for apical dominance in plants is known as A. gibberellin B. tannin C. auxin D. kinnin. (1997:Q30)
20. Regulation of blood sugar level takes place in the A. pancreas B. ileum C. liver. D. kidney. (1998:Q15)
21. The part labelled III is for A. protection B. insulation C. lubrication D. growth (1999:Q29)

Use the diagram below to answer questions 21 and 22



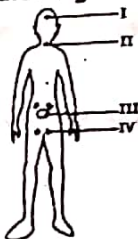
22. The structure labelled II is known as A. sweat gland B. lymph vessel C. blood vessel D. nerve ending (1999:Q30)
23. In which part of the human body does the secretion of the growth hormone occur? A. head region B. waist region C. neck region D. gonads (2000:Q9)
24. Which of the following growth activities in plants is brought about by gibberellins? A. Rapid cell division B. Tropic response C. Cell elongation D. Main stem longation (2000:Q33)
25. Urea formation occurs in the A. heart B. liver C. lung D. kidney (2001:Q13)

Use the diagram below to answer questions 26 and 27



26. The gland usually found in the position labelled is the A. adrenal B. thyroid C. pancreatic D. pituitary (2002:Q43)
27. A hormone secreted at IV serves to A. facilitate the development of facial hairs B. raise the level of calcium ions in the blood C. lower blood glucose level D. make the body react to emergencies (2002:Q44)
28. Metabolic production of urea is carried out in the A. Urinary bladder and kidney B. Liver C. Pancreas D. Kidney and Malpighian tubule. (2003:Q23)
29. The most important hormone that induces the ripening of fruit is A. Ethylene B. Indole acetic acid C. Gibberallin D. Cytokinin. (2003:Q29)
30. If a nursing mother is not producing enough milk, her hormonal system is probably deficient in A. prolactin B. testosterone C. thyroxin D. insulin. (2004:Q30)
31. Which of the following is a homeostatic response in humans? A. Withdrawing the hand from a hot object. B. The mouth getting watery when food is sighted C. Yawning owing to tiredness D. Shivering in a cold environment. (2005:Q31)
32. The part of the mammalian skin involved in temperature regulation is the A. sweat gland B. hair papilla C. hair follicle D. sebaceous gland. (2006:Q29)
33. In mammals, the organ directly on top of the kidney is the A. thyroid gland B. adrenal gland C. pancreas D. prostate gland. (2007:Q17)

Use the diagram below to answer questions 34 and 35



34. Insulin is produced by the endocrine organ labeled A. IV B. III C. II D. I. (2007:Q21)
35. The function of the structure labeled I is to A. stimulate the development of secondary sexual characters B. prepare the body for any emergency. C. maintain proper glucose concentration in the blood D. regulate the activities of other endocrine glands. (2007:Q22)
36. Thyroxine and adrenalin are examples of hormones which control A. tongue rolling B. behavioral patterns C. colour variation D. blood grouping. (2010:Q44)
37. Which of the following organs regulates the levels of water, salts, hydrogen ions and urea in the mammalian blood. A. Bladder B. colon C. Liver D. Kidney. (2011:Q25)
38. Plant growth can be artificially stimulated by the addition of A. gibberelin B. kinin C. abscisic acid D. ethylene. (2012:Q26)
39. The gland that is found just below the hypothalamus is the A. adrenal B. pituitary C. thyroid D. parathyroid. (2003:Q34)
40. The most important plant hormone is A. abscisic acid B. auxin C. gibberellin D. cytokinin. (2013:Q35)
41. The absence of anti-duretic hormone in humans results in A. drastic dehydration B. eliminating dehydration

- C. increasing dehydration D. decreasing dehydration. (2013:Q37)
42. Oestrogen is a hormone that is synthesized in the A. testis B. anterior pituitary C. adrenal cortex D. ovaries. (2003:Q38)

### CHAPTER 18: ANSWERS

- 1C. Hence the hormones of the adrenal medulla are called emergency hormones

#### NOTES:

- These hormones prepare an animal to flee danger (flight) or face it (fight) - fight and flight hormones
  - Medullary hormones are
    - Adrenalin (or epiphine)
    - Nor-adrenalin (or nor-epiphine)
  - Adrenal cortex produces another sets of hormones called cortical hormones
    - Mineralocorticoids e.g aldosterone
    - Glucocorticoids e.g cortisol.
- 2E. The two hormones are
- Insulin - converts excess blood glucose to glycogen (animal starch) for storage in the liver and muscle cells.
  - Glucagon - converts glycogen to glucose when blood sugar falls - it reverses the action of insulin  
Glucose insulin Glycogen glucagon

#### NOTES:

- Diabetes here suggests persistently high level of glucose in the blood even when the sufferer is not in post-meal prandial state (i.e just after a meal)
  - The excess glucose (hyperglycaemia) means renal threshold for glucose has been exceeded and the kidney flushes out the excess glucose with urine (glucosuria - sugar in urine) with attendant high volume of urine (polyuria). "Diabetes" literally means large amount of urine.
  - The above scenario is called Diabetes Mellitus (DM)
  - Diabetes Insipidus (DI) does not involve hyperglycaemia glucosuria (but only polyuria) and it is due to deficiency of the hormone ADH (not insulin)
- 3D. Urea is made by the liver, filtered from blood into urine by the kidney and stored in the urinary bladder for subsequent excretion via the urethra (Compare: Ureter)
- 4B. See Q1
- 5E. Breakdown of excess amino acid (D) by the liver is called Deamination and it leads to the formation of urea but the latter is excreted (filtered) from the blood by the kidneys (See Q3)

#### Other Liver functions

- Metabolism of carbohydrates, proteins, fats and drugs
  - Storage of vitamins
  - Synthesis of blood proteins
  - Storage of blood and mineral salts (especially Iron)
  - Generation of heat
  - Detoxification of poison
- 6B. See Q5
- 7D. Their release is triggered by the concentration of one chemical or the other in the body e.g calcium and calcitonin; water and ADH; Glucose and Insulin; Salts- Aldosterone
- 8D. See Q5
- 9C. See Q5 2 and 7
- 10C. Thyroxin, like growth hormone, contributes to growth but it is also required for development in young animals hence its deficiency before maturity produces a cretin who is:
- dwarfed
  - Mentally retarded
  - Sexually undeveloped
  - Cold Intolerant
  - Obese etc

**NOTES:**

- Undersecretion of thyroxin after maturity leads to myxedema, a condition which causes:
  - Slow metabolic rate
  - General sluggishness or lethargy
  - Truncal obesity
  - Retarded sexual and mental activities
- Hypersecretion of thyroid hormones has opposite effects and creates a condition called exophthalmic goitre characterized by:
  - Very high metabolic rate
  - High rate of heart beat
  - Insomnia - inability to sleep
  - General restlessness
  - Muscle wasting/weight lost in spite of high food intake
  - Protrusion of eye balls (hence "exophthalmic")
  - Anterior swelling of the neck (hence "goitre")
- Thyroxine (T3) and Thyronine (T4), the two hormones involved, require 3 and 4 atoms of Iodine respectively for their syntheses.
- Iodine deficiency in the diet leads to hyperplastic goitre as a result of continuous activation (but to no avail) of the thyroid by TSH from the pituitary.

**11B. Functions of Gibberellins**

- They promote growth at root and stem apices
- They stimulate stem growth in dwarfed plant varieties
- They activate dormant seed to germinate
- They activate dormant axillary buds to grow
- They increase the size of fruits

**Functions of Auxins**

- They stimulate growth
- They stimulate the development of lateral and adventitious roots.
- These cause the increase in girth of stem by stimulating the vascular cambium
- They promote the development of fruits
- They inhibit the growth of lateral buds to ensure apical dominance by inducing the formation of ethene (see below)
- They inhibit the process of abscission

**Functions of Cytokinins**

- Also act as growth hormones
- They stimulate lateral buds (unlike auxins) to grow into branches
- They delay aging in plants.

**Functions of Abscissic Acid**

- Inhibits growth of terminal and lateral buds
- It promotes dormancy until favourable conditions return
- It promotes aging
- Promotes abscission (including leaf fall)
- Influences the opening and closing of stomata

**Functions of Ethylene (Ethene)**

- Slows down the development of lateral buds (in apical dominance)
- Hastens the opening of fruits and this can be artificially induced.

**NOTES:**

- Auxins are the most important plant hormones
- The most important known auxin is Indole Acetic Acid (IAA)
- Excess auxins could be herbicidal
- Abscission is falling off from a plant any part of it such as leaves, fruits, branches and flower.
- Abscissic acid antagonizes all the three sets of growth hormones - auxins, gibberellins and cytokinins

12D. See Q11

13A. Endocrine system involves chemical transmission as hormones are released directly into, and transferred by, the blood while nervous transmission is a wave of electrical

activities passing along nerve fibre but this can be traced to chemical transmission across the cell membrane from one section of the length of the fibre to another.

**Differences between Hormonal/Nervous Systems**

Nervous	Hormonal
1. Messages pass as electrical wave along in nerves although with a chemical underpinning	1. Messages pass as chemical substances called hormones in the blood stream.
2. Transmission along nerve fibres	2. Transmission via blood
3. Transmission rapid	3. Transmission is slower by comparison.
4. Response is rapid (in fractions of a second)	4. Response is usually
5. Respiration is precise but temporary	5. Response is diffuse (widespread) and long-lasting
6. Effects are usually and local and temporary	6. Effects may be wide-spread permanent
7. Message is received by effector organs namely muscles and glands	7. Message is received by target organs.

14B. A growth hormone (See Q 11)

15B. But when it is hot, blood vessels dilate to increase the amount blood available to the skin (A) and heat near the surface is dissipated to the surroundings mainly as radiant heat

**NOTES:**

- Regulation of body temperature is part of homeostasis
- Main organs/systems involved in homeostatic processes are i. Skin ii. Liver iii. Kidney iv. Endocrine system v. And all are overseen by the brain

16A. See Q 2

17C. Contractile vacuole accumulates and eliminates excess water.

18B. Metabolism proceeds even below the basal level in the absence of thyroid hormones (See also Q10)

19C. See Q 11

20C. ... although the hormones used to achieve that is released from the pancreas.

21B. III → Subcutaneous fat.

22A. Note the sweat duct and the sweat pore on the surface. I &amp; IV → nerve endings

23A. Precisely in the pituitary

**NOTES:**

- Pituitary hormones from
  - Anterior pituitary
    - Growth Hormone (GH)
    - Thyroid Stimulating Hormone (TSH)
    - Adrenocorticotrophic Hormone (ACTH)
    - Follicle Stimulating Hormone (FSH)
    - Luteinizing Hormone (LH)
    - Prolactin
  - Posterior pituitary
    - Oxytocin
    - Anti diuretic Hormone ((ADH)
- The pituitary gland is called the master gland because some of its hormones have tropic/stimulating effects on other endocrine glands (i.e. it is a gland of glands)
- Tropic hormones of the pituitary:
 

ACTH — stimulates the adrenal cortex  
TSH — stimulates the thyroid  
FSH/LH - stimulates the gonads.
- Prolactin** causes the production of milk in female mammals.

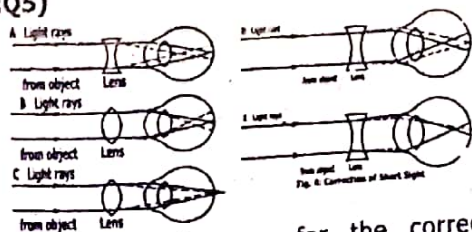
- Oxytocin** causes the contraction of the uterine musculature (myometrium) during child birth and it also promotes secretion of milk (milk let-down)
- ADH prevents diuresis (excessive water loss via urine) by stimulating the distal convoluted tubules of the kidneys making them more permeable to water for reabsorption)
- Undersecretion of ADH causes diabetes insipidus
- Other Endocrine organs:  
Neck - Thyroid  
Abdomen - Pancreas/Adrenal glands  
Pelvis - Gonads (as testes or ovaries)
- Gibberellin cause growth by inducing cell elongation and some slow cell division while auxins cause the three aspects of growth namely rapid cell division, cell elongation and cell differentiation
- NOTE:** Cytokinnins cause only cell division.
- See Q3 26D. See Q23
- IV - gonads which secrete testosterone that causes the development of male secondary sexual characteristics e.g facial hair development
- See Q3 29A. See Q11 30A. See Q23
- The shivering generates heat and besides the skin (Q15) develops goose pimples (or bumps) to contribute to conservation of heat
- When the sweat from the gland evaporates from the skin surface, the skin experiences cooling.
- Adrenal (or supra renal)
- III - Pancreas

**NOTES:**

- Pancreatic hormones are produced in the cells found in the islets of Langerhans
- Islet - Small Island
- Insulin - insular (check the dictionary meaning)
- The pituitary (Q23)
- Their secretions cause the animal to behave in specific ways
- The kidney decides to retain or flush out (excrete) these substances in the blood according to the body needs
- See Q11
- The pituitary is controlled by and connected to the hypothalamus (by the infundibulum or pituitary stalk)
- See Q11
- i.e. diuresis (See Q23)
- Also progesterone by the ovaries

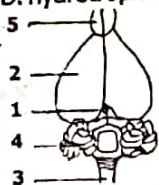
**CHAPTER 19: THE NERVOUS SYSTEM**

- People suffering from myopia A. can see near objects clearly. B. can see far away objects clearly C. cannot see any objects clearly D. are colour blind E. are able to see better in the dark. (1978:Q5)



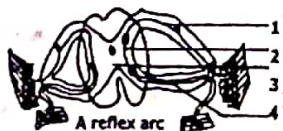
- The fig shows diagrams for the correction of shortsightedness. If the unbroken lines represent the light rays from the object and the broken lines the refracted rays through the lens, which of these is correct. A. A B. B C. C D. D E. E (1978:Q39)
- In a phototropic experiment, young seedlings in a box were subjected to light from one direction. The seedlings continued to grow erect. Which of the following statements is correct? A. Only the tips of the seedlings received light. B. The light was not strong enough C. The seedlings were rather too

- young D. the tips of the seedlings may have been covered E. The box containing the seedlings should have been placed on a laboratory bench. (1978:44)
- When the ciliary muscle of the eye contracts, the eye lens A. bulges B. contracts C. rotates D. flattens E. is rounded. (1979:Q17)
- The part of the mammalian brain responsible for maintaining balance is A. medulla oblongata B. cerebellum C. optic lobe D. cerebrum E. olfactory lobe. (1979:Q20)
- Which part of the human brain is concerned with reflexes controlling the rate of heartbeat and breathing? A. Medulla B. cerebrum C. Pineal body E. Olfactory lobe (1980:Q32)
- The following are connected with the movement of a reflex action. (1) Central nervous system (2) Muscle (3) Skin (4) Sensory nerve (5) Motor nerve. Which of the following sequences indicates a correct path? A. 1-2-3-4-5. B. 2-1-4-5-3 C. 3-4-1-2-5 D. 4-1-5-2-3 E. 3-4-1-5-2 (1980:Q34)
- Biconcave lenses are used in the correction of an eye defect called A. myopia B. colour blindness C. old age D. hypermetropia E. weakening of ciliary muscles (1980:Q36)
- The centre which controls respiratory activities in the mammalian brain is the A. cerebrum B. olfactory lobes C. pituitary organ D. cerebellum E. medulla. (1980:Q37)
- The tips of some rice seedlings were cut off while some were left intact. Both were covered with a container which had only one small hole to allow light through. After twenty-four hours it was observed that A. the cut tips bent away from light B. the cut tips bent towards source to light C. the intact tips bent away from the light D. the intact tips bent towards light E. both tips bent away from light. (1980:Q40)
- Which of these instruments is used to demonstrate the response if roots and shoots to gravity? A. kinostat B. Manometer C. Potometer D. Photometer. (1981:Q17)
- Accommodation of the human eye is best described as the A. ability to see distant objects B. movement of upper and lower eyelids C. focusing of near and distant objects D. changing of lens shape due to varying light intensities E. constant adjustment of the iris. (1981:Q26)
- Growing yam tendrils climb for support. This growth response is A. haptotropism B. geotropism C. phototropism D. hydrotropism E. chemotropism. (1981:Q42)



- Which of the labelled parts in the figure controls the muscles which maintain balance? A. 5 B. 4 C. 3 D. 1 E. 2 (1981:Q45)
- Roots of plants are normally A. positively phototropic B. negatively geotropic C. negatively hydrotropic D. negatively chemotropic. (1982:Q16)
- The part of the mammalian eye that strongly bend light rays are the A. cornea and the lens B. cornea and aqueous humor C. cornea and vitreous humor D. lens and aqueous humor E. lens and vitreous humor. (1982:Q25)
- External ears of mammals consists of A. pinna and tympanum B. pinna only C. auditory meatus only D. auditory meatus and pinna E. auditory meatus and tympanum. (1982:Q29)
- Which of these parts of the mammalian ear is directly concerned with the sense of balance? A. Cochlea B. Eustachian tube C. Ear-drum D. Pinna E. Semicircular canals. (1982:Q33)
- The movement of part of a plant in response to external stimulus of no particular direction is A. taxis B. tropism C. haptotropic movement D. nastic movement E. phototropism (1983:Q15)

20. The part of the mammalian brain responsible for maintaining balance is the A. medulla oblongata B. olfactory lobe C. cerebellum D. cerebrum E. frontal lobe. (1983:Q16)
21. In a positive phototropic response of a coleoptile, the region of greatest curvature is brought about by the A. movement of auxins away from the region of curvature, B. even distribution of auxins in all parts of the coleoptile, C. inhibition of growth by auxins in the region of smaller curvature D. concentration of auxins in the region of curvature E. absence of auxins in the coleoptile. (1983:Q37)
22. The function of the ossicles (malleus, incus and stapes) in the mammalian ear is the A. transmission of vibrations B. regulation of pressures C. support of the inner ear D. maintenance of balance during motion E. secretion of oil. (1983:Q39)
23. If an animal is very active and has good muscular control, it is likely to have well-developed A. olfactory lobes B. cerebral hemispheres C. optic lobes D. cerebellum E. spinal cord (1994:Q37)
24. Movements and positions of the head in man are detected by the A. cochlea B. malleus C. utricle D. semicircular canals E. outer ear (1985:Q28)
25. An old man is likely to be long-sighted because age affects the A. optic nerves B. retina C. ciliary muscles D. cornea E. aqueous humour. (1985:Q39)
26. In a mammal, stimulus is transferred from the receptor muscle to the central nervous system through the A. motor neurons B. effector muscles C. dendrites D. sensory neurons E. synapses. (1985:Q40)
27. Nastic movement is A. response to light stimulus B. non-directional C. directional D. response to internal stimulus (1986:Q33)
28. An instrument that can be used to demonstrate phototropism and geotropism in plants is the A. auxanometer B. potometer C. klinostat D. photometer. (1986:Q41)
29. The growth of a coleoptile towards unilateral light source is due to A. rapid rate of photosynthesis B. unequal distribution of auxins C. the effect of geotropism D. the effect of photolysis. (1987:Q36)
30. The sequence of ear ossicles from the fenestra ovalis is A. malleus, incus and stapes B. malleus, stapes and incus C. stapes, incus and malleus D. stapes, malleus and incus. (1987:Q37)
31. The centre for controlling body temperature in the brain is the A. cerebrum B. cerebellum C. medulla D. hypothalamus. (1987:Q38)
32. Taxism differs from tropism because A. the whole organism is affected B. it is a directional movement C. it is a response to multi-directional stimuli D. part of the organism is affected. (1988:Q27)
33. The main function of the choroid is A. protection of the eye ball B. transmission of light C. supply of nutrients to tissues of the eye D. converging light. (1988:Q34)
34. What part of the central nervous system is concerned with answering an examination question? A. Cerebrum B. Cerebellum C. Medulla oblongata D. Spinal cord. (1988:Q35)
35. The region that controls most of the unconscious processes of a mammalian body is the A. cerebellum B. cerebrum C. spinal cord D. medulla oblongata. (1989:Q35)
- Use the figure below to answer questions 36 and 37**
36. All the cell bodies in the spinal cord are found in A. 1 B. 2 C. 3 D. 4 (1990:Q33)
37. In a reflex action, impulse flows from A. 1 to 2 B. 2 to 1 C. 4 to 1 D. 4 to 2 (1990:Q34)
38. The part of the ear that is concerned with balance is the A. semi-circular canals B. incus C. malleus D. Eustachian tube. (1990:Q35)
39. The movement of the whole organism to an external stimulus is termed A. tropism B. a taxis C. a nastic movement D. a phototropic movement. (1991:Q30)
40. Neurons that receive stimuli from the body or internal organs are called A. sensory neurons B. efferent neurons C. motor neurons D. relay neurons. (1992:Q31)
41. The response shown by the tips of the root and shoot of a plant to the stimulus of gravity is A. haptotropism B. phototropism C. hydrotropism D. geotropism. (1993:Q23)
42. In the mammal, the autonomic nervous system consists of A. sympathetic and parasympathetic systems. B. brain and spinal nerves C. brain and cranial nerves D. spinal cord and spinal nerves. (1993:Q28)
43. Which path does sound entering the human ear follow? A. Oval window ossicles ear drum B. ear drum oval window ossicles C. Ear drum ossicles oval window. D. Ossicles ear drum oval window. (1993:Q32)
44. When a short-sighted person views a distant object without spectacles, the image is formed A. on the retina B. in front of the retina C. behind the retina D. on the blind spot. (1994:Q27)
45. The part of the brain that controls heart beat and breathing is the A. olfactory lobe B. cerebellum C. cerebral hemisphere D. medulla oblongata. (1994:Q29)
46. When a healthy shoot of a flowering plant is illuminated from one side, auxin accumulate on the A. non-illuminated side of the shoot B. illuminated side of the shoot C. upper side of the shoot D. lower side of the shoot. (1995:Q20)
47. The process of walking is under the control of the part of the brain called A. optic lobe B. olfactory lobe C. cerebellum D. medulla oblongata. (1995:Q26)
- Use the diagram below to answer questions 48 and 49**
48. The diagram represents A. sensory neurone B. relay neurone C. afferent neurone D. motor neurone (1995:Q28)
49. The part labelled X is the A. axon B. cell body C. terminal dendrites D. synapse. (1995:Q29)
50. Which of the following ions is involved in the conduction of the nerve impulse? A.  $Ca^{2+}$  B.  $K^{+}$  C.  $H^{+}$  D.  $Mg^{2+}$ . (1995:Q30)
51. The part of the brain that regulates most biological cycles in humans is A. olfactory lobe B. optic lobe C. medulla oblongata D. pineal body. (1997:Q31)
52. The ability of the eye to focus on both near and distant objects is termed A. image formation B. refraction C. hypermetropia D. accommodation. (1997:Q32)
53. The small masses of nervous tissues in which many neurons have their nuclei are called A. dorsal roots B. ventral roots C. ganglia D. synapses (1998:Q27)
54. The correct sequence for the operation of smell in mammals is A. chemicals olfactory nerve endings brain B. dissolved chemicals nasal sensory cell brain C. chemicals mucus membrane sensory cells brain D. dissolved chemicals sensory cells olfactory nerve brain (1999:Q28)
55. The part of the brain that controls body posture in mammals is the A. thalamus B. cerebrum C. spinal cord D. cerebellum (2000:Q12)
56. Short-sightedness can be corrected by lenses which are A. convex B. biconvex C. planoconvex D. concave (2000:Q18)



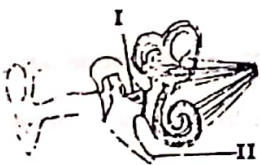
57. The inner ear contains two main organs, namely, the  
 A. eardrum and Eustachian tube B. cochlea and semi-circular canals C. oval window and ossicles D. pinna and cochlea (2000:Q19)
58. The centre for learning and memory in the human brain is the  
 A. medulla oblongata B. cerebellum C. cerebrum D. olfactory lobe (2001:Q12)

Use the diagram below to answer questions 59 and 60

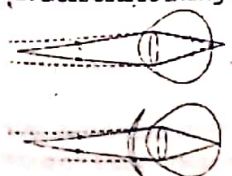
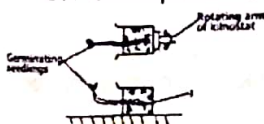


59. The parts which function together to bring about hearing are labelled. A. IV, V and VI B. I, II, IV and VI C. I, II, III and IV D. I, II and IV (2001:Q22)
60. The part labelled II is the A. fenestra ovalis B. middle ear canal C. internal auditory meatus D. ear ossicles (2001:Q23)
61. The structure can be found in the A. Sympathetic and parasympathetic nervous systems B. Peripheral and central nervous systems C. Peripheral nervous system only D. Central nervous system only (2003:Q24)
62. The point marked I is referred to as A. myelin sheath B. dendrites C. axon D. node of Ranvier (2003:Q25)
63. The response of plants to external stimuli in a non-directional manner is known as A. Tactic movement B. Phototropism C. Geotropism D. Nastic movement (2003:Q28)
64. Nervous control differs from hormonal central in that the former A. involves only chemical transmission B. is a slower process C. produces short-term changes D. has no specific pathway. (2004:Q29)
65. The two key cations involved in the action potential of nervous transmissions are A.  $\text{Na}^+$  and  $\text{Fe}^{2+}$  B.  $\text{Mg}^{2+}$  and  $\text{K}^+$  C.  $\text{N}^{3-}$  and  $\text{K}^+$  D.  $\text{Fe}^{2+}$  and  $\text{Mg}^{2+}$  (2004:Q31)
66. When bacteria swim from cold to warm regions, this is known as A. negative chemotaxis. B. positive thermotaxis C. positive phototaxis D. negative phototaxis. (2005:Q23)

Use the diagram below to answer questions 67 and 68



67. The structure labeled I is the A. incus B. malleus C. hammer D. stapes. (2005:Q29)
68. A function of the part labeled II is to A. equalise pressure on both sides of the tympanum B. conduct sound waves to the brain C. help the animal maintain balance or posture D. transform sound waves into electric impulses. (2005:Q30)
69. One basic similarity between nervous and endocrine system is that they both A. produce widespread effects B. transmit very fast impulses C. involve the use of chemical substances D. Produce precise and short lived effects. (2006:Q6)
70. The experiment demonstrates A. geotropism B. thigmotropism C. Phototropism D. hydrotropism (2007:Q33)
71. The part marked I will contain contain a high concentration of A. ascorbic acid B. abscisic acid C. ethylene D. auxin. (2007:Q34)
72. The transmission of impulses along a nerve fibre is characterised by A. hormonal and temperature changes B. electrical and ionic changes C. hormonal changes D. electrostatic changes. (2008:Q28)



73. The eye defect illustrated is A. myopia B. hypermetropia C. astigmatism D. cataract. (2009:Q27)

74. The function of the correcting lens is to A. diverge incoming rays B. converge incoming rays C. reflect incoming rays D. screen incoming rays. (2009:Q28)
75. Which of the following stimuli is likely to elicit a nastic response in an organism? A. Light intensity B. Chemical substances C. Gravity D. Touch. (2010:Q23)
76. The ability if a living organism to detect and respond to changes in the environment is referred to as A. growth B. taxis C. locomotion D. irritability. (2011:Q15)
77. The part of the mammalian ear responsible for the maintenance of balance is the A. perilymph B. ossicles C. cochlea D. pinna. (2011:Q21)
78. The movement response of a cockroach away from a light source can be described as A. negative phototropism B. positive phototropism C. positive phototaxis D. negative phototaxis. (2011:Q23)
79. The autonomic nervous system consists of neurons the control the A. voluntary muscles B. heartbeat C. tongue D. hands. (2012:Q27)
80. The sensory cell that responds to dim light is referred to as the A. lens B. rod C. iris D. cone. (2013:Q36)
81. The eye defect caused by the development of cloudy areas in the lenses is A. glaucoma B. cataract C. astigmatism D. presbyopia. (2013:Q39)
82. Coordination and regulation of body activities in mammals are achieved by the A. nerves and muscles B. nerves and hormones C. nerves only D. hormones only. (2014:Q23)
83. The cerebellum of the brain controls A. reflex actions B. muscular activity C. emotional expressions D. the endocrine system. (2014:Q24)
84. The part of the brain responsible for peristalsis is the A. olfactory lobe B. medulla oblongata C. hypothalamus E. thalamus. (2014:Q25)

#### CHAPTER 19 ANSWER

- 1A. "... but cannot see far objects"

##### NOTES:

- Myopia = short sightedness
- Myopia may be caused by
  - eyeballs being longer than normal
  - eye balls lying deeper than normal
- Image from distant object is brought to focus prematurely before the retina instead of on the retina.
- Myopia is corrected by wearing concave lenses which diverge the rays and delay their premature convergence
- Hypermetropia = long sightedness
  - Distant objects are seen clearly; near ones appear blurred.
  - Eyeballs are shorter than normal or lie less deep in the socket
  - Long-sight is corrected by using convex lenses to converge the rays otherwise the image is brought to a focus behind the retina
- Other eye defects
  - Presbyopia - A defect in the elderly
  - Astigmatism - Due to uneven cornea and seeing horizontal lines is difficult.
  - Cataract - cloudy material obstructing the lens
  - Night blindness— Due to lack of vitamin A.
  - Xerophthalmia --- Dry-eye condition, may be caused by vitamin A deficiency
  - Conjunctivitis - Inflammation of the conjunctiva usually caused by bacterial infection e.g. Glaucoma - Due to increased Intraocular pressure (IOP)



2D. See Q 1

3D. "... otherwise the seedlings would bend (grow) towards the

light under the influence of the uneven distribution of auxin around the tip

**4A. When Ciliary Muscle Contracts**

1. Suspensory ligament slackens
2. Lens gets shorter and thicker or fatter (i.e it bulges)
3. The eye can accommodate near objects in this condition

**When Ciliary muscle relaxes**

1. The ligament tightens
2. Lens becomes thinner and longer (or elongated)
3. The eye can focus distant objects in this state

**NOTES:** This ability of the eye to bring images to perspective on the retina at varying distances of the object is called **accommodation** as the events above cause the focal length of the lens to vary accordingly.

5B. Cerebellum for posture and balance (equilibrium) because it coordinates voluntary muscles.

**Functions of the Cerebrum**

1. It is the seat of intelligence, learning, memory, thinking, reasoning, judgement, sense of morality, creativity, power and imagination
2. Sensory perception e.g of pain, pleasure, temperature, touch, sight, hearing, taste and smell
3. Initiation and control of skeletal (voluntary) muscle contraction.

**Functions of the Hypothalamus**

1. It controls the centres for regulation of body temperature, thirst, appetite and alertness (or wakefulness)
2. It serves as a link between two important coordinating systems namely the Nervous and endocrine systems

**Function of the Pons Varolli**

Pons varolli or simply called the pons, connects the two lateral cerebral hemispheres (Pons literally means bridge)

**Functions of the Medulla Oblongata**

1. The medulla controls involuntary activities such as respiration, heartbeat, digestion (peristalsis) as well as vasoconstriction and vasodilation
2. Its neuronal components constitute the relay station between the spinal cord and the cerebrum

**Divisions of the Brain**

1. Fore brain
  - a. olfactory lobes
  - b. cerebrum
  - c. Hypothalamus
2. Mid brain
3. Hind brain
  - a. The pons
  - b. The medulla
  - c. The cerebellum

**NOTE:** Midbrain + hind brain = Brain stem.

6A. See Q5

**7E. Simple Reflex Arc**

3. Skin → Receives the sensory input
4. Sensory neuron → Takes impulse from skin to the CNS
  1. CNS - Processes and interprets information
5. Motor nerve → Takes impulse from CNS to effector i.e muscle or gland
  2. Muscle → contracts in response to stimulation by motor nerve fibre.

**NOTE:** Interneuron may/may not be involved

8A. See Q1 9E. See Qs 5 and 6 10D. See Q3

11A. The clockwork of the clinostat helps to rotate the seedlings on its disc to ensure even distribution of auxins at the apices of the plumules and radicles

12C. See Q4

13A. Haptotropism = Thigmotropism

**Types of Tropism or tropic movement**

1. Phototropism - Response to light

2. Hydrotropism - Response to water

3. Geotropism - Response to gravity

4. Haptotropism - Response to touch.

**NOTES:**

1. Phototropism is also called heliotropism (Helio = Sun)
2. Negative tropism - Growing away from the stimulus
3. Positive tropism - Growing towards.
4. To the same stimulus, the root and the stem respond differently

**PUT A DIAGRAM**

14B. 4 → cerebellum (see Q5). The cerebellum derives its sensory inputs from the muscles, joints, the eyes and the ears to coordinate body balance

2 → cerebrum 1 → pineal body 3 → The medulla  
5 → Olfactory lobe

15D. See Q13

16E. The optical (transparent) parts of the eye are conjunctiva → cornea → aqueous humour → lens → vitreous humor (until the light rays, heavily converged by the lens and vitreous humour, are finally brought to a focus on the Retina.

17D. External Ear

Pinna + External auditory/acoustic meatus

Middle Ear

Tympanic membrane + Tympanic chamber

**NOTE:**

1. The chamber is air-filled and contains the three ossicles (small bones) namely
    - a. Malleus or Hammer
    - b. Incus or anvil
    - c. Stapes or Stirrup
  2. The chamber leads to the pharynx (throat) via the Eustachian tube
  3. Tympanic membrane = Ear drum
- The Inner Ear
1. Round and oval windows
  2. Sacculle and utricule
  3. Semicircular canals and cochlea

18E. **Cochlea:** For hearing proper

**Eustachian tube:** To equilibrate air pressure on both sides of the tympanic membrane

**Eardrum:** Transmits vibrations to the ossicles when sound waves impinge on it.

**Ossicles:** Amplify the vibration of the membrane manifold

**Pinna:** Collects, concentrates and channels sound waves into the middle ear

19D. Nastic Movement

1. A non-directional response to a multi-directional stimulus
  2. Only parts of the plant move
  3. Examples: Mimosa plant, pitcher plant, flamboyant
- Tactic Movement = Taxis = Taxism
1. A directional response to a uni-directional stimulus
  2. The whole organism moves (translocation)
  3. Taxism could be phototactic, chemotactic or thermotactic
4. Examples: Positive phototaxis in chlamydomonas and euglena in a pond; Positive chemotaxis of white blood cells towards bacterial cells; Thermotaxis of bacteria towards a warm region.
- Tropic movement = Tropism
1. A directional response to a unidirectional stimulus
  2. Only a fixed part of the plant moves e.g plumule (shoot) or radicle (root).
  3. The movement is actually a growth movement

20C. See Q5

21D. The part away from the light source thus grows faster than the illuminated side of the stem hence coleoptile

(plumule sheath) bends toward light. Coleorhiza (radicle sheath) has opposite response as auxins move towards the side exposed to light.

- 22A. Transmission and amplification (see Q18)  
23D. See Q5      24D. See Q18 and compare Q14  
25C. The muscles slacken and this largely affects the accommodation of the eye in the elderly (Presbyopia; See Q1)  
26D. See Q7      27B. See Q19      28C. See Q11  
29B. See Qs 3 and 30C. See Qs 17

**NOTE:** Fenestra ovalis = oval window  
Fenestra rotunda = Round window

- 31D. See Q5      32A. See Q19  
33C. It particularly provides nourishment for the retina - Nutritive function.

The three layers of the eyes

1. Sclera - outermost
2. Choroid - middle
3. Retina - innermost

**NOTES:**

1. The sclera or sclerotic layer protects the delicate structure within the eyeball-protective function
2. The sclera also has optical function as it is transparent in the anterior part of the eye where it is known as the cornea.
3. The retina contains photosensitive cells called photoreceptors that transmit nerve impulses to the brain via the optic nerves
4. The conjunctiva, a thin transparent membrane, lines the outer surface of the cornea and it is continuous with the epithelium of the eyelids.
5. The choroid layer is black, pigmented and highly vascularised (rich supply of capillaries) for nourishment
6. The choroid forms a thickened ring of muscle at its free edges as ciliary muscle

- 34A. See Q5  
35C. The spinal cord mediates most of the unconscious activities of the body while the brain does the rest (medulla oblongata) as well as all voluntary actions

**NOTE:** Involuntary actions = reflex actions

- 36C. This is why (3) is greyish (grey matter) while the outer part of the spinal cord (containing axonal fibres) is white (white matter)

**NOTE:** This is reversed in the brain: Grey matter outside white matter inside (except at the medulla)

- 37A. 1 to 2 to 4  
1 → sensory or afferent neuron  
2 → intermediate or relay neuron  
4 → motor or efferent neuron

- 38A. See Q18      39B. See Q19  
40A. While motor neurons take it to effectors (see Q7)  
41D. See Q13      42A.      43C. See Q17  
44B. See Q1      45D. See Q5

- 46A. Compare Qs 3 and 21      47C. See Q5  
48A. Motor neuron taking impulses to an effector (muscle)  
49B. The cell body = soma  
50B.  $K^+$  and  $Na^+$  involved  
51D. The pineal body (Q14) controls the internal biological clock of the body i.e the so-called circadian rhythm

**NOTES:**

1. The pineal body is so named because it resembles a "pine" cone.
2. It is located very close to the famed pituitary gland. It is endocrinal as it releases melatonin, a hormone which controls the sleep-wake cycle

4. Other functions of the pineal body
  - a. It controls youthfulness and the aging process
  - b. It controls sex drive, hunger/ satiety, and thirst
5. Most of the pineal functions are linked with the hypothalamus
6. Common names pineal body is known by
  - a. Pineal body      b. Pineal organ      c. Pineal gland
  - d. "Third eye" (of the body)

- 52D. See Q4  
53C. A ganglion is a collection of neuronal cell bodies e.g dorsal root ganglia along the spinal cord.

- 54D. The chemical must first dissolve in the moisture on the surfaces of the sensory cells lining the nasal epithelium which are connected to nerve endings that aggregate to form the olfactory nerves which in turn reach the olfactory lobes of the brain

- 55B. See Q5      56D. See Q1  
57B. Cochlear and vestibular portions of the auditory nerve emanate from the cochlea (for hearing) and the ampullae of the semi-circular canals (for balance) respectively (see Qs 17 and 18)

**NOTE:** Auditory Nerve = Vestibulocochlear nerve.

- 58C. See Q5  
59C. I → External acoustic meatus  
II → The ossicles  
III → The sacculus of the cochlea  
IV → The cochlea

- 60D. See above  
Also: V → Eustachian tube or internal auditory meatus  
VI → bone

- 61B. A typical multipolar and motor neuron which usually has its cell body in the CNS and its axon (fibre) in the peripheral nervous system.

- 62D. Constrictions or interruption on the myelin sheath.

- 63D. See Q19      64C. See Chapter 18  
65C. See Q50      66B. See Q19  
67D. Stapes (also called stirrups) is closest to, and abut on, the oval window (fenestra ovalis) - see Qs 17 and 30

- 68A. See Q18  
69C. Endocrine system uses neurotransmitters as well as  $Na^+$  and  $K^+$  (See Q64 and Chapter 18)

- 70A. Response to gravity (earth's pull) - See Q13

- 71D. See Qs 3, 11, 13, 19, 21

- 72B. Now see Q50 and 69

- 73B. See Q1      74B. See Q1

- 75D. The leaves of mimosa plant close up on being touched, the lid of a pitcher plant closes on the entry (touch) of an insect, sleeping movements of the flamboyant's compound leaves in response to low light intensity are all nastic responses. This question is ambiguous but go for "touch"

- 76D. i.e sensitivity  
77A. The ampullae of the semi-circular canals (Q57) contain sensory cells bathed in perilymph (a fluid) and the movement or orientation of this fluid in the canals triggers the stimulation of the vestibular nerves which is connected to the cerebellum of the brain (for balance)

- 78D. The whole organism moves away (Q19)

- 79B. The autonomic nervous system (ANS) controls involuntary muscles such as seen in the heart, the gut and blood vessels while the somatic nervous system (SNS) controls voluntary muscles

**NOTES:**

1. Involuntary muscles are not under the control of the will and there are two types

- a. smooth muscle - seen in the wall of a hollow viscus (plural: viscera) e.g alimentary canal, blood vessels etc.
- b. cardiac muscle - Striated muscle type seen only in the heart and responsible for its continuous beats
2. Voluntary muscles are controlled by one's will and are attached to bones e.g biceps, triceps, rectus abdominis etc
3. Involuntary muscle = smooth muscle or cardiac
4. Voluntary muscles = skeletal muscles = striated muscles
5. The tongue is a voluntary muscle
6. Ciliary muscle of the eye is smooth and involuntary but the extraocular muscles are not.

80B. rod → Dim light

Cone → Coloured light

Photoreceptors in the Eyes

1. Rods are sensitive to dim light as well as black and white hues
2. Cones are sensitive to bright light and detect coloured lights other than black and white.
3. Rods are more populous in the eye than cones- 120 million vs. 6 million

81B. See Q 1

82B. The nervous and endocrine systems are the two coordinating systems of the body (See Chapter 18)

83B. See Q5      84B. See Q5

## CHAPTER 20:

### AGRICULTURE. SOIL SCIENCE

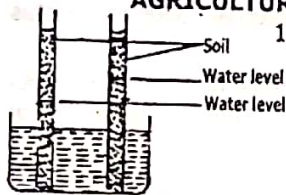


Fig. 6 Experiment with Soil

1. The fig represents an experiment with two types of soil. The experiment demonstrates A. soil attraction of water B. soil porosity C. soil capillarity D. draining capacity soils E. oil permeability. (1978:Q50)
2. Which of these is not a type of soil? A. Sand B. Granite C. Loam D. Clay E. Sandy loam. (1979:Q26)
3. The farmer cannot check soil erosion effectively by A. Constructing his ridges for planting across the slope B. cultivating cover crops C. practicing strip cropping. D. clearing the land of vegetation E. constructing terraces. (1979:Q27)
4. If three 30 cm lengths of glass tubing are tightly packed with clay, sand and loamy soils respectively and then stood in a beaker of water for one week, the level of water will be A. lowest in the tube with clay B. the same in all the tubes C. lowest in the tube with loamy soil D. highest in the tube with sandy soil E. lowest in the tube with sandy soil. (1980:Q41)
5. Leguminous plants, e.g Mucuna, are usually planted in cultivated farmlands because they A. enrich the soil with phosphates B. provide animals with food C. enrich the soil with organic nitrogen D. protect the soil from being overheated E. protect the microorganisms in the soil. (1980:Q43)
6. A few grams of dried soil were first heated until red hot and then further heated until no more smoke was released. This experiment was to determine the A. amount of water in soil B. percentage of water in soil C. presence of humus in soil D. resistance of laterites to heat E. release of smoke from the soil. (1980:Q45)
7. In which of the following plants is swollen shoot disease common? A. Groundnut B. Cocoa C. corn D. cotton E. Rubber. (1981:Q38)
8. Soil is said to be fertile if A. it is black B. it can supply usable nutrients to plant C. The oxygen content is very high D. artificial manure is added to it E. it is not waterlogged. (1981:Q43)
9. Treatment of a poor soil with lime supplies A. sulphur B. calcium C. phosphorus D. sodium. (1982:Q21)
10. If a farmer left his land uncultivated for five years before returning to it. A. modern agriculture B. strip cropping C. contour ridging D. crop rotation E. the bush fallow system. (1982:Q35)
11. A 28g soil sample was heated to a constant weight of 24g. When further heated to red hot and cooled, it weighed 18g. What is the percentage of humus in the soil? A. 22.2 B. 55.6 C. 75.0 D. 25.9 E. 35.7. (1983:Q21)
12. Erosion can be reduced along a slope by A. ridging across slope B. ridging up slope C. ridging down slope D. crop rotation E. bush fallowing system. (1984:Q46)
13. If a handful of soil is shaken with water and left to settle, the soil particles will settle from light to heavy particles as follows: A. humus, clay, silt, sand, stones B. humus, silt, clay, sand, stones C. humus, clay silt, stones, sand D. humus, sand, silt, clay, stones E. clay, humus, silt, sand, stones. (1984:Q47)
14. Leaching is A. washing away of humus from the soil surface B. reduction of soil aeration by pressure C. soil erosion by means other than rainfall D. loss of organic matter due to exposure to direct sunlight E. washing out of chalk and limestone from upper layers of soil by heavy rains (1984:Q49)
15. The process of soil erosion is usually from A. rill sheet gully B. gully rill sheet C. sheet gully rill D. sheet rill gully E. rill gully sheet (1984:Q50)
16. Soil erosion CANNOT be controlled by A. planting cover crops B. contouring of sloping ground C. terracing of slopes D. laying of mulch E. burning of bush (1985:Q46)
17. Water retention is highest in soils which are rich in A. sand, poor in humus and devoid of clay B. clay and sand, but poor in humus C. clay and humus, but poor in sand D. clay, poor in humus and devoid of sand E. Sand and humus, but poor in clay (1985:Q47)
18. The origin of mineral particles in the soil is A. humus B. water C. micro-organisms D. weathered rock E. organic matter (1985:Q48)
19. The initial volume of water poured into a bag of dry soil was 50ml and the amount that drained through was 35ml. The percentage water content of the fully soaked soil is therefore A. 46.7 B. 25.0 C. 20.0 D. 30.0 E. 58.3. (1985:Q50)
20. The swollen shoot disease of cocoa tree is caused by a A. virus B. fungus C. bacterium D. protozoan (1986:Q47)
21. A large percentage of tropical soils tend to be acidic because they A. contain large quantities of potash B. contain large quantities of lime C. lose a high proportion of their organic matter to running water D. lose lime and potash from the top soil through rain action (1986:Q48)
22. The following are methods of soil conservation EXCEPT A. contour terracing B. strip cropping C. contour ploughing D. mixed grazing (1986:Q49)
23. Samples of different soil types are packed in glass tubes whose lower ends are plugged with cotton wool. If these tubes are suspended in a trough of water, water will rise highest after a few hours in A. sand B. loam C. clay D. humus. (1986:Q50)
24. The process by which lime is added to clay soils is known as A. sedimentation B. flocculation C. leaching D. manuring (1987:Q50)

25. The mineral nutrient that is most bound to the soil is  
A. phosphorus B. calcium C. iron D. potassium. (1988:Q47)
26. The mineral nutrient that easily gets leached out of the soil is  
A. phosphorus B. calcium C. magnesium D. nitrate. (1988:Q48)
27. Most commercial fertilizers are rich in salts of  
A. Sodium, iron and calcium B. nitrogen, phosphorus and potassium  
C. iron, copper and nitrogen D. calcium, sodium and phosphorus. (1988:Q49)
28. 5g of oven dried soil was heated in a furnace for 24 hours, after cooling, it weighed 4.8g what is the amount of humus in the soil?  
A. 40.0g per 100g dry soil B. 4.4g per 100g dry soil  
C. 4.0g per 100g dry soil D. 0.4g per 100g dry soil. (1989:Q46)
29. Most irrigated lands often become unproductive in later years because of  
A. loss of fertility B. increase in salinity  
C. soil erosion D. loss of water (1989:Q47)
30. Farmers practice crop rotation because it  
A. helps to prevent soil erosion B. allows two crops to be planted at the same time  
C. helps to conserve soil fertility D. is an alternative to shifting cultivation. (1989:Q48)
31. An acidic soil can be improved upon by  
A. Sedimentation B. Leaching  
C. Flocculation D. Watering. (1990:Q48)
32. Fertilizers are lost from the soil through  
A. sheet erosion and evaporation B. leaching, underground seepages and run-off  
C. sheet erosion, gully erosion and wind erosion D. wind erosion and heavy rainfall. (1991:Q41)
33. Soil with the finest particles is called  
A. silt B. clay C. sand D. gravel. (1992:Q38)
34. Soil fertility can be conserved and renewed by  
A. yearly mono cropping B. crop rotation and cover crops  
C. bush burning to remove unwanted debris D. avoiding artificial manures. (1993:Q43)
35. The water-retention capacity of a soil indicates its  
A. fertility B. capillarity C. aeration level D. pH level (1994:Q39)
36. In a soil sample, the relative amounts of the different soil particles can best be determined by the process of  
A. filtration B. centrifugation C. precipitation  
D. sedimentation (1997:Q39)
37. Soil micro-organisms are beneficial because of their involvement in  
A. photosynthesis B. translocation  
C. cycling of nutrients D. respiration using soil air. (1998:Q33)
38. A soil consisting of alumina and iron (II) oxide is known as  
A. loamy soil B. clayey soil C. laterite D. podzol. (1999:Q38)

Use the graph below to answer questions 39 and 40



39. The soil becomes toxic to plants when the concentration of its essential elements is in the range labelled  
A. IV B. III C. II D. I (2000:Q31)
40. The range at which soil essential element concentration is recorded for optimal plant growth is marked  
A. IV B. III C. II D. I (2000:Q32)
41. The addition of lime to clay soil serves to  
A. aid water retention B. close up the texture  
C. prevent water-logging D. improve capillary action (2002:Q19)
42. The excessive use of agro-chemicals could lead to the pollution of  
A. the lithosphere B. the atmosphere  
C. fresh water D. space (2002:Q20)
43. The stunted growth of a leguminous plant suffering from nitrogen deficiency may be corrected by inoculating the soil with  
A. Denitrifying bacteria B. Saprophytic bacteria  
C. Rhizobium D. Nitrosomonas (2003:Q12)

44. Soil fertility can best be conserved and renewed by the activities of  
A. Earthworms B. Man C. Rodents D. Microbes (2003:Q36)
45. The soil type that will be most difficult to plough in a wet season is one that is  
A. loamy B. clayey C. sandy D. silty. (2004:Q40)
46. A farm practice that results in the loss of soil fertility is  
A. mixed farming B. bush fallowing  
C. shifting cultivation D. continuous cropping. (2004:Q41)
47. Which of the following is used to test for the presence of lime in a soil sample?  
A.  $H_2SO_4(aq)$  B.  $NaOH(aq)$   
C.  $HCl(aq)$  D.  $HNO_3(aq)$  (2005:Q41)
48. The importance of practicing crop rotation in agriculture is to  
A. maintain soil fertility B. improve the nutritional value of crops  
C. control soil erosion D. ensure the growth of crops. (2005:Q42)
49. The soil type that contains nutrients which are not readily available for plants is  
A. alluvial B. clayey C. sandy D. loamy. (2006:Q46)
50. The increasing order of the particle size in the following soil types is  
A. clay - sand - silt - gravel B. silt - sand - clay - gravel  
C. Clay - silt - sand - gravel D. Silt - clay - sand - gravel (2007:Q2)
51. A crucible of 5gm weighed 10 gm after filling with fresh soil. It is then heated in an oven at  $100^\circ C$  for 1 hour. After cooling in a desiccator, the weight was 8 gm. The percentage of water in the soil is  
A. 80% B. 60% C. 20% D. 40%. (2007:Q6)
52. In an experiment to determine the percentage of air in a soil sample, the following readings were recorded:  
Volume of water in a measuring cylinder =  $500\text{cm}^3$   
Volume of soil added to water =  $350\text{cm}^3$   
Volume of water and soil after stirring =  $800\text{cm}^3$   
The percentage of air in the soil sample is  
A. 6.25% B. 10.36% C. 14.28% D. 43.28% (2008:Q37)
53. Mass of a crucible = 10g  
Mass of a crucible and soil before heating = 29g  
Mass of a crucible and soil after heating = 18g  
From the information above, determine the percentage of water in the given soil sample?  
A. 20% B. 25% C. 40% D. 50% (2009:Q36)
54. The loss of soil through erosion can be reduced by  
A. crop rotation B. manuring  
C. irrigation D. watering. (2010:Q38)
55. In an experiment to determine the percentage of humus and water in a soil sample, the following results were obtained:  
Weight of the evaporating basin alone = 80.5g  
Weight of basin and soil = 101.5g  
Weight after drying the soil in the oven = 99.0g  
Weight of basin and roasted soil = 95.5g. (2011:Q29)
56. An indigenous method of renewing and maintaining soil fertility is by  
A. clearing farms by burning B. planting one crop type  
C. adding inorganic fertilizers yearly D. crop rotation and shifting cultivation. (2012:Q36)
57. The soil with the highest water-retaining capacity is  
A. clayey soil B. Stony soil  
C. sandy soil D. loamy soil (2014:Q35)

#### CHAPTER 20 ANSWERS

- 1C. Capillarity is the tendency of a liquid (in this case, water) to rise up a narrow tube or pore (in this case, soil spaces)

#### NOTES:

- Drainage is capillarity in the opposite direction and this is dependent on the porosity of the soil
  - Loamy soil is ideal for agriculture because it strikes a balance between soil capillarity (or water retention) and drainage.
- 2B. Granite is a rock type; but if weathered, becomes part of the laterite soil type.

3D. The soil is exposed to agents of denudation if ripped of its vegetation cover.

**Preventing Erosion**

1. Planting cover crops
2. Strip cropping
3. Mulching
4. Constructing terrace
5. Afforestation
6. Bush fallowing/shifting cultivation
7. Planting across (no along) the slope - contour ridging

**Causes of Soil Erosion**

1. Bush clearing
2. Bush burning
3. Deforestation
4. Continuous cropping
5. Ridging along the slope
6. Overgrazing

4E. Sandy soil is most porous hence has least capillarity and least water retention capacity while clay soil has the highest in both.

**Characteristics of Sandy Soil**

1. Large soil particles with large spaces between them
2. Well aerated
3. High drainage, low water-retention hence salts are easily leached away is by water
4. Low capillarity
5. Easy to work on.

**Characteristics of Clay Soil**

1. Fine soil particles with small spaces
2. Poor drainage
3. Poorly aerated
4. High water-retention
5. High capillarity
6. Usually water logged
7. Sticky when wet
8. Difficult to till

**Characteristics of Loamy Soil**

1. Properties are intermediate between those of sandy and clayey soils.
2. Large humus content hence ideal for farming
3. Soil organisms e.g earthworms are abundant in loamy soil.

**NOTES:** Sandy soil = light soil; Clayey soil = heavy soil

5C. Legumes have mutualistic (symbiotic) bacteria resident in their root nodules (swellings) and the bacteria are fixers of atmospheric nitrogen thereby converting it to soil nitrates useful to their hosts which in turn provide protection for the bacteria

**NOTES:** Legumes are also cover crops preventing erosion.

6C. Remains of organic matter (humus) contain carbon and produce smoke when burnt vigorously enough after water has been driven out

7B. Swollen shoot disease of cocoa is caused by a virus. Black pool disease of cocoa is caused by a fungus

8B. Clay soil, for example, is considered infertile because its water and mineral salts are tightly held by the soil hence they are not readily available to the plants

9B. Liming does the following

1. Adds calcium to soil
2. Neutralizes soil acidity in acidic soil
3. Makes soil lighter (clay soil is heavy soil)
4. It aggregates fine soil particles into larger ones, a process called flocculation.

**Examples of Liming Materials**

1. Limestone (CaCO<sub>3</sub>)
2. Lime or quicklime (CaO)
3. Slaked lime [Ca(OH)<sub>2</sub>]
4. Wood ashes (mainly potash)

10E. The fact that he was cultivating a piece of land while he allowed another to go fallow means that he has "shifted cultivation"

Shifting cultivation -- bush fallowing

**Advantages of Bush Fallowing**

1. It lessens pressure on the land
2. It prevents erosion
3. It encourages nutrient recycling so that soil fertility is restored.

4. Prevents pest and diseases of plants.

\* However, bush fallow system is difficult to practice in areas where there is shortage of lands

11A. %humus =  $\frac{24-18}{28} \times 100\%$   
 $= \frac{6}{28} \times 100\%$   
 $= 21.43\%; 22.2\%$  in the closest here

12A. See Q3

13A. Humus → Negligible Diameter of particles

Clay → 0.002mm

Silt → 0.002-0.02mm

Fine sand → 0.02 - 0.20mm  $\frac{0.2}{5} \times 100\% = 4\%$

Coarse sand → 0.20 - 2.0mm

Gravel → > 2.0mm

14E. Leaching is movement of lime or potash from upper to lower level of the soil (i.e vertical movement not horizontal one) and these important minerals are no longer within the reach of plant roots. Leaching causes soil acidity which can be reversed by liming.

**NOTE:** Leaching can also produce laterite soil (which is Leaching can also produce laterite soil (which is ordinarily acidic)

15D. Sheet Erosion → Even removal of topsoil

Rill Erosion → Run-off is concentrated in small channels

Gully Erosion → Rills now widen and deepen to give rise to gullies.

16E. See Q3

17D. See Q4

18D. Weathering is the breakdown of rocks into particles which form soil.

**Agents of Weathering**

1. Air (oxygen)
2. Water
3. Wind
4. Temperature
5. Plant roots
6. Animals

**Types of Weathering**

1. Chemical Weathering:

- a. oxidation - oxidized rocks break up easily e.g granites oxidized to form laterite soil
- b. solution - atmospheric CO<sub>2</sub> dissolves in water to form carbonic acid and this can dissolve limestone
- c. Hydrolysis - Rocks can also be hydrolysed into soils.

2. Physical Weathering:

- a. Temperature - sudden fluctuations in temperature can cause rocks to break into soil.
- b. Water - water carries oxidized part of rocks away and exposes the inner layers of rocks to more of weathering agent.
- c. Plant roots penetrates through rocks and dissolve or crack them.
- d. Animal hoof exerts pressure on rocks, human activities also break up rocks.

19D. % content =  $\frac{50-35}{50} \times 100\%$   
 $= 30\%$

20A. See Q7 21D. See Q14 22D. See Q3

23C. See Q1 24B. See Q9

25C. Usually as ferric oxide (Fe<sub>2</sub>O<sub>3</sub>) hence not readily available to plant

26B. See Q14

27B. The famous NPK 15:15:15

28C. % humus =  $\frac{5.0-4.8}{5} \times 100\%$

29A. Loss of fertility from repeated cultivation (continuous cropping)

30C. This stems from some of the principles of crop rotation:

1. Deep rooted plant must follow a shallow rooted plant
2. At least a leguminous crop must be included in a 4- or 5-year course

**Other principles are:**

1. Crops affected by same disease must not follow each other
  2. Crops affected by same pests must not follow each other
- 31C. Flocculation = liming (See Q9)
- 32B. Fertilizers may get to water bodies these ways and cause eutrophication  
**NOTE:** Eutrophication is a state of increased algal growth leading to depletion of oxygen in the water body and death of organisms to produce foul-smelling sight.
- 33B. See Q 4    34B. See Q 30    35B. See Q 4
- 36D. Sedimentation is achieved by adding water to a sample of soil in a measuring cylinder. The mixture is shaken and allowed to settle down. The particles then form layers and the depth of each layer can be read off.
- 37C. These microbes cause decay leading to nutrient recycling.
- 38C. Concerning Laterite  
1. Usually produced by chemical weathering of granites (rocks)  
2. Contains  $Al_2O_3$  and  $Fe_2O_3$  and very little else  
3. It is a product of heavy leaching  
4. Its distinct red colour is due to the presence of Iron (III) oxide  $Fe_2O_3$ , [not Iron (II) oxide  $FeO$ ]  
5. Laterite is usually hard, poorly aerated, acidic, and difficult to till.  
6. Most soils in tropical Africa are laterite  
7. Laterite can be improved by adding lime, compost or farmyard manure
- 39A. Growth is taking a downward trend in range IV
- 40C. Growth is at its peak here
- 41C. In clay soil: High capillarity = High-water retention = Low water drainage = water logging.  
Therefore, to prevent water logging, liming  
1. Reduces (rather than improve) the capillarity  
2. Lowers the water-retention  
3. Improves water drainage  
4. Changes the fine texture clayey soil to coarse one by aggregating the particles - flocculation
- 42C. See Q32
- 43C. Legumes usually obtain their proteins from nitrogen fixation by symbiotic bacteria in their root nodules. If such bacteria (e.g. Rhizobium) are not naturally available, they can be supplied artificially
- 44D. The decomposers - bacteria and fungi - causing nutrient recycling
- 45B. See Q4
- 46D. Especially when it is worsened by monocropping i.e. same crop is used for the continuous cropping
- 47C. Hydrochloric (HCl) acid is preferred to sulphuric acid ( $H_2SO_4$ ) and the presence of lime (or chalk) is confirmed by effervescence of carbon dioxide  
 $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$
- 48A. See Q 30    49B. See Q 8
- 50C. See Q 13
- 51D. Weight of water =  $10 - 8 = 2\text{gm}$   
Weight of soil =  $10 - 5 = 5\text{gm}$   
 $\% \text{ water in soil} = \frac{2}{5} \times 100\% = 40\%$
- 52C. Vol. of water and soil before stirring =  $500 + 350 = 850\text{cm}^3$   
Volume of air in the soil =  $850 - 800 = 50\text{cm}^3$   
 $\% \text{ of air in the soil} = \frac{\text{volume of air}}{\text{volume of soil}} \times 100\%$   
 $= \frac{50}{350} \times 100 = 14.29\%$   
350  
Please, do not use  $850\text{cm}^3$  in your calculation, it is an error.  
Mass of water =  $29 - 18 = 11\text{g}$

$$\text{Mass of soil only} = 29 - 10 = 19\text{g}$$

$$\% \text{ by mass of water in the soil}$$

$$= \frac{11}{19} \times 100\% = 57.89\%$$

19

No option is correct

54A. See Q 30

55C. Weight of humus =  $99.0 - 95.5 = 3.5\text{g}$

Weight of soil before drying/roasting =  $101.5 - 80.5 =$

21.0g

$$\% \text{ humus in soil} = \frac{3.5}{21.0} \times 100\% = 16.7\%$$

**NOTE:** (1) % water in the soil

$$= \frac{101.5 - 99.0}{101.5 - 80.5} \times 100\% = 11.90\%$$

101.5 - 80.5

2. Drying is to remove water as vapour; roasting is to remove humus as smoke (or soot)

56D. See Qs 10 and 30

57A. See Q4 and 41

**CHAPTER 21**

**COMMON DISEASES. INSECT VECTORS**

1. In the life history of Schistosoma (Bilharzia), one of the following is the intermediate host A. man B. snail C. mosquito larva D. crayfish E. fish. (1978:Q15)
2. A farmer X working in a swamp did not eat any food nor drink any water. Which of these diseases can he contract? A. Cholera B. Bilharzia C. River blindness D. Malaria E. sleeping sickness (1978:Q42)
3. Which of these diseases cannot be controlled by killing the vectors? A. River blindness B. Malaria C. polio D. Cholera E. Bilharzia (Schistosomiasis) (1979:Q19)
4. One of the following statements is not true of viruses A. They are Micro-organisms B. they are smaller than bacteria C. they can be seen with an ordinary light microscope E. They cause polio and smallpox (1979:Q32)
5. The center which controls respiratory activities in the mammalian brain is the A. cerebrum B. olfactory lobes C. pituitary Organ D. cerebellum E. medulla (1980:Q3)
6. Below are some groups of diseases. Which group of diseases is caused by bacteria? A. Tuberculosis, smallpox B. Gonorrhoea, measles C. Tuberculosis, polio D. sleeping sickness, measles E. Syphilis, gonorrhoea. (1980:Q7)
7. Refrigeration, as a method of food preservation, has one of the following characteristics A. kills all the bacteria B. kills most of the bacteria C. makes the bacteria inactive D. dried food E. hydrolyzes food. (1980:Q47)
8. The blackfly is a vector of A. malaria B. trypanosomiasis C. onchocerciasis D. yellow fever. (1982:Q20)
9. Which of the following diseases is NOT caused by a virus? A. Rinderpest B. Maize rust C. Newcastle disease D. Swine fever E. Cassava mosaic disease. (1983:Q22)
10. One disease NOT caused directly by bacteria is A. malaria B. tuberculosis C. pneumonia D. tetanus E. cholera. (1983:Q27)
11. Which of the following diseases could be exclusively associated with a river basin? A. Malaria B. Syphilis C. Onchocerciasis D. Cholera E. Poliomyelitis. (1983:Q33)
12. Which of the following lists of diseases, their causes and transmission is CORRECT? A. Cholera, virus, severe diarrhoea, infected water. B. Malaria, protozoan, high fever, contact with infected person C. Syphilis, virus, venereal disease, sexual intercourse D. Smallpox, virus, skin with blister, close contact with infected person. E. Sleeping sickness, bacteria, tiredness, headaches and dozing, tsetse fly bite (1984:Q45)
13. The primary and secondary hosts respectively of bilharzia are A. fish and man B. man and dog C. snail and man D. man and snail E. fish and snail (1985:Q43)

14. Which of the following is NOT caused by bacteria?  
A. Cholera B. Gonorrhoea C. Tuberculosis  
D. Onchocerciasis E. Typhoid. **(1985:Q44)**
15. Tsetse fly is harmful to man because it is associated with the spread of A. river blindness B. malaria C. sleeping sickness D. leprosy E. dysentery. **(1985:Q45)**
16. If a person is bitten by a snake on the leg, it is advisable for the person A. keep moving so that the venom will ooze out with bleeding B. wash the wound with water containing antiseptic C. bandage the wound so that germs do not get in through it D. keep still and apply a tourniquet above the wound. **(1986:Q29)**
17. Which of these diseases CANNOT be prevented by immunization? A. Poliomyelitis B. Tuberculosis C. Cholera D. Onchocerciasis **(1986:Q44)**
18. Poliomyelitis is an infectious disease caused by A. virus B. protozoan C. bacterium D. fungus. **(1987:Q47)**
19. One of the functions of UNICEF is to A. prevent and control major diseases B. prevent disease outbreak by administering vaccines C. Improve the health and nutrition of children and nursing mothers D. monitor environment pollution **(1987:Q48)**
20. Which of the following disease can be contracted in areas with fast flowing rivers? A. Schistosomiasis B. Elephantiasis C. Syphilis D. Onchocerciasis **(1988:Q45)**
21. Which of the ways of controlling bilharzia can result in pollution? A. Clearing water weeds on which the snails feed. B. Treating infected people with drugs C. Preventing contamination of water by infected urine and faeces D. Applying chemical to kill the snails. **(1989:Q43)**
22. Which of the following diseases can be caused by a bacterium? A. ringworm B. poliomyelitis C. malaria D. syphilis. **(1989:Q44)**
23. Which of the following diseases is rarely spread by a housefly? A. Yellow fever B. Dysentery C. Typhoid fever D. Poliomyelitis **(1990:Q15)**
24. Which set of diseases is spread mainly by insect vectors? A. cholera, taenia and gonorrhoea. B. poliomyelitis, tuberculosis and syphilis. C. cholera, malaria and tuberculosis D. malaria, cholera and river blindness. **(1990:Q46)**
25. Which of the following diseases can be prevented by inoculation? A. Syphilis B. Malaria fever C. Tuberculosis D. Acquired immune Deficiency Syndrome. **(1991:Q47)**
26. Malaria symptoms are caused by A. toxins released into the blood as a result of the destruction of red blood cells B. the multiplication of the malarial sporozoites in the liver. C. the invasion of the red blood cells by the trophozoites D. the development of merozoites into gametocytes. **(1992:Q39)**
27. What ecological condition favours the breeding of blackflies? A. Fresh water habitat B. Water in ponds and swamps C. Water in small containers D. Fast flowing stream. **(1993:Q44)**
28. Which of the following is transmitted through mosquito bite? A. Filariasis B. Typhus. C. Plague. D. Schistosomiasis. **(1995:Q6)**
29. Which of the following is a measure for the control of bilharzias? A. Cutting low bushes around homes B. Application of molluscicides in water bodies C. Screening windows and doors with mosquito nets. D. Application of herbicides in water bodies. **(1995:Q36)**
30. Some of the diseases caused by bacteria are A. tuberculosis, gonorrhoea and syphilis B. tuberculosis, gonorrhoea and AIDS C. Poliomyelitis, syphilis and gonorrhoea D. AIDS, cholera and tuberculosis **(1995:Q37)**
31. One of the most effective ways of controlling guinea worm is by A. treating the disease B. public enlighten men campaigns. C. accelerating rural development D. provision of portable drinking water. **(1997:Q41)**
32. Which of the following groups of diseases are associated with water? I Onchocerciasis II Schistosomiasis III. Dracunculiasis IV. Elephantiasis Taeniasis. A. I,II and III B. II, IV and V C. II, III and IV D. I, II and V. **(1998:Q34)**
33. The construction of dams may lead to an increase in the prevalence of A. typhoid fever, measles and yellow fever B. tuberculosis, leprosy and trypanosomiasis C. guinea worm, malaria and tuberculosis D. malaria, bilharziasis and Onchocerciasis **(1999:Q35)**
34. Vaccination is carried out in order to A. check the production of poison B. Increase the activity of white blood cells C. increase the number of red blood cell D. stimulate the production of antibodies **(1999:Q37)**
35. Examples of water-borne and sex-linked disease are A. Taeniasis and malaria B. cholera and gonorrhoea C. typhoid and syphilis D. Dracunculiasis and haemophilia **(2000:Q46)**
36. The most common means of transmitting Acquired Immune Deficiency Syndrome (AIDS) is A. from mother to child B. through blood transfusion C. through sexual intercourse D. through the sharing of needles **(2002:Q13)**
37. The blackfly is a vector of A. malaria B. trypanosomiasis C. onchocerciasis D. yellow fever **(2005:Q11)**
38. The causative agent of typhoid fever is A. Salmonella B. Entamoeba C. Escherichia D. Shigella. **(2006:Q41)**
39. The causative agent of bird flu is a A. protozoan B. virus C. bacterium D. fungus. **(2007:Q3)**
40. The bacteria type that are arranged in chains are the A. Staphylococci B. Clostridia C. Streptococci D. Bacilli. **(2008:Q7)**
41. A boy who is fond of swimming in a pond finds himself passing urine with traces of blood. He is likely to have contracted A. Schistosomiasis B. onchocerciasis C. poliomyelitis D. salmonellosis **(2008:Q38)**
42. I. Onchocerciasis II. Schistosomiasis III. Salmonellosis IV. Meningitis.  
Which of the diseases listed above are associated with water? A. I and II only B. II, III and IV C. I, II and III D. II and IV. **(2009:Q37)**
43. The vector for yellow fever is A. Anopheles mosquito B. tsetse fly C. blackfly D. Aedes mosquito **(2010:Q39)**
44. The protozoan Plasmodium falciparum is transmitted by A. female Aedes mosquitoes B. female Culex mosquitoes C. female blackfly D. female Anopheles mosquitoes. **(2010:Q40)**
45. The vector of the malaria parasite is a A. male culex mosquito B. female culex mosquito C. female Aedes mosquito D. Female anopheles mosquito **(2011:Q33)**
46. Exo-erythrocytic phase of the life cycle of malaria parasite occurs in the A. Malpighian tubules of mosquito B. brain of humans C. liver of humans D. reticuloendothelial cells of humans. **(2011:Q35)**
47. Dracunculiasis can be contacted through A. bathing in contaminated water B. bites of blackfly C. eating contaminated food D. drinking contaminated water. **(2011:Q37)**
48. The diseases caused by waterborne pathogens include A. gonorrhoea and poliomyelitis B. typhoid and syphilis C. tuberculosis and cholera D. typhoid cholera. **(2012:Q37)**
49. An example of a parasitic protozoan is A. Plasmodium B. Euglena C. chlamydomonas D. Paramecium. **(2013:Q22)**
50. A tropical disease caused by Trypanosoma is A. river blindness B. yellow fever C. malaria D. sleeping sickness. **(2013:Q41)**

51. Which of the following is caused by *Treponema pallidum*?  
 A. Leprosy B. Tuberculosis C. Syphilis D. Gonorrhoea. (2013:Q43)
52. The causative agent of poliomyelitis is A. virus B. fungus C. protozoan D. bacterium. (2014:Q36)
53. Which of the following is true of smallpox? A. It is transmitted by bacteria B. It can effectively be controlled with antibiotics C. It can effectively be controlled by vaccination D. It is a waterborne infection (2014:Q39)
54. A biological agent with antiviral property is A. interferon B. enzyme C. antibiotic C. disinfectant. (2014:Q44)

### CHAPTER 21 ANSWERS

- 1B. The secondary (or intermediate) host is water snail while human is the primary host.
- NOTES:**
- Infestation of man by *Schistosoma* causes **Schistosomiasis or bilharziasis**
  - Schistosoma* = bilharzia = blood fluke
  - Life cycle of Blood fluke  
Eggs → Miracidia → cercariae → adult flukes.
  - Miracidia develops into cercariae inside the water snail (singular: miracidium/cercaria)
  - Blood fluke is not liver fluke
  - Liver fluke largely affects sheep while blood fluke affects human
  - Flatworms/ Platyhelminthes include  
1. Blood fluke 2. Liver fluke 3. Tapeworm etc
- 2A. Cholera is a water borne disease which can only be contracted if one eats or drinks.  
**NOTE:** In spite if his not eating or drinking he can still contract others because
- Cercariae (Q1) may penetrate his skin in the swamp
  - He might be bitten by vectors of  
 a. River blindness: blackfly      b. Malaria: Mosquito  
 c. sleeping sickness = tsetse fly.
- 3C. Polio (poliomyelitis) is contracted through food and water contaminated with faeces droplet but never through a vector  
**NOTES:** 1. Vector for cholera is housefly  
 2. Vectors for others: see Q1 and 2
- 4C. A virus can only be seen by using electron microscope.  
**NOTES:**
- The biggest virus is smaller than the smallest bacteria (B)
  - Viral diseases in Animals/Human  
 a. Smallpox and Chicken pox  
 b. Measles and Mumps  
 c. Rinderpest, Newcastle disease and Coccidiosis  
 d. Foot and mouth disease  
 e. Yellow fever and Rabies  
 f. Influenza and Hepatitis (A/B)  
 g. Acquired Immune Deficiency Syndrome (AIDS)  
 h. Swine fever
  - Viral Diseases in Plants  
 a. Rosette disease of Groundnut  
 b. Leave mosaic disease of cassava/potato/tobacco / garden egg.  
 c. swollen shoot disease of cocoa  
 d. leaf curl disease of cotton  
 e. Bunchy top disease of banana
  - Vectors of  
 a. Mosaic diseases - Aphids  
 b. Swollen Shoot disease - Mealy bug  
 c. Rosette - Aphids.  
 d. Leaf curl disease - house fly  
 e. Bunch top disease - Aphids.
54. Female *Anopheles* Mosquito which feeds on blood for its egg to develop; male *Anopheles* is harmless to human- feeds on fruit juice.

DISEASE	INSECT VECTORS
1. Malaria	Female <i>Anopheles</i> Mosquito
2. Dengue Fever	<i>Aedes</i> Mosquito
3. Elephantiasis or filariasis	<i>Culex</i> Mosquito
4. Yellow fever	<i>Aedes</i> Mosquito
5. Equine Encephalitis Trypanosomiasis	<i>Aedes/Culex</i> Mosquito. Tsetse fly
6. Onchoerciasis	Blackfly
8. Cholera/typhoid dysentery/polio	Housefly

### NOTES:

- Filariasis = Elephantiasis
  - Trypanoaoomiasis = sleeping sickness
  - Onchocerciasis = River blindness
  - There are 2 types of Mosquito  
 a. **Anopheles Mosquito** - malaria fever mosquito  
 b. **Culex Mosquito**
  - Aedes Mosquito** (scientific name: *Aedes aegypti*) is a sub-type of *Culex* mosquito which is a day-flying insect.
6. No option is correct.  
**NOTE: Pasteurization**, designed by Lious Pasteur (process is named after him). Involves heating milk to 72°C for 15 seconds and then cooling rapidly. This preservation method lengthens the shelf life of milk.
- 7E. **Bacterial Diseases (Animal)**
- Cholera - *Vibrio Cholerae*.
  - Typhoid - *Salmonella typhi*
  - Diphtheria - *Corynebacterium diphtheria*.
  - Tuberculosis - *Mycobacterium tuberculosis*
  - Gonorrhoea - *Neissaria gonorrhoeae*
  - Whooping cough - *Bordetella pertusis*
  - Tetanus - *Clostridium tetani*
  - Syphilis - *Treponema pallidum*.
  - Bacterial dysentery - *shigella dysenteriae*
  - Food poisoning - *Salmonella Sp*
  - Leprosy -
- Bacterial Diseases (Plants)**
- Leaf spots and soft rot.
  - Blight and galls
  - Cassava wilt
- Fungal Diseases (animal)**
- athlete's foot
  - Head ringworm
  - Candidiasis (thrush)
  - Body ringworm
- Fungal Diseases (Plants)**
- Leaf rust of cereals
  - Smut disease of cereals
  - Leaf spot and blast
  - Black root rot
  - Black pod disease of cocoa
- Protozoan Diseases (Animals)**
- Amoebic dysentery - *Entamoeba histolytica*
  - Malaria --- *Plasmodium sp*
  - Sleeping sickness - *Trypanosoma gambiensi*
- 8C. Refrigeration (cooling) does not kill but it only inactivates the bacteria while heating kills.
- Methods of Food Preservation**
- Drying - Preserves by dehydration
  - Salting - dehydration
  - Smoking - dehydration
  - Heating - killing germs
  - Refrigeration - Inactivating germs



6. Canning - Putting food in air-tight cans
7. Pickling - Preserving in vinegar (acid)
8. Curing - smoking combines with drying and salting.
9. Pasteurization - Heating to 72°C for 15 seconds
10. Fermentation - converting to harmless substance by microbial activities
11. Irradiation - Sterilizing food by exposing to radiation

9B. See Q4 and 7 10A. See Q7

11C. River blindness

12D. Smallpox is a highly contagious viral skin disease but now extremely rare.

13D. See Q1

14D. Onchocerca volvulus, a filarial worm which causes river blindness is a roundworm (nematode)

**NOTE: Onchocerciasis** is called river blindness because the nematode *Onchocerca volvulus* breeds in fast-flowing, highly oxygenated rivers and it migrates into the eyes through the blood to cause blindness.

15C. See Q5

16D. The patient must keep still because the more he moves, the more the venom escapes onto the blood stream.

**NOTES:**

1. Tourniquets is necessary to slow the spread of venom to other part of the body via blood vessels.
2. However, the tourniquet must be loose enough to allow exit of blood from the wound.
3. Tourniquets must not be used to stop bleeding from a wound as they may prevent blood from reaching the rest of the limb causing damage to cells (and gangrene)
4. Bleeding must be stopped by covering the wound with a clean dressing while applying direct pressure over and around the wound.

17D. Blackflies are either destroyed or avoided.

Blackfly = Simulium.

**NOTES:**

1. Since polio (infantile paralysis) is an infantile killer disease, oral vaccines are now commonly given to children under 2 years.
2. TB vaccine is the common BCG vaccination for children and is now mandatory.
3. Vaccination against cholera only lasts a short time (about 6 months)
4. Vaccination = immunization = inoculation.

18A. See Q4

19C. The full meaning of UNICEF provides an insight here:

UNICEF = United Nations Children and Emergency Funds.

So when you care for the nursing mothers, you are still caring for the children.

20D. The larvae of blackfly (*Simulium damnosum*) which causes onchocerciasis live in fast-moving (highly oxygenated) streams and rivers while the intermediate stages of *Schistosoma* are found in slow-moving streams/rivers or ponds.

21D. Such chemical (a molluscicide) is likely to kill other harmless or useful water creatures e.g fish

22D. See Q7

23A. Yellow fever strictly by *Aedes Mosquito* (see Q5)

24D. See Q5 25C. See Q17

26A. Life cycle of Malaria Parasite

1. An infected mosquito bites and releases sporozoite stage into the blood of a healthy human.
2. The **sporozoites** migrate to the (exo-erythrocytic phase) liver where they multiply and develop into trophozoite stage
3. **Trophozoites** then invade the red blood cells, develops into **merozoites** and destroy rest blood cells to release

toxins - erythrocytic phase

4. Merozoites invade more cells while the toxins cause the symptoms
5. Merozoites later develops into gametocyte and a mosquito may pick them up.
6. Male and female gametocytes reproduce sexually to form sporozoite and the cycle continues.

**NOTES:**

1. The malarial parasite above is any *Plasmodium* sp
2. There are four species of plasmodia:
  - a. *Plasmodium malariae* b. *P. vivax*
  - c. *P. ovale* d. *P. falciparum* - the most dangerous.

27D. See Q14 and 20 28A. See Q5

29B. But not without environmental consequences (see Q21)

30A. Compare 2 and 7

31D. This prevents people from using streams infected with guinea worms as sources of potable water.

**NOTES:**

1. Guinea worm is another roundworm or nematode variety.
2. It is not a true filarial worm but it is usually grouped with them
3. Guinea worm has a secondary host in the barely visible water-flea called *Cyclops* and the larvae of guinea worm penetrate the skin of the fleas from an infected person.
4. A healthy individual DRINKS the fleas with the water and become infected.
5. Water fleas are crustaceans, remember?
6. Consider the following filarial worms
  - a. ***Wuchereria bancrofti*** causes elephantiasis/ filariasis (vector: *Culex* mosquito)
  - b. ***Onchocerca volvulus*** causes onchocerciasis / river blindness (vector: *Simulium* and occasionally housefly).
  - c. ***Loa Loa*** causes calabar swelling (secondary host: red fly or mangrove fly known as *Chrysops*)
  - d. ***Dracunculus medinensis*** or guinea worm causes dracunculiasis (Secondary. host: *Cyclops* / waterflea)

32A. **Taeniasis** is tapeworm infestation, water is not involved as is elephantiasis from mosquito bites.

33D. The dams provide breeding ground for vectors of malaria and Schistosomiasis (stagnant water) while the spillways of large dams have proved excellent substitutes for the free flowing rivers that breed blackfly.

34D. A vaccine is an antigenic substance (antigen) injected into the body or swallowed to elicit the production of antibodies long before infection in readiness for fighting future microbial infections

**NOTES:**

1. The vaccine could be one of the following:
  - a. a harmless form of the microbe which causes the disease under consideration.
  - b. dead form of the microbe
  - c. inactivated toxins (called toxoid) produced by the micro-organism
2. Antibodies (called immunoglobulins) are chemical substances which can recognize and kill specific antigens and they are usually produced by white blood cells.
3. Diseases which require vaccines
  - a. cholera b. polio c. diphtheria d. whooping cough (or pertusis) e. tuberculosis f. tetanus g. measles.

35D. Dracunculiasis = Guinea worm infestation (see Q31)  
Haemophilia = Bleeders's disease which affects only a male child of a carrier mother (see chapter 24)

**NOTE:** Sex-linked diseases such as haemophilia and colour blindness should not be mistaken for sexually transmitted diseases/infections (STD/STI) such as gonorrhoea and syphilis.

- 36C. However, AIDS is not STI in the strictest sense of the term.  
 37C. See Q5  
 38A. Salmonella typhi (Q7)

**NOTE:**

- JAMB avoided the specific name here because it is self-revealing (typhi-typhoid)
- The following follow the same pattern  
 Vibrio cholerae (cholera)  
 Clostridium tetani (tetanus)  
 Neisseria gonorrhoeae (gonorrhoea)  
 Bordetella pertussis (pertussis is Whooping cough)
- Hence, master the generic names of these pathogens and others.

39B. See Q4 [Flu = influenza]

40C. Classification of Bacteria (based on shape)

- Spherical bacteria ---- Cocci (sing. coccus)
  - Cocci in pairs ---- diplococci
  - Cocci in chains ---- streptococci
  - Cocci in clusters ---- Staphylococci
- Rod-shaped bacteria ---- bacilli (sing. bacillus)
- Comma-shaped bacteria ---- vibrios
- Spiral-shaped bacteria ---- Spirillae (rigid)
- Spiral-shaped bacteria ---- Spirochactae. (flexible)

41A. Haematuria (blood in urine) is symptomatic of Schistosomiasis. Note the use of the word 'pond' and now revisit Qs 20 and 27.

42C. See Q32 and also note that Salmonellosis is typhoid fever (linked with contaminated water) and it is caused by Salmonella typhi.

43D. See Q5 and 23 44D. See Q5 45D. See Q44

46C. See Q26 47D. See Q31

48D. They are contracted by eating or drinking contaminated food or water.

49A. Causing malaria (see Q26)

50D. Trypanosoma gambians is another pathogenic protozoan (Q49) which causes typanosomiasis or sleeping sickness (Q5)

51C. See Q7 52A. See Q4

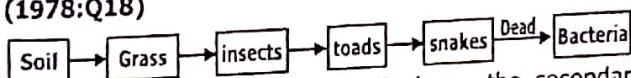
53C. In fact, it has been eradicated through vaccination as the last known case was in 1977 although the virus is kept in some laboratories for specific research.

54. Interferon gamma

**CHAPTER 22**

**ECOLOGY I: BASIC CONCEPTS, ECOLOGICAL MANAGEMENT**

- Nitrifying bacteria keep the soil fertile by
  - converting nitrate to nitrogen
  - converting ammonium salts to nitrates
  - converting atmospheric nitrogen to plant protein
  - converting nitrates to nitrous oxide
  - converting atmospheric nitrogen to nitrates. (1978:Q14)
- The study of the organism and the environment of an abandoned farmland is the ecology of
  - a community
  - a population
  - a species
  - a habitat
  - an ecosystem. (1978:Q18)



- In the food chain shown in Fig.5 above, the secondary consumer is
  - 6
  - 2
  - 3
  - 5
  - 4 (1978:Q48)
- The complex relationship between the member of a community and between the community as a whole and its physical environment is
  - ecosystem
  - habitat
  - environment
  - niche
  - microhabitat. (1979:Q9)

- A secchi disc is used in the determination of
  - rainfall
  - tides
  - waves
  - turbidity
  - current velocity (1979:Q10)
- Bacteria inhabiting legume root nodule and which add atmospheric nitrogen to the soil are referred to as
  - denitrifying bacteria
  - nitrifying bacteria
  - nitrogen fixing bacteria
  - nitrogen putrefying bacteria (1979:Q31)
- Grasses - grasshoppers - lizards - snakes - hawks. In the above food chain the organisms which are the least in number are
  - grasses
  - grasshoppers
  - lizards
  - snakes
  - hawks. (1979:Q43)
- Which of these is not true? Grasses in the above food chain
  - trap all the sun energy
  - trap a small percent of the sun energy
  - are primary producers
  - are eaten by primary consumers
  - contain chlorophyll. (1979:Q44)
- Leguminous plants, e.g. Mucuna, are usually planted in cultivated farmlands because they
  - enrich the soil with phosphates
  - provide animals with food
  - enrich the soil with organic nitrogen
  - protect the soil from being over-heated
  - protect the micro organisms in the soil. (1980:Q43)
- During thunderstorms the energy of lightning discharge causes
  - oxygen and nitrogen to combine
  - more carbon dioxide to be formed
  - nitrites to be converted to nitrates
  - nitrates to be converted to nitrogen
  - death (1980:Q44)
- Choose the sequence which represents the correct order of organisms in a food chain.
  - Grass, snake, toad, grasshopper, hawk
  - Grass, grasshopper, toad, snake, hawk
  - Grass, grasshopper, snake, toad, hawk
  - Grass, snake, grasshopper, toad, hawk
  - Grass, toad, snake, grasshopper, hawk. (1981:Q14)
- Nitrification means
  - conversion of nitrates to nitrogen
  - fixing nitrogen into plants
  - conversion of nitrates to nitrites
  - changing of ammonia to nitrites, then nitrates
  - nitrogen cycle (1981:Q32)
- An instrument used in measuring the speed of wind is
  - a barometer
  - a wind gauge
  - a wind vane
  - an anemometer
  - a hydrometer (1981:Q37)
- A population is defined as the collection of
  - similar organisms that are found in the same habitat
  - similar organisms that breed in the same habitat
  - similar organisms that interbreed freely in the same habitat
  - similar organisms in the same habitat
  - different organisms in the same habitat. (1982:Q1)
- Which of the food chains is NOT possible in a forest?
  - Diatom -> fly -> toad -> snake
  - Fly -> toad -> snake -> hawk
  - Leaves -> antelope -> man -> lion
  - Leaves -> caterpillar -> bird -> lion
  - Leaves -> goat -> man -> lion (1982:Q8)
- A pyramid of numbers can be defined as
  - the number of plants and animals in an ecosystem
  - an arrangement of organisms according to their habitats
  - the numerical relationships of a food chain
  - the number of plants and animals in a population
  - the total number of species and general in a community (1982:Q36)
- Which of the following instruments is used for determining turbidity of water?
  - Thermometer
  - Secchi Disc
  - Rain gauge
  - Hygrometer
  - Wind vane (1983:Q40)
- Which sequence represents the correct order of organism in a food chain?
  - Toad
  - Mucuna
  - Grasshopper
  - Snake
  - Hawk
  - 5 4 1 3 2
  - 1 2 3 4 5
  - 2 1 3 4 5
  - 2 3 1 5 4
  - 2 3 1 4 5 (1983:Q42)
- The transect method can be used in ecology to show the
  - number of plants and animals in a habitat
  - population of a plant species
  - distribution of organisms along a line
  - heights of trees in a section of a forest
  - number of young plants across a forest. (1984:Q33)

20. Green plants are important in the ecosystem because they are A. primary consumers B. producers C. decomposers D. secondary consumers E. scavengers (1984:Q41)
21. An anemometer is an instrument for measuring A. relative humidity B. altitude C. wind speed D. turbidity E. salinity (1984:Q42)
22. Which of the following groups of factors is completely abiotic? A. salinity, tide, plankton, turbidity B. Temperature, pH, soil insect C. Wind, altitude, humidity, light D. Conifers, winds, pH, rainfall E. Soil, water, bacteria, salinity (1984:Q44)
23. Denitrifying bacteria in nature liberate gaseous nitrogen directly from A. ammonium salts B. soil nitrates C. thunderstorms D. soil nitrites E. plant and animal proteins. (1984:Q48)
24. Which of the following food chains is in the correct sequence? A. Weeds Tadpoles Beetles Fish Man B. Weeds Tadpoles Fish Beetles Man. C. Tadpoles Beetles Weeds Man Fish D. Man Fish Beetles Tadpoles Weeds E. Fish Beetles Tadpoles Weeds Tadpoles. (1985:Q42)
25. Atmospheric nitrogen is directly replenished in nature through A. the activities of denitrifying bacteria B. the breakdown of ammonium salts in the soil C. the activities of nitrifying bacteria D. the activities of nitrogen-fixing bacteria in root nodules E. egestion, death and decay (1985:Q49)
26. In an ecosystem, animals which feed directly on plants are called A. secondary consumers B. primary consumers C. producers D. predators (1986:Q42)
27. In an agricultural ecosystem, the biotic component consists of A. crops, pest and beneficial insects B. crops, temperature and humidity C. pests, beneficial insects and water D. crops, water and soil. (1986:Q43)
28. Which of the following ecological factors are common to both terrestrial and aquatic habitats? A. Rainfall, temperature, light and wind B. Salinity, rainfall temperature and light C. Tides, wind, rainfall and altitude D. Ph, salinity, rainfall and humidity (1986:Q45)
29. In a community, bacteria and fungi are referred to as A. producers B. decomposers C. scavengers D. consumers (1986:Q46)
30. Which of the following relates to edaphic factors? A. The structure of the earth's surface B. The influence of living organisms on each other. C. Temperature, rainfall and humidity D. The influence of soils on plants and animals. (1987:Q45)
31. Nitrifying bacteria are important because they A. release nitrogen to the atmosphere B. convert atmosphere nitrogen to ammonia C. combine ammonia with nitrogen D. oxidize ammonium salts to nitrates. (1987:Q49)
32. The turbidity of a pond can be measured using the A. anemometer B. secchi disc C. theodolite D. hydrometer. (1988:Q38)
33. Which of the following has the greatest influence on the distribution of animals in marine and fresh water habitats? A. pH. B. Salinity C. Water current D. Turbidity (1988:Q42)
34. Which of these groups of animals is likely to be found in fresh water? A. Blood worm, pond skater and scorpion B. Blood worm, pond skater and dragonfly larva C. Pond skates scorpion and dragonfly larva. D. Pond skater, bloodworm and ant-lion. (1988:Q43)
35. One of the characteristics of plant in the savanna is the A. possession of thin, smooth barks B. possession of large tap roots C. production of seedlings on mother plant D. possession of thick, flaky barks. (1988:Q44)
36. Dead plants and animals are decomposed by bacteria and fungi into A. nitrates B. nitrites C. amino acids D. ammonia (1988:Q50)
37. In an ecosystem, the LEAST efficient energy transfer link is from A. producers to primary consumers B. sun to producers

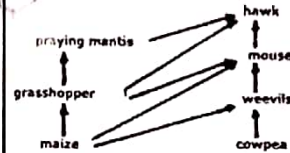
C. primary consumers to secondary consumers D secondary consumers to decomposers (1989:Q40)

Use the figure below to answer questions 38 and 39



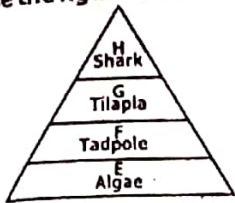
38. In which of the habitats will the plants show xeromorphic features most prominently? A. X B. R. C. P. D. Q (1989:Q49)
39. Which ecological factor exerts the greatest influence on the structure of the profiles? A. topographic B. edaphic C. biotic D. climatic. (1989:Q50)
40. In a savanna ecosystem, the abiotic factors include A. legumes, temperature and sandy soil B. water, temperature and soil C. minerals, oxygen and reptile D. water, soil and grasses. (1990:Q41)

Use the figure below to answer questions 41 and 42



41. Which organism is an omnivore? A. Praying mantis B. Hawk C. Mouse D. Grasshopper (1990:Q42)
42. Which of the organisms will have the lowest population in an ecosystem? A. Hawk. B. Cowpea C. Praying mantis D. Mouse. (1990:Q43)
43. The salinity of a brackish environment. A. increases immediately after rain B. increases at the end of the rainy season C. decreases with increase in micro-organisms D. increases during the dry season (1990:Q44)
44. Free nitrogen is released to the atmosphere by A. nitrogen fixing bacteria B. nitrifying bacteria C. denitrifying bacteria D. saprophytic bacteria (1990:Q50)
45. The most important factors which influence an organism's way of life in its habitat are A. the physical and biotic environment B. food and water availability C. temperature, water, light and predator-prey relationship D. competition for food and space (1991:Q41)
46. Organisms in an ecosystem are usually grouped according to their trophic level as A. carnivores and epiphytes B. consumers and parasites C. producers and consumers D. producers and saprophytes (1991:Q42)
47. The above diagram represents a competitive interaction between organisms in communities I and II. Which of the following statement is CORRECT? A. The population of I was higher than II at the beginning of the experiment. B. II was wiped out from the environment at the end of the experiment. C. The population of II was always lower than that of I D. The population of I was lower at the end of the experiment than at the beginning (1991:Q43)
48. A food web is more stable than a food chain because. A. it contains more organisms B. it has greater energy source C. it is not easy to destroy D. every organism has an alternative food source. (1991:Q44)
49. The flowering period of plants in a habitat is determined by the A. duration of sunlight B. intensity and duration of rainfall. C. relative humidity of the atmosphere D. temperature of the habitat. (1992:Q6)
50. A population is defined as a collection of similar organisms that A. behave in the same way B. interbreed freely C. are found in the same habitat D. eat the same food. (1992:Q33)
51. In typical predator food chain involving secondary and tertiary consumers, the organisms become progressively A. smaller and more numerous along the food chain B. equal in number and size along the food chain C. larger and fewer along the food chain D. parasitized along the food chain as consumers get bigger. (1992:Q34)

Use the figure below to answer questions 52 and 53



52. Which level of the pyramid has the least total stored energy?  
A. E. B. F. C. G. D. H. (1992:Q35)
53. Which organism in the pyramid functions as a tertiary consumer?  
A. Algae. B. Shark. C. Tadpole. D. Tilapia. (1992:Q36)

54. Mangrove swamp can be found  
A. on a sea shore with flat terrain  
B. where a river meets the sea  
C. on a mud flat near the sea.  
D. where two rivers meet. (1992:Q37)
55. Which of the following factors is LEAST likely to affect the animals living in a fresh water habitat?  
A. Turbidity  
B. Temperature  
C. pH.  
D. Salinity. (1992:Q48)
56. What is the term used to describe the sum total of biotic and abiotic factors in the environment of the organism?  
A. Habitat. B. Biome. C. Ecosystem  
D. Ecological niche. (1993:Q35)
57. Important abiotic factors which affect all plants and animals in the habitat are  
A. temperature and turbidity  
B. rainfall and relative humidity  
C. salinity and wind direction  
D. temperature and rainfall. (1993:Q36)
58. The most important physical factor which affects an organism living in the intertidal zone of the seashore is  
A. pH  
B. Salinity  
C. wave action  
D. temperature. (1993:Q37)
59. At which trophic level would the highest accumulation of a non-biodegradable substance occur?  
A. Primary producers.  
B. Tertiary consumers.  
C. Primary consumers.  
D. Secondary consumers. (1993:Q38)
60. Which of the following instruments is NOT used in measuring abiotic factors in any habitat?  
A. Microscope  
B. Thermometer  
C. Hygrometer  
D. Windvane (1993:Q40)
61. The nitrifying bacteria, Nitrosomonas, convert ammonia to  
A. nitrites  
B. nitric acid  
C. nitrates  
D. nitrous oxide. (1994:Q15)

Use the list of ecological constituents below to answer questions 62 and 63

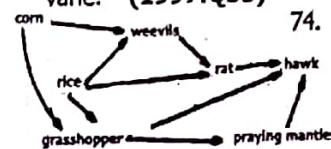
1. Mango 2. Spear grass 3. Goat 4. Sheep  
5. Temperature 6. Beans 7. Rock 8. Water.
62. Items 1-4 can be regarded as  
A. a population  
B. a community  
C. an ecosystem  
D. a niche. (1994:Q30)
63. The physical factors are represented by  
A. 1,5,6, B. 4,5,7, C. 5,7,8, D. 6,7,8. (1994:Q31)
64. Which of the following sets is made up of decomposers?  
A. Rhizopus, earthworm and protozoa  
B. Mushroom, Rhizopus and bacteria  
C. Bacteria, earthworm and nematodes  
D. Earthworm, sedges and platyhelminthes (1994:Q32)
65. The correct order in a food chain involving the organisms  
1. Grasses, 2. Hawks, 3. Snakes, 4. Grasshopper, 5. Lizards is  
A. 1 2 3 4 5  
B. 5 4 3 2 1  
C. 1 4 5 3 2  
D. 3 2 4 5 1. (1994:Q33)
66. The organisms with the least number of individuals in a pyramid of numbers are the  
A. secondary consumers  
B. tertiary consumers  
C. primary producers  
D. primary consumers (1994:Q34)

Use the list of biomes below to answer questions 67 and 68

1. Desert 2. Rain forest  
3. Southern Guinea Savannah  
4. Northern Guinea Savannah
67. A biome with a low annual rainfall, few scattered trees within dense layer of grasses and found in Kano and Katsina States is  
A. 1. B. 2. C. 3. D. 4 (1994:Q35)
68. A biome where small mammals undergo aestivation for long periods is  
A. 1. B. 2. C. 3. D. 4 (1994:Q36)
69. The depth of illumination in a water body can be measured with  
A. photometer  
B. secchi disc  
C. hydrometer  
D. anemometer (1995:Q31)
70. In a food chain involving a primary producer, a primary

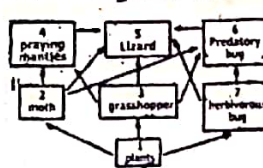
consumer as well as a secondary consumer, the sharing of trophic energy is in the form that the  
A. primary consumer has more energy than the primary producer  
B. secondary consumer takes up all the energy contents of the primary consumer  
C. energy is shared equally between the three groups of organism.  
D. secondary consumer gets only a small portion of the energy contained in the primary producer (1995:Q32)

71. In spite of the removal of carbon dioxide from the atmosphere, its amount remains more or less constant because  
A. it is produced by green plants during photosynthesis.  
B. it is produced during respiration by animals  
C. it is absorbed in ocean water  
D. green plants release it during the day (1995:Q33)
72. In a tropical rain forest, non-epiphytic ferns and fern allies occur as  
A. middle storey species  
B. upper storey species  
C. shade-loving species  
D. emergent species. (1995:Q34)
73. The speed of wind can be measured with an instrument called  
A. hydrometer  
B. secchi disc  
C. anemometer  
D. wind vane. (1997:Q33)



74. Which organism in the food-web illustrated above is an omnivore?  
A. Weevils. B. Rat. C. Hawk. D. Praying mantis. (1997:Q34)
75. The Southern Guinea Savannah differs from the Northern Guinea Savannah in that it has  
A. lower rainfall and shorter grasses  
B. less grasses and scattered trees  
C. more rainfall and taller grasses  
D. less arboreal and burrowing animals. (1997:Q37)
76. A group of organisms of different species living in a particular area is described as a  
A. colony  
B. community  
C. population  
D. niche. (1998:Q28)
77. Which of the following is the direct consequence of transferring energy from one trophic level to another?  
A. Increase in biomass  
B. A decrease in the efficiency of energy conversion  
C. An increase in the numbers of resulting individuals  
D. A decrease in the resulting biomass. (1998:Q29)
78. The condition that encourages denitrification is  
A. low soil oxygen  
B. high soil nitrogen  
C. absence of soil bacteria  
D. lightning and thunderstorm (1998:Q30)
79. The sequence of the biomes in Nigeria from Port Harcourt to Damaturu is  
A. estuarine → rain forest → Guinea savannah → Sahel savannah  
B. rain forest → Guinea savannah → estuarine → desert  
C. estuarine → Guinea savannah → rain forest → Sahel savannah  
D. rain forest → estuarine → Guinea savannah → desert. (1998:Q32)
80. The unrestricted pattern is presented by  
A. I. B. II. C. III. D. IV. (1998:Q37)
81. The line that represents efficient recycling combined with stringent conservation is  
A. IV. B. III. C. II. D. I. (1998:Q38)
82. Floating microscopic heterotrophs are mostly grouped as  
A. phytoplankton  
B. zooplankton  
C. microbes  
D. nekton (1999:Q36)

Use the diagram below to answer questions 83 and 84



83. Primary consumers are found in  
A. 1,2, and 3  
B. 1,3 and 7  
C. 2,3 and 7  
D. 2,4 and 5 (1999:Q40)
84. The biomass is likely to increase in the sequence  
A. 1 → 2 → 4 → 5  
B. 1 → 3 → 4 → 5  
C. 3 → 5 → 6 → 7  
D. 5 → 4 → 3 → 1 (1999:Q41)
85. Which of the following characterized the white mangrove?  
A. prop roots  
B. buttress roots  
C. breathing roots  
D. stilt roots (1999:Q42)
86. The most important environmental factor which epiphytes in the rain forest compete for is  
A. water  
B. nutrient  
C. light

- D. space (1999:Q50)
87. Atmospheric nitrogen is converted to soil nitrogen for plant use by A. nitrification and combustion B. putrefaction and lightning C. lightning and nitrification D. combustion and putrefaction (2000:Q29)
88. I. High birth rate and high immigration rate II. Low birth rate and high immigration rate III. Low mortality rate and low emigration rate IV. High mortality rate and high emigration rate. Which combination of the above can cause rapid overcrowding in climax biotic communities and human settlements? A. II and III B. I and III C. I and IV D. I and II (2000:Q30)
89. In a food chain, each succeeding level in a forward direction, represent? A. an increase in the number of individuals B. a decrease in the number of individuals C. an increase in the biomass of individuals D. a gain in the total energy being transferred. (2000:Q36)
90. The study of how and why population size change over time is A. population estimation B. population dynamics C. population ecology D. population cycles (2014:Q33)

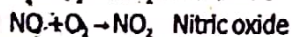
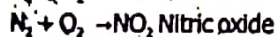
### CHAPTER 22 SOLUTION

18. Dead Organism or waste  $\rightarrow$  Ammonium salts  
Ammonium salts  $\rightarrow$  nitrites  
Nitrites  $\rightarrow$  nitrates where
- a = putrefaction (or ammonification) by putrefying bacteria and fungi
  - b = Nitrification I by nitrifying bacterial e.g. nitrosomonas
  - c = Nitrification II by nitrifying bacteria e.g. nitrobacter

#### Other Events in Nitrogen Cycle

- Soil Nitrates  $\rightarrow$  atmospheric nitrogen  
Where d = denitrification by denitrifying bacteria.
- Atmospheric Nitrogen  $\rightarrow$  plant protein  
Where e = Nitrogen Fixation through
  - Symbiotic means by Rhizobium
  - Non-symbiotic means by Azotobacter, nostoc, clostridium
- Atmospheric Nitrogen  $\rightarrow$  soil nitrate  
Where f = thunderstorm

**NOTE:** During thunderstorm, atmospheric nitrogen and oxygen combine in the presence of the electric flash of the accompanying lightning to produce oxides of nitrogen



Nitric oxide dissolves in rain water to form nitrous acid and nitric acid  $2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$

The acids combine with salts in the soil to form soil nitrites

- 2E. Such farmland is a self supporting unit - ecosystem - containing biotic (living) and abiotic (non-living) components

#### Ecological Concepts:

- Environment** - the surroundings of an organism, biotic and abiotic
- Habitat** - the place where an organism lives.
- Ecological Niche** - the space occupied or roles performed by an organism in its habitat.
- Population** - the total number of organisms of the same species living in the same habitat.
- Community** - a combination of the populations of different species in the habitat.
- Biosphere** - parts of the earth where life can be found
  - Atmosphere** - air enveloping the earth (gaseous part)

- Lithosphere** - the earthcrust or soil (solid part)
  - Hydrosphere** - water-bodies (liquid part)
- Biome** - a large natural terrestrial habitat
  - Terrestrial habitat** - a land habitat
  - Aquatic habitat** - water habitat
    - Marine - seawater/ocean
    - Fresh water - No salt present hence not affected by salinity
  - Arboreal habitat** - habitat on trees e.g. epiphytic plants, birds and monkeys
- 3E. Soil (1) = Anchorage and source of salts to grasses  
Grasses (2) = Producers  
Larvae (3) = primary consumers  
Toads (4) = secondary consumers  
Snakes (5) = Tertiary consumers  
Bacteria (6) = Decomposers (Also Fungi)
- 4E. The relationship between living members constitutes the biotic component while the relationship between the living members and their non-living environment constitutes the abiotic component of the ecosystem

#### 5D. Measuring Abiotic Factors

- Temperature - a thermometer would do while the maximum - minimum thermometer is used to measure the highest and lowest temperatures of the day.
- Rainfall - Rain gauge.
- Light - photometer
- Relative Humidity - wet and dry bulb hygrometer.
- Wind - Wind vane for direction of wind; anemometer for wind speed.
- Pressure - Aneroid Barometer
- Water depth - Weighted string
- Water flow - Water speed meter
- Turbidity - Secchi disc
- Height - Method of similar triangles
- Slope - Slope gauge
- Edaphic factors
  - soil particles - sedimentation
  - soil PH - PH paper or solution

- 6C. Symbiotic nitrogen-fixing bacteria such as Rhizobium (Q1)
- 7E. As we move along the chain, number of organism decreases (Pyramid of number)
- 8A. Only 1% of the solar energy is trapped for photosynthesis and the remaining 99% is lost through.
  - Reflection 20%
  - Warming of the air, soil and vegetation 40%
  - Evaporation of water 39%**NOTE:** As we move along the food chain, energy is even lost the more-pyramid of energy
- 9C. The symbiotic nitrogen fixers (bacteria e.g. Rhizobium) in their root nodules do this (See Q6)
- 10A. See Q1 11B. See Q3 and 7 12D. See Q1  
13D. See Q5.

- 14C. See Q2 and juxtapose with the definition of the term "species"

#### NOTE:

- A species is a group of similar organisms which freely interbreed and produce fertile offspring.
- "Forced" interbreeding of a donkey and a horse, for example, produces a mule but the offspring is sterile hence donkey and horse although closely related are not the same animal or species.

- 15A. Diatoms are photosynthetic plankton (diatoms are protists) which live only in aquatic habitats while a forest is terrestrial
- 16C. ... or the trophic levels of a food chain in numbers (see Q7)
- 17B. See Q5
- 18E. Every food chain starts with a producer i.e. autotrophic plant
- 19B. To use a transect, a tape marked at intervals is stretched across the area and the plants encountered at the intervals are recorded.

**NOTES:**

- Plants can be collected by using quadrants or transects
  - Transect method is about plants only. Avoid options A and C
  - Animals are collected by capturing method or capture-recapture method.
- 20B. The producer is the link between the ecosystem and its external energy source, the sun.
- 21C. See Q5
- 22C. Note the absence of a living component in the list
- 23B. ...but not nitrites as in option D (See Q1)
- 24B. We start with a producer (weed) and end with man (here a quaternary consumer). Some beetles eat small fishes.
- 25A. See Q1                      26B. See Q3
- 27A. Living components only
- 28A. Others are hydrogen ion concentration (PH) and pressure.
- Factors Affecting Aquatic Habitat Only**
- Salinity - Concentration of dissolved substances/salts in water, affects only marine habitat.
  - Density - Affected by Salinity
  - Turbidity - A measure of clarity or cloudiness of water as determined by the presence of suspended matter in water and it affects penetration of light.
  - Water current or flow - It increases degree of oxygenation (aeration) and turbidity of water.
  - Tides and Waves - Affects marine habitat and estuary.
  - Dissolved Gases - Oxygen gas is most important here and its concentration is reduced by high salinity, high temperature, presence of organic matter, low speed of water
  - Nature of the substratum - This defines a rocky, sandy or muddy floor to which organisms are attached; affects swamps and marshes.
- For Terrestrial Habitat Only**
- Relative Humidity - A measure of the amount of water vapour or moisture in air and is dependent on temperature, rainfall and wind.
  - Topography - A measure of the sloppiness or sleepiness of the soil.
  - Edaphic factor - soil factors with respect to
    - soil types and particles
    - PH of soil
    - Presence of humus and water
    - presence of salt and aeration
    - depth of water table.
- 29B. See Q3    30D. See Q28    31D. See Q1    32B. See Q5
- 33A. Rather than adapt, organisms tend to be completely absent in a habitat whose PH is different from what they can ordinarily tolerate.
- 34B. The freshwater considered here is a pond
- 35D. The thick barks prevent evaporation and resist forest fires
- 36D. See Q1
- 37B. The producer is able to utilize or convert only 0.1% of solar energy but the primary consumer is able to tap about 10% of available energy from the producer; the secondary consumer taps about 20% of energy from primary consumer and so on otherwise the energy available will quickly spiral to zero.
- NOTE:** This must not be confused with the pyramid of energy which means that the overall energy available to each trophic level declines
- 38A. i.e. features which resist dry conditions. The absence of trees in X shows that it is the driest.
- 39D. By "climatic" we mean rainfall and temperature as we move from forest biome to grassland.
- 40B. Nonliving factors.
- 41C. The mouse feeds on both plant (maize) and animals (Grasshopper and weevils)  
The principle remains that a consumer must be fewer than its food - pyramid of number

**NOTE:** In some few cases especially in parasitism, the food is fewer e.g many ticks feeding on a single cow or a plague of locust feeding on a tree.

- 43D. A brackish environment is produced where marine water meets freshwater at the mouth of a river into the sea or ocean.

**NOTES:**

- The habitat is called an estuarine habitat or simply an estuary.
  - An estuary may have:
    - marshes
    - swamps
    - delta
    - lagoons
  - The daily fluctuation of salinity is caused by tides
  - Fluctuation also occurs between the wet-dry seasonal changes.
- 44A. See Q1
- 45C. The key phrase here is 'most important'
- 46C. See Q3
- 47B. Curve II touches the horizontal axis signifying the extinction of II
- 48D. Food chain is too linear a food relationship to be possible at all times while food web, an agglomeration of many food chains, provides the alternatives.
- 49A.                                      50B. See Q14
- 51C. Predators are usually larger and fewer than their preys (Q42) while parasites as smaller and more numerous than its host.
- 52D. Overall energy is least here (H) although most efficient energy conversion occurs from G to H (Q37).
- 53B. See Q3.    54B. Or delta of a river    55D. See Q28
- 56C. See Q4    57D. See Q28
- 58C. The intertidal zone is exposed to wave action due to rising and falling tides
- 59B. Non-biodegradable substance such as teeth or bone (not found in producers but in tertiary consumers such as mammals) is not easily subject to decay against unsightly accumulation.
- 60A. Microscope is used in the lab.
- 61A. See Q1
- 62A. An ecosystem is a community of populations of organisms of different species.
- 63C. Abiotic factors comprising the physical environment and climatic factors
- 64B. The only two classes of decomposers are
  - Fungi e.g mushroom/Rhizopus
  - Bacteria.
- NOTES:**
- Earthworms, millipedes, woodlice and termites are mere detritus eaters
  - Decomposing materials constitute a detritus
  - Hence the detritus-eating organisms are called macro decomposers while the true decomposers are called micro-decomposers.
- 65C. Compare Q3                      66B. Compare Q42
- 67D. Mangrove swamp
  - Lagos
  - Edo
  - Delta
  - Rivers
  - Cross River
  - Akwa Ibom
  - Bayelsa Rainforest
  - Oyo
  - Ondo
  - Ogun
  - Ekiti
  - Osun
  - Imo
  - Anambra
  - Ebonyi
  - Enugu
  - Rivers
  - Abia
  - Cross River States
  - Akwa Ibom
  - Lagos.
- Guinea Savanna (or southern Guinea Savanna)
- Kaduna
  - Kwara
  - Kogi
  - Benue
  - Niger
  - Nasarawa
  - Taraba.
- Sudan Savanna (or Northern Guinea Savanna)
- Kebbi
  - Sokoto
  - Zamfara
  - Kano
  - Katsina
  - Jigawa
  - Yobe
  - Borno
  - Adamawa
  - Gombe
  - Bauchi.
- Sahel Savanna
- Yobe
  - Borno

Montane Forest  
Plateau(Jos)

**NOTES:**

1. Your standard textbooks might have been written when Nigeria was 19, 21 or 30 states hence states like Ekiti, Bayelsa and Kogi may not be present
2. Some states occur twice in the above list because they fall into more than one belt.
3. Savanna is a grassland and the 3 belts northwards are Guinea - Sudan - Sahel
4. Correct order from south to north  
Mangrove Swamp - rainforest- Montane forest- Guinea - Sudan - Sahel.

68A. No desert yet in Nigerian but the Sahel Savanna might transform to one if desert encroachment (desertification) is not checked

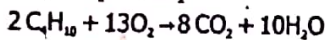
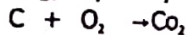
69A. See Q5                      70D. See Q37

**71B. Processes which replenish CO<sub>2</sub> in the atmosphere**

1. Respiration by both plant and animals



2. Burning, especially of fossil fuels e.g coal and petrol



3. Decomposition of calcareous substances e.g chalk, marble, limestone shell of animals like snails



4. Decay of dead plant and animal or decay of their wastes

**Processes which deplete the atmosphere of CO<sub>2</sub>**

1. Photosynthesis:  $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + O_2$

2. Dissolution in water bodies especially the oceans/seas:  
 $CO_2 + H_2O \rightarrow H_2CO_3$

**NOTE:**

1. H<sub>2</sub>CO<sub>3</sub> is incorporated into building the calcareous shells of animals such as crabs, snails etc.
2. Photosynthesis is the reversal of respiration
3. The entire carbon cycle is oxygen cycle in the reverse

72C. Non-epiphytic ferns grow on the forest floor where light rays hardly reach and there is high humidity. But epiphytic ferns (on trees) occupy the middle-storey.

**The five layers of the Tropical rainforest**

1. Ground layer - forest floor
2. Lower storey - of shade-loving, dwarf trees and shrubs.
3. Middle storey - shade-loving, tall trees
4. Upper storey - canopy layer of light-loving tall trees
5. Emergent layer - trees as high as 60 metres.

73C. See Q5

74B. Compare Q41

75C. Southern Guinea borders the rainforest hence more rainfall, more luxuriant grasses and even more trees

76B. See Q62

77D. Since energy available for successive trophic levels declines

78B. To strike a balance in the composition of soil nitrogen, the soil must be denitrified.

79A. See Q67

**NOTES:**

1. Estuarine = mangrove swamp (see Q43)
2. Port - Harcourt of Rivers state and Damaturu of Yobe State.

\* Perhaps you need your state-and-capital nursery rhyme once again.

80A. Production reached a peak.

81C. There was a balance between production and conservation cum recycling hence, production is kept constant over the years.

82B. Two classes of organisms are found afloat the surface of the waters of a marine habitat: 1. Planktons 2. Nektons

**Planktons:**

1. Planktons are of two groups
  - a. Phytoplanktons - They are photosynthetic (autotrophic) and microscopic plants or very small plants forming the producer pool of the habitat
  - b. Zooplanktons - They are heterotrophic. They are either microscopic or very small animals.
2. Examples of Phytoplanktons: a. Diatoms b. seaweeds
3. Examples of zooplanktons: a. protozoans b. crustaceans (e.g copepods) c. worms d. larvae e. molluscs
4. Planktons are passively moving organisms i.e their movement is largely due to water current

**Nektons:**

Nektons are actively swimming animals like fishes, crabs, prawns, squids and whales.

83C. Feeding directly on plants

84D. From consumers to producers

85C. **White mangrove** = Breathing root = pneumatophore  
**Red mangrove** = stilt roots

86D. They compete for limited space on their tree - hosts.

87C. Putrefaction only ammonifies while nitrification really makes nitrogen available to plants (see Q1)

88B. **Mortality rate** = Death rate

**Immigration** = Moving into the habitat

**Emigration** = Moving out of the habitat

89B. Pyramid of Numbers

90B.

**CHAPTER 23**

**ECOLOGY II: SUCCESSION. ADAPTATION.**

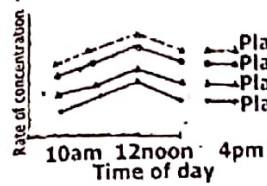
**NUTRIENT RECYCLING**

1. A plant which grows on another plant without apparent harm to the host plant is called A. a parasite B. an epiphyte C. a saprophyte D. a predator E. a hermaphrodite. (1978:Q1)
2. In which of these associations is much harm done to one of the partners? A. Symbiosis B. Epiphytism C. Commensalism D. Parasitism E. Mutualism (1979:Q19)
3. A student trying to find out the order in which organisms appear on a cleared plot is studying one of the following A. Ecosystem B. Food Chain C. Food web D. Succession E. Community (1980:Q38)
4. An organism X lives entirely on the waste products in another organism Y. In this association X is A. a symbiont B. commensal C. saprophyte D. parasite E. epiphyte. (1980:Q39)
5. Which of the following statements is NOT true of symbiosis? A. Symbionts must be living B. It is an association of 'give and take' C. The association may involve two plants D. Association between two similar species E. Symbionts derive mutual benefit. (1981:Q28)
6. In which part of a leguminous plant can you find bacteria like Azotobacter? A. Spongy mesophyll of leaf B. At the nodes C. At the internodes D. In nodules E. Palisade mesophyll of leaf. (1982:Q42)
7. The absence of stomata shows that a leaf may be A. from a floating plant B. from a submerged plant C. variegated D. from a terrestrial plant E. from parasitic green plant (1982:Q50)
8. Plants which can survive in places where the water supply is limited are A. bryophytes B. mesophytes C. xerophytes D. hydrophytes E. pteridophytes. (1983:Q25)
9. Which of the following is NOT regarded as a pollutant on land or in the air? A. Noise B. Smoke C. Sulphur dioxide D. Carbon monoxide E. Nitrogen (1984:Q43)
10. A relationship between living organisms which is of mutual benefit is A. parasitism B. saprophytism C. ecosystem

D. symbiosis E. commensalism. (1985:Q41)

11. An organism found on a bare rock surface has features of algae and fungi. The organism is A. an epiphyte B. a lichen C. a bryophyte D. a fern. (1987:Q3)

Use the information in the graph below to answer question 12 and 13



12. Which of the plants is likely to have broad leaves with thin cuticle? A. R. B. S C. T D. U (1987:Q25)

13. Which of the plants is likely to be a desert species? A. U B. T C. S. D. R. (1987:Q26)

14. Epiphytes growing on the branches of trees provide an example of the relationship known as A. parasitism B. commensalism C. apophytism D. holophytism. (1987:Q46)

15. If an organism obtains its food by means of haustoria, it is said to be A. holophytic B. heterophytic C. Saprophytic D. Parasitic. (1988:Q40)

16. Which of the following relationship involves only one organism? A. Saprophytism B. Commensalism C. Parasitism D. Symbiosis. (1988:Q41)

17. Which of the following causes pollution? A. Consumption of canned drinks. B. The addition of fertilizer to farmland C. Respiration of living organisms D. Burning of refuse (1988:Q46)

18. Lichen is an example of A. a saprophytic organism. B. a symbiotic association C. an epiphytic plant D. a carnivorous plants (1989:Q41)

19. A physiological adaptation of plants to the problem of excessive water loss is A. reduction in the number of stomata B. reversal of the normal stomatal rhythm C. possession of shallow roots D. possession of waxy cuticle. (1989:Q42)

20. Which of the following is a dangerous product of coal burning? A. sulphur dioxide B. carbon-dioxide C. carbon D. nitrogen. (1989:Q45)

21. Physiological adaptation to very dry condition in animals is called A. hibernation B. aestivation C. rejuvenation D. xeromorphism (1990:Q45)

22. Which of the following constitutes pollution? A. Droppings from birds B. Loud disco music C. A pack of cigarettes D. Refuse in an incinerator. (1990:Q47)

23. What do bacteria in root nodules derive from the host plant? A. Protection and minerals B. Water and minerals. (1990:Q49) C. Carbohydrates and water D. Protection and carbohydrates.

24. Which of the following is likely to occur in a deciduous forest during the dry season? A. New leaves are formed B. The trees die off. C. The undergrowth increases D. The ground becomes bare. (1991:Q45)

25. Which of these is NOT an adaptive feature for arboreal life? A. Possession of a long tail B. Possession of claws C. Possession of teeth D. Counter shading in coat colour. (1991:Q46)

26. Sources of air pollutants are A. industrial chimneys, burning fossil oils and river dams B. sulphur dioxide, acid rain and pesticides C. sulphur mines, vehicle exhausts and aerosols D. sewage, smoke and old vehicles. (1991:Q48)

27. Nitrogen-fixing micro-organisms in leguminous plants live symbiotically in the A. root nodules B. tap roots C. branch roots D. root hairs. (1991:Q50)

28. Which of the following is true of a climax community? A. It persists until the environment or climate changes. B. It changes drastically from one year to the next C. It is the first stage in succession. D. It is made up of the tallest trees and the smallest animals. (1992:Q32)

an example of plant adaptation to a xerophytic environment

is represented by the development of A. fleshy tissues and reduced leaves B. broad canopy and extensive surface root system C. thick barks and broad leaves D. rough leaves and shallow root system. (1992:Q47)

30. Two organisms of different species, living in close association but not dependent on each other are referred to as A. parasites B. commensals C. symbiots D. autotrophs (1993:Q39)

31. Plants adapted for life in salty marsh are called A. hydrophytes B. xerophytes B. Halophytes D. epiphytes. (1993:Q41)

32. Which group plants would be the first colonizers in an ecological succession changing rocks to soil? A. Mosses. B. Ferns C. Lichens D. Grasses. (1993:Q42)

33. Carbon monoxide poisons tissues by A. constricting the blood vessels B. killing the cells C. combining with haemoglobin D. rupturing the blood vessels. (1993:Q45)

34. The bright colours of the comb and feathers in the peacock are for A. sex differentiation B. beauty C. courtship D. defence. (1993:Q26)

35. Ecological succession ends with the formation of a stable A. niche B. population C. pioneer community D. climax community (1994:Q37)

36. People who suck petrol with their mouths run the risk of increasing in their blood the concentration of A. iron B. lead C. calcium D. magnesium. (1994:Q40)

37. Breathing root is an adaptation for survival in the A. mangrove swamp B. desert C. arboreal habitat D. savanna. (1994:Q47)

38. Red coloration on the head of a male lizard helps it to A. mark its territory B. camouflage in the environment C. secure its mate D. defend itself. (1994:Q48)

39. A phenomenon by which an animal goes into a state of dormancy during the dry season is called A. hibernation B. aestivation C. incubation D. deactivation. (1994:Q49)

40. Colonization of a bare rock surface is termed A. evolution B. spciation C. primary succession D. secondary succession (1995:Q35)

41. Environmental pollutants which can work through the media of water, soil and air include A. carbon monoxide B. noise C. sulphur (IV) oxide D. smoke.

42. The slender, long and slightly curved beak of the sunbird is an adaptation for feeding on A. nectar B. small seeds C. big seeds D. insects. (1995:Q46)

43. Scales on reptiles are a feature for A. conserving water B. conserving food C. protecting the skin D. locomotion (1995:Q47)

44. The colour of the ventral surface of a fish is lighter than that of the dorsal. This is mainly A. an adaptation for moment B. an adaptat on for camouflage C. for attracting mates D. for regulating body temperature. (1995:Q48)

45. Toads and lizards in an ecosystem depend on a limited quantity of food. This is an example of A. parasitism B. intraspecific competition C. predation D. interspecific competition. (1997:Q35)

46. Adaptive features of plants to desert conditions include A. thick barks, succulent stems and sunken stomata B. thin barks, succulent stems and sunken stomata C. thin barks, air floats on stems and sunken stomata D. air spaces in tissues, adventitious roots and thick barks. (1995:Q38)

47. Which is the most important pollutant of the marine environment in Nigeria? A. Insecticides B. Sewage C. Oil D. Inorganic fertilizers. (1995:Q46)

48. Water loss is regulated in plants and animals by both the A. scales and the skin B. scales and the hair C. thick leaves and the feathers D. leathery cuticle and the feathers. (1997:Q46)

49. What combination of characters should a prey develop to survive in the environment of its predator? A. Camouflage,



well developed limbs and effective vision. B. Showy colour, big body and well developed limbs. C. Camouflage, big body and effective vision. D. Show colour, well developed muscles and an acute sense of smell. (1997:Q47)

50. A freshwater plant such as water lily can solve the problem of buoyancy by the possession of A. aerenchymatous tissues B. dissected leaves C. thin cell walls of the epidermis D. water-repelling epidermis. (1998:Q31)

51. The biological association that contributes directly to succession in a community is A. competition B. predation C. parasitism D. commensalism. (1998:Q43)

Use the diagram below to answer questions 52 and 53



52. The bird's bill adapted for fishing is labeled A. I B. II C. III D. IV. (1998:Q45)

53. Toes of the feet ending in a sharp, curved hook suitable for

holding and tearing are most likely to belong to the bird with the bill in A. I B. II C. III D. IV. (1998:Q46)

54. In the whistling pine leaves are reduced to brown scale and young stems are green. This is an adaptation for A. obtaining food B. conserving nutrients C. storing water D. reducing transpiration. (1998:Q48)

55. The sign + is used to indicate an association where an organism gains, while 0 is used where an organism is unaffected. An association indicated as + 0 is known as A. predation B. commensalism C. parasitism D. competition (1999:Q39)

56. The very bright colours in some types of mushroom A. are a warning that they may be poisonous B. indicate that they are very tasty C. attract potential transporters of their spores D. perform the same function as bright colours in flowers (1999:Q46)

57. The least adaptive feature for arboreal life is that A. possession of four limbs B. possession of claws C. development of a long tail D. counter shading of coat colour (1999:Q47)

58. The loud cry made by a brooding hen when a predator is around is meant to A. alert the poultry attendants B. attract cocks to come and fight the predator C. advertise the boundaries of its territory to intruders D. warn its chicks and other chickens of impending danger (1999:Q49)

59. An ecological succession often leads to A. an increase in species diversity B. a decrease in species diversity C. an unstable community D. the dispersal of species (2000:Q28)

60. Which of the following are adaptations of animals to aquatic habitats? A. Gills, streamlined bodies and lateral line B. Lateral line, streamlined bodies and lungs C. Gills, scaly skin and lungs D. Gills, streamlined bodies and spiracles (2000:Q34)

61. Which of the following is an adaptation of forest species? A. Few stomata B. Thick bark C. Buttress roots D. Reduced leaves (2000:Q35)

62. In a group of male Agama lizards, the one with brightest head colour is the A. dominant B. youngest C. oldest D. largest (2000:Q45)

63. A certain savanna grasshopper changes colour from green during the rainy season to brown during the dry season bush fires. The reason for these colour changes is that the A. grasshopper is getting older B. environment temperature is changing C. grasshopper is avoiding predation D. grasshopper is frequently moulting (2000:Q48)

64. Complex social behaviour and organization are found mostly in A. Insects B. birds C. reptiles D. mammals (2000:Q49)

65. Which of the following structural features are adapted for uses other than water conservation? A. Succulent stems B. Scales in animals C. Spines in plants D. Feathers in birds (2000:Q50)

66. An association between the root nodule of a leguminous plants and rhizobium sp is known as A. commensalism B. mycorrhiza C. parasitism D. symbiosis (2001:Q1)

67. Carbon (IV) oxide content of the atmosphere is least affected by A. cutting down and clearing of forest B. forest fires C. burning of fossil fuels D. plant and animal respiration (2001:Q29)

68. The stem of a typical aquatic plant usually has many A. air cavities B. intercellular spaces C. water cavities D. water-conducting cells. (2001:Q45)

69. The ability of an organism to live successfully in an environment is known as A. resistance B. competition C. succession D. adaptation (2001:Q47)

70. The most important adaptation of xerophytes is the ability of the protoplasm to A. resist being damaged by loss of water B. store sugar and minerals in the vacuoles C. absorb water and swell D. shrink from the cell wall (2001:Q48)

71. A green snake in green grass is able to escape notice from predators because of its A. disruptive colouration B. countershiping C. warning colouration D. cryptic colouration (2001:Q9)

72. For heterotrophic organisms, competition is least caused by the inadequacy of A. mates B. space C. light D. nutrients (2001:Q50)

73. One of the adaptations to life on trees by a monkey is its possession of digits which are A. extensible B. big C. opposable D. long (2002:Q10)

74. The community of plants in which the same species occur from year to year is the A. annual species B. pioneer vegetation C. perennial species D. climax vegetation (2002:Q11)

75. The supporting tissue of xylem is most poorly developed in A. mangrove swamp plants B. grassland plants C. submerged water plants D. desert plants (2002:Q18)

76. Animals are restive when the environment in which they live becomes A. hot and dry B. cold and wet C. warm and humid D. windy and snowy (2002:Q26)

77. Birds which are large with long straight pointed beaks, long necks and long legs are likely to be A. insect eaters B. fish catchers C. nectar feeders D. fruit eaters (2002:Q27)

78. One example of fossil fuels is A. coral B. limestone C. coal D. firewood (2003:Q31)

79. The most effective method of dealing with non-biodegradable pollution is by A. burying B. recycling C. incineration D. dumping (2003:Q32)

80. Mycorrhiza is an association between fungi and A. filamentous algae B. roots of higher plants C. bacteria D. protozoans (2003:Q34)

81. The pioneer organisms in ecological succession are usually the A. algae B. lichens C. ferns D. mosses (2003:Q37)

82. The presence of sunken stomata and the folding of leaves are adaptations to A. prevent entry of pathogens B. reduce water loss C. remove excess water D. prevent guttation (2003:Q46)

83. Spines and shells on animals are adaptations for A. chemical defence B. camouflage C. physical defence D. mimicry (2003:Q48)

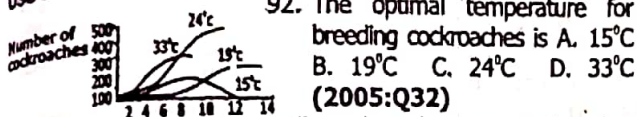
84. An example of cryptic colouration is the A. mottled colours on moths that rest on lichens B. bright colour of an insect pollinated flower C. bright marks on a poisonous tropical frog on variegated leaves D. green colour of a plant (2003:Q47)

85. The inactive state exhibited by an animal during hot dry seasons is termed A. aestivation B. dormancy C. resting D. hibernation (2003:Q47)

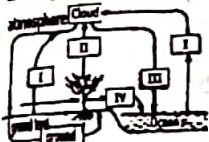
86. The association between termites and the cellulose digesting protozoans in their guts is an example of A. saprophytism

87. B. mutualism C. parasitism D. commensalism (2004:Q35)  
 One adaptation of reptiles to water loss is the presence of  
 A. keratinous scales B. claws on limbs C. long tails D. long  
 sticky tongues (2004:Q37)  
 88. The scarcity of food causes a sudden decrease in population  
 size by A. decreasing the reproductive rate B. bringing  
 about immigration C. raising the mortality rate D. minimizing  
 the rate of competition (2004:Q39)  
 89. Which of the following is an example of Intraspecific  
 competition? A. a lizard and an ant-eater chasing an insect  
 B. a worker termite and a soldier in a limited space C. a hawk  
 and an eagle targeting the same chicken D. yam and potato  
 shoots growing out through the same window (2004:Q46)  
 90. Plants survive hot dry conditions by A. storing water in large  
 parenchyma cells B. producing numerous leaves C. having  
 numerous stomata D. having evergreen leaves (2004:Q47)  
 91. The spots and stripes of the leopard and tiger are examples  
 of A. cryptic colouration B. warning colouration  
 C. disruptive colouration D. countershading (2004:Q49)

Use the diagram below to answer questions 92 and 93



92. The optimal temperature for breeding cockroaches is A. 15°C B. 19°C C. 24°C D. 33°C (2005:Q32)  
 93. At which temperature will cockroaches not survive after 10 days. A. 15°C B. 19°C C. 24°C D. 33°C (2005:Q33)



94. Evaporation and transpiration are respectively represented by the components labelled A. I and II B. II and III C. III and IV D. IV and I (2005:Q34)

95. The main reservoir of water in the cycle is the cycle is the A. cloud B. groundwater C. plant D. ocean (2005:Q35)  
 96. Secondary succession is much faster than primary succession because A. pioneer colonizers are more in number B. Soil is already present C. secondary series require less nutrients D. species competition is increased (2005:Q37)

97. The recycling method of solid waste disposal is unsuitable for A. organic matter B. glass C. plastics D. metal scraps (2005:Q42)

98. A non-renewable alternative source of energy is A. wind generators B. solar panels C. nuclear energy D. hydroelectric power (2005:Q43)

99. The association in which one member benefits and the other is relatively unaffected by the interaction is termed A. symbiosis B. parasitism C. commensalism D. mutualism (2005:Q46)

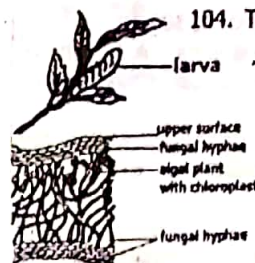
100. When a peacock displays its colourful feathers, it is A. ready for a fight B. protecting itself from predators C. protecting its male from predators D. courting a female (2005:Q4)

101. When an animal has dark-coloured dorsal surface and a light-coloured ventral surface, this is an adaptation called A. concealment coloration B. countershading C. colour blending D. disruptive coloration (2005:Q48)

102. The intensity of competition among animals in a given area will increase with A. an increase in the frequency of disease outbreaks B. an increase in population size C. a decrease in the immigration rate D. an increase in the emigration rate (2006:Q26)

Use the diagram below to answer questions 103 and 104

103. The economic importance of the larva is that it A. is eaten by birds B. develops into a moth C. resembles the plant on which it lives D. feeds on the leaves of crops. (2006:Q27)



104. The type of adaptation shown by the larva is A. mimicry B. countershading C. flash coloration D. disruptive coloration (2006:Q28)

105. The importance of the association to the fungus is that it obtains A. a partner for reproduction B. anchorage from the algae C. oxygen and carbohydrates from the algae D. water and mineral salts from the algae. (2006:Q47)

106. The association illustrated demonstrates A. parasitism B. commensalism C. saprophytism D. mutualism (2006:Q48)

107. Which of the following is an example of parasitism? A. Fungi growing on a dead tree branch. B. A squirrel living in an abandoned nest of a bird C. Mistletoe growing on an orange tree. D. Cattle egrets taking ticks from the body of cattle. (2007:Q4)

108. One adaptation shown by hydrophytes in freshwater habitats is the A. leaves reduced to spines B. poor development of roots and xylem tissues C. waxy cuticle on shoot surface D. well-developed roots and supporting system. (2007:Q5)



109. The type of protective adaptation exhibited by the animal is A. disruptive colouration B. flash colouration C. countershading colouration D. warning colouration (2007:Q11)

110. The structure labelled I is A. photosensitive B. radiosensitive C. chemoreceptive D. tactile (2007:Q12)

111. Which of the following factors can bring about competition in a population? A. Dispersion. B. Emigration. C. Drought. D. Mortality. (2007:Q13)

112. The beak of a duck is structurally adapted for A. scooping and sieving food B. catching and grasping food C. picking and cracking food D. boring and sucking food (2008:Q11)

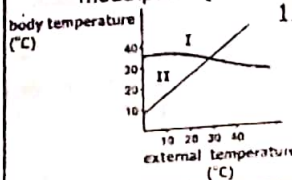
113. The major consequence of bush burning in an ecosystem is A. the loss of water absorbing ability of the soil B. the loss of biological diversity C. a decrease in animal population D. an increase in soil fertility. (2008:Q2)

114. Which of the following associations is an example of mutualism? A. Hydra viridis and zoochlorella B. Human and lice C. Shark and Remora fish D. Bread and Rhizopus stolonifer (2008:Q30)

115. Stomata of some plants are sunken and protected by hairs. These are features of A. mesophytes B. epiphytes C. hydrophytes D. xerophytes. (2008:Q33)

116. The easiest way to establish the level of pollution in a local stream is to measure the level of A. oxygen B. carbon (IV) oxide C. ammonia D. alkalinity. (2008:Q39)

117. A major adaptive feature of endoparasites is the A. loss of the organ of movement B. presence of claws C. loss of the central nervous system D. presence of piercing mouthparts. (2008:Q45)



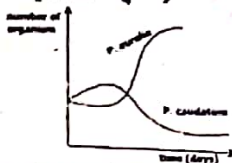
118. From the graph above, it can be appropriately deduced that A. the body temperature in II varies with that in I B. the body temperature in I is independent of external temperature C. I and II maintain constant body temperature D. external temperatures affect the body temperature of I and II. (2008:Q46)

119. The animal represented by I is a A. poikilotherm B. homiotherm C. carnivore D. herbivore (2008:Q47)

120. The ability of a chameleon to change its colour is an adaptive feature for A. attraction B. defence C. display D. attack. (2008:Q48)

121. The association between bacteria residing in the caecum and the ruminant is A. parasitism B. predation

- C. saprophytism D. mutualism (2009:Q30)
122. The major cause of global warming is the A. burning of fossil fuel B. construction of dams C. use of electricity D. exploration of space (2009:Q38)
123. Plants that grow in an area that is neither too wet nor too dry are A. xerophytes B. mesophytes C. epiphytes D. hydrophytes (2009:Q45)
124. The specialized pigment cells that are involved in colouration and colour change in animals are the A. xanthophyl B. chromatophores C. chlorophyll D. melanin (2009:Q48)
125. During the dry season in the tropics, the body metabolism of some animals slows to a minimal level in a process referred to as A. hibernation B. aestivation C. dormancy D. senescence (2009:Q49)
126. Mycorrhizae promote plant growth by A. protecting it from infection. B. helping it to utilize atmospheric nitrogen. C. serving as a growth regulator. D. absorbing inorganic ions from the soil. (2010:Q29)
127. I. Adoption of appropriate nocturnal habits II. Burrowing. III. Adjusting their internal body temperature. IV. Possession of many sweat pores. Which of the above are ways in which desert animals adapt to extreme heat of the environment? A. II and III only. B. I and II only. C. I, II and III only. D. I and IV only. (2010:Q34)
128. In nature, plants and animals are perpetually engaged in mutualism because A. they utilize respiratory wastes of each other B. they are neighbours C. they are rivals D. all animals rely on food produced by plants. (2011:Q28)
129. Lack of space in a population could lead to an increase in A. disease rate B. drought C. water scarcity D. birth rate (2011:Q41)
130. The brightly coloured eye spots on the hind wings of a moth are an example of A. crypsis B. mimicry C. warning colouration D. disruptive colouration (2011:Q49)
131. Countershading is an adaptive feature that enables animals to A. fight enemies B. remain undetected C. warn enemies D. attract mates. (2012:Q12)
132. The water cycle is maintained mainly by A. evaporation of water in the environment B. evaporation and condensation of water in the environment C. condensation of water in the environment.
133. Which of the following animals can exist solely on the water they get from food and metabolic reactions? A. Forest arboreal dwellers. B. Desert dwellers. C. Forest ground dwellers. D. Rainforest dwellers (2012:Q29)
134. The most likely first colonizers of a bare rock are A. mosses B. ferns C. lichen D. fungi (2012:Q32)
135. The carrying capacity of a habitat is reached when the population growth begins to A. increase slowly B. increase exponentially C. slow down D. remain steady (2012:Q33)



136. The type of interaction shown is referred to as A. interspecific competition B. intraspecific competition C. mutualism D. cooperation. (2012:Q34)
137. Which of the following statements is true of the interaction? A. P. aurelia is better adapted for obtaining food than P. caudatum. B. P. caudatum is better adapted for obtaining food than P. aurelia. C. Both organisms cannot coexist D. Both organisms cannot reproduce. (2012:Q44)
138. The short thick beak in birds is an adaptation for A. crushing seeds B. sucking nectar C. tearing flesh D. straining mud.

- (2012:Q45)
139. The plants that grow in deserts or very dry areas are referred to as A. hydrophytes B. epiphytes C. xerophytes. D. mesophytes. (2012:Q46)
140. The structural adaptation of desert plants for water conservation is A. spongy mesophyll. B. spiny leaves C. prominent stomata in leaves. D. broad leaves with numerous stomata (2013:Q11)
141. The long and sharp clawed feet of birds is an adaptation for A. scooping mud. B. tearing flesh. C. grasping prey. D. crushing seeds. (2013:Q14)
142. A pollutant that is biodegradable is A. heavy metals. B. cellophane C. sewage D. crude oil (2013:Q15)
143. Physiological adaptation to very dry conditions in animal's demonstrates A. xeromorphism. B. hibernation C. aestivation D. rejuvenation (2013:Q40)
144. One adaptation of Cactus opuntia to conserve water is the reduction of A. stem to leaves. B. leaves to spine. C. flower size D. internodes (2013:Q46)
145. Which of the following structures is adapted for feeding in a bird of prey? A. Smooth beak and strong claws. B. Big beaks and strong feet C. Pointed beak and strong claws. D. Hooked beak and sharp claws. (2013:Q47)
146. The special pigment for colour change in chameleon is A. carotenoid. B. chromatin C. chromatophore D. melanin (2013:Q48)
147. The behavioural adaptation in social insects could best be described as A. saprophytism B. Parasitism C. Commensalism D. symbiosis (2013:Q49)
148. One of the ways of controlling noise pollution in urban areas is A. by siting industries away from residential area B. that fuel should completely combusted by engines C. by planting trees on both sides of the road D. by wearing ear devices. (2013:Q50)
149. A constituent of the exhaust fumes from electricity generating sets which causes serious air pollution is A. carbon (II) oxide B. water vapour C. ozone D. Carbon(IV)oxide. (2014:Q37)
150. A pollutant that is mostly associated with acid rain is A. nitrogen(IV)oxide B. ozone C. fluorine D. carbon (IV) oxide. (2014:Q38)
151. The streamline shape of fishes is an adaptation for A. securing mates B. easy movement C. obtaining Food D. defense and attack. (2014:Q)

## CHAPTER 23: ANSWERS

- 1B. Epiphytism In animals is called commensalism  
Plant → epiphytism → epiphytes  
Animal → commensalism → commensals

### NOTES:

- An epiphyte only derives support from its host because it can manufacture its own food as it is a chlorophyllous plant.
  - It obtains water from the one trickling down the external surface of the host.
  - Its mineral salts also from the dust particles dissolved in the water.
  - A parasitic plant penetrates the host vascular tissue by an absorbing organ called **haustorium**.
- 2D. The parasite gains, the host loses
- ### NOTES:
- Although **Mutualism** and symbiosis are still used interchangeably, mutualism is now the old definition of symbiosis.
  - Mutualism** involves two organisms where both derive mutual benefits from each other

3. **Symbiosis** now strictly means any relationship involving two organisms

10. Ecological succession is a phenomenon by which an ecological community undergoes more or less orderly and predictable changes following a disturbance or the initial colonization of a new habitat until a climax community is established.

### Primary Succession

1. Succession which begins in new habitats, uninfluenced by preexisting community is called primary succession.
  2. Primary Succession occurs over a long period of time because it takes a long time to establish the soil on which the community is based.
  3. Pioneer organisms on a bare rocky slope are lichens (first colonizers)
  4. A new habitat can be formed in the following ways:
    - a. Weathering of rocks (to form soil)
    - b. Lakes/ponds filled with surrounding soil
    - c. Rivers forming deltas at the mouths to the sea.
5. Examples of primary succession
- a. Rocky slope → forest
  - b. Shallow lakes → marshes/swamps → forests
  - c. Delta → Mangrove swamp → forest

### Secondary Succession

1. This occurs when an original climax community is disturbed by forces such as fires, floods, hurricanes, tornados, drought, volcanic eruption etc.
2. An abandoned farmland being cleared will also undergo secondary succession.
3. Secondary succession is faster than primary succession because
  - a. Land/soil is established already as soil formation takes a very long time.
  - b. Organisms from surrounding communities are readily available.

4C. Putrefying bacterial/fungi (chapter 22)

5D. Association between similar species is in fact a competition see also Q2

6. No option was correct because Azotobacter is a free living, non-symbiotic, nitrogen-fixing bacterial living in the soil.

### 7B. Adaptations of Hydrophytes

1. Roots are poorly developed - absorption occurs throughout the entire body surface.
2. Floating leaves are well developed cuticle and stomata are seen in the upper epidermis only.
3. Their cuticle and no stomata in submerged leaves
4. Poorly developed vascular system. Poorly lignified xylem (wood) since mechanical support is not all that needed.
5. Air space; for buoyancy.

### Xerophytes

1. Extensive surface root
2. Well developed tap root
3. Succulents have water-storage tissues e.g portulaca, Bryophyllum and bisal hemp.
4. Reduction of transpiration rate in a number of ways:
  - a. waxy cuticle or hairy leaves
  - b. sunken stomata
  - c. leaf rolling
  - d. small leaves
  - e. Leaves modified into spines
  - f. Reverse stomatal rhythm.

### Mesophyte

1. Well developed root system
2. Flat, broad, thin leaves with chlorophyll plenty.
3. Stomata not specially protected but usually confined to the underside of leaves.

### NOTES:

1. Xerophytes - plants which live in extremely dry habitat e.g desert
2. Hydrophyte - live in water or extremely wet habitat e.g pond or swamp
3. Mesophyte - live in moderately dry or wet habitat e.g rainforest.

8C. See Q7

9E: Nitrogen, a normal component of the atmosphere, is innocuous.

10D. See Q2

11B. Algae and fungi are mutualistic partners in a lichen:

- a. Algae are autotrophs producing food for the union
- b. Fungi provides support and protection for the algae

lichen = Algae + fungi

12A. It loses water fastest in transpiration

13A. It loses water least

14B. See Q1

15D. See Q1

### Examples of Parasitic Plants

1. Mistletoe - partial parasite or semi-parasite
2. Dodder plant - Total parasite.

16A. The other organism involved is dead and now decaying.

17D. This directly causes pollution while the others may cause pollution indirectly or overtime

18B. See Q11

19B. This adaptation is functional while others are structural adaptations.

20A. May cause acid rain

21B. While hibernation is adaptation to very cold, wet condition.

**NOTE:** In both cases, the animals assume a sleeping mode over a long period of time until favorable conditions return and the metabolism of the body is at basal level.

22B. Noise Pollution

23D. While the host obtains a rich supply of nitrogenous compounds (minerals)

24D. Because each tree sheds all its leaves at once.

25C. (A) e.g chameleon, American monkey (B) e.g common pangolin (C) e.g tree snakes

26C. Sources, not the pollutants themselves

27A. See Q23

28A. Its state of dynamic equilibrium can only be disrupted by environmental or climatic changes.

29A. See Q7 30B. See Q1

31C. Special hydrophyte Halo = salt (halogen?)

32C. See Q3

33C. Hence, it reduces the oxygen carrying capacity of haemoglobin

34C. To attract the peahen.

35D. See Q3

36B. Petrol is usually "leaded" to reduce "knocking" in engines

37A. Breathing root = pneumatophore (in white mangrove)

38C. Compare Q34 39B. See Q21 40C. See Q3

41C. Air → Inhalation of Sulphur dioxide leads to irritation and damage of the lining of the eyes, air way and the lungs.

Soil → It forms acid rain which affects vegetation since most plants cannot thrive in acidic soil

Water → Acid rain also dissolves aluminum salts in the soil and these find their way into ponds and lakes and life in them are destroyed.

42A. The long slender beak reaches the nectary at the flower base

### NOTES:

1. Short, thick beak for crushing seeds in sparrow
2. Strong, hooked beak for cracking nut in parrot.
3. Long, slender, pointed beak to peck wood for insects in woodpecker

4. Strong, curved beak for tearing flesh in eagle, hawk, owl and falcon
5. Flat, grooved beak for sieving mud for food in duck.
- 43A. Scales prevent desiccation.
- 44B. This is an example of counter shading.
- NOTES:** The light ventral surface blends with the sky background to confuse the predators from below; the dark dorsal surface blends with the dark water background to confuse predator from above.
- 45D. ....competition between two different species; and if it is between organisms of the same species it is intraspecific competition
- 46A. See Q7
47. Oil from spillage.
- 48D. Cuticle in plant; feather in birds (animals)
- 49A. Camouflage to blend with the surroundings and escape detection; limbs to flee from the predator; keen sight to see the predation in time.
- 50A. **Aerenchymatous tissues** have air spaces against hypoxia (low oxygen) **NOTE:** Aero = air (as in aeroplane)
- 51A. The fit survive and the unfit are eliminated
- 52D. The long, strong and pointed beak of heron (IV)
- 53B. Eagle (II) is a bird of prey as its bill (beak) shows; I = weaverbird; II = sunbird
- 54D. Transpiration through photosynthetic leaves would have been enormous.
- 55B. e.g. a remora fish obtains its food from the crumbs coming from a shark while the shark itself is not affected positively or negatively.  
Parasitism (+-); Commensalism (+o); Epiphytism (+o); Mutualism (++) Predation(+); Saprophytism(+)
- 56A. This is called warning coloration
- 57A. The number of limbs is not important.
- 58D. Warning cry is part of parental care in the hen.
- 59A. Until the community of species attains a climax.
- 60C. A gill utilizes dissolved oxygen; streamlined bodies offer little resistance to the dense water; lateral lines detect and changes in pressure
- 61C. Buttress root for support and to obtain water from shallow level of the soil
- 62A. The dominant or the fittest is the most susceptible to predation but also the fittest to escape danger and such has a harem of mates.
- 63C. By blending with the changing environment.
- 64D. Especially in man
- 65D. Feathers for insulation against cold (i.e. to produce warmth) and for flight
- 66D. Or mutualism
- 67D. Others are human activities disrupting the balance.
- 68A. Or air spaces for buoyancy
- 69D. And it can be structural, functional or behavioral adaptation
- 70A. To withstand long period of drought
- 71D. Cryptic or concealing coloration.
- 72C. It is only autotrophs (plants) which compete for light (for photosynthesis)
- 73C. Hence, digits can grasp tree branches.
- 74C. Annuals only exist for a year or a single planting season
- 75C. The mechanical support of xylem (wood) is not needed as the plants are surrounded by water.
- 76A. See Q21
- 77C. e.g. Heron, egret.
- 78C. Others are petroleum and natural gas.
- 79B. They are recycled for re-use
- 80B. Root + fungi = mycorrhiza.
- 81B. See Q3
- 82D. by a xerophyte

- 83C. Spiny anteater rolls into a ball when a predator threatens; snail or tortoise withdraws into its shell.
- 84A. (C) is warning coloration.
- NOTES:**
- Adaptive coloration includes
    - cryptic or concealing colouration
    - Warning colouration
    - Disruptive colouration
    - counter shading
  - Cryptic colouration offers a camouflage with the surroundings.
  - Warning coloration warns the predator that the prey might have unpleasant features e.g. bad taste or being poisonous
  - Disruptive colouration involves an animal with stripes or patterns on their body that make them cryptic e.g. leopard, tiger, zebra, giraffe etc.
  - See Q44 for counter shading
- 85A. See Q21
- 86B. Termites provide protection
- 87A. Scales prevent desiccation or drying (Q43)
- 88C. Deaths from starvation.
- 89B. See Q45
- 90A. Such plants are xerophytes known as succulents.
- 91C. See Q87
- 92C. Maximum population possible at 24°C
- 93A. A population is zero after 10 days at 15°C
- 94A. I = evaporation  
II = Transpiration  
III = Precipitation (rain, hail, snow)  
IV = Surface run off to oceans.
- 95D. The largest percentage of the earth surface is made of open seas and oceans.
- 96B. See Q3.
- 97A. Organic matter would rather decompose
- 98C. Nuclear deposits are depleted as nuclear energy is harvested from them
- 99C. See Q1
- 100D. Courtship behaviour i.e. it is courting the peahen.
- 101B. See Qs 44 and 87
- 102B. (A), (C) and (D) all cause the opposite of (B) i.e. a reduction in population and decrease in the intensity of competition.
- 103D. Note that economic importance here stands for either positive or negative effects
- 104A. It mimics the appearance of the leaf to escape detection by predator
- 105C. Oxygen and carbohydrate come from photosynthesis (see also Q11)
- 106D. Both benefit (++)
- 107C. See Q15 108B. See Q7 109C. See Q44
- 110D. Whiskers or vibrissae are tactile (i.e. sensitive to touch)
- 111C. Organisms competing for water
- 112A. See Q42
- 113B. And restriction of diversity takes a long time in ecological succession
- 114A. See Q55 115D. See Q7
- 116A. A polluted stream is likely to be deprived of oxygen and this might lead to death of aquatic life and eutrophication. In fact, biochemical oxygen demand is a measure of water pollution.
- 117A. The need to move about does not arise since an endoparasite lives in the tissue, blood (carried about by blood flow) or alimentary canal of the host
- 118B. Since I is parallel to the horizontal axis
- 119B. While II is a poikilotherm.
- 120B. It assumes the color of its background and avoids detection

CHAPTER 24

HEREDITY, VARIATION, EVOLUTION

- 121D. by predator.  
The Bacteria help the ruminant (a herbivore) to digest cellulose while the ruminant provides protection and cellulose for the bacteria
- 122A. This releases CO<sub>2</sub> to the atmosphere and its accumulation traps infrared heat to cause greenhouse effect which subsequently "warms our globe" (the earth)  
See Q7
- 123B. Especially in chameleon
- 124B. See Q21
- 125B. The fungus (Q83) supplies inorganic nutrients (mineral salts) to the plant while the plant supplies organic nutrient (carbohydrate)
- 126D. It is cooler in the night (and also within burrows) than on the upper surface of the desert; sweat glands are usually absent in many desert animals to conserve water.
- 127B. Or more precisely photosynthetic waste of plant (i.e. oxygen) is available for respiration in animal while the respiratory waste of actively, respiring animals (i.e. carbon dioxide) is available to plant during photosynthesis.  
**NOTE:** (D) looks like parasitism.
- 129A. Disease spreads faster in a densely populated area.  
See Q87 131B. See Q44
- 130C. The water cycle clearly has two sub-cycles (See Q94)
- 132B. 1. **Abiotic water cycle** within the non-living environment  
a. Evaporation of water from open water bodies and soil to form cloud  
b. condensation and precipitation of water as rain, snow, hail (and even dew and mist).  
2. **Biotic water cycle** within the living environment  
a. Water absorbed by plants from the soil and for photosynthesis  
b. Water transfer within the food chains (or webs)  
c. Water drunk from the abiotic environment by animals.  
d. Water lost from plants by transpiration  
e. Water lost from plants and animals via respiration.
- 133B. In the desert where there is practically little or no water and they also have a very strong capacity to conserve water.
- 134C. See Q3
- 135D. Now a dimax community
- 136A. Both belong to the same genus *Paramecium* but to two different species *aurelia* and *caudatum* hence, it is interspecific competition.
- 137A. *P. aurelia* increases in population in the time while *P. caudatum* declines in population, a sign of extinction (elimination of the unfit)
- 138A. See Q 42 139C. See Q7 140B. See Q7
- 141C. e.g. eagle
- 142C. i.e. it can be broken down into harmless products by microbial activities
- 143C. See Q21
- 144B. It is also a succulent.
- 145D. See Q42 and 143
- 146C. Most prominent in chameleon than other animals.
- 147D. They depend on one another
- 148A. The workers within the industry can wear ear devices if necessary (Option D)
- 149A. And it kills if inhaled
- 150A. Also sulphur (IV) oxide
- 151B. Against water resistance.

1. In a breeding programme a cross was made between two true-breeding cowpea types: one with round seeds and the other with wrinkled seeds. If roundness is dominant while wrinkleness is recessive, in the first filial generation all the seeds produced will be A. 25 percent wrinkled, 75 percent round B. 100 percent wrinkled C. 50 percent wrinkled, 50 percent round D. 75 percent wrinkled, 25 percent round E. 100 percent round. (1978:Q49)
2. The carrier of the hereditary characters in plants and animals is the A. cell B. nucleus C. chromosome D. chloroplast E. gene. (1979:Q11)
3. If you cross-breed a tall variety (Tt) of maize with a short variety (tt), the ratio of tall to short plants in the offspring will be A. 2:1 B. 1:2 C. 1:1 D. 1:3 E. 3:1 (1979:Q33)
4. If a baby is a female, her mother's ovum must have been fertilized by a sperm carrying the chromosome A. X B. XY C. XX D. YY E. Y. (1980:Q42)
5. What is the genetic ratio of a cross between a homozygous tall plant and a homozygous dwarf plant? A. 0 tall: 4 short B. 3 tall: 1 short C. 2 short : 2 tall D. 1 tall : 1 short E. 4 tall: 0 short. (1981:Q5)
6. Normally any character shown by an organism is due to the effects of A. hormones and chromosomes B. chromosomes C. mutations D. hormones and genes E. genes and environment (1981:Q27)
7. A person whose blood can be donated to all other people, must have the blood group A. O B. AB C. B D. A E. none of the above (1981:Q29)
8. A surprising fact about sickle is that A. affects only black people B. kills the patient C. is hereditary D. affects blood cells E. weakens the patient. (1981:Q31)
9. If a tall man (TT) marries a dwarf woman (tt) and they have four male children, the offspring will be A. all short B. three short and one tall C. two short and two tall. D. One short and three tall E. all tall. (1982:Q9)
10. A married couple have 10 children and they are all girls. Which of the following is the CORRECT explanation? A. The woman is incapable of producing male children B. The man's sperms are very weak C. The man is not athletic enough D. The Y component of the man's sex chromosomes was always involved E. the X component of the man's sex chromosomes was always involved. (1982:Q10)
11. If a 26 year old blind man married a young one-eyed woman and they had four children, how many of them would be blind like their father? A. all B. 3 C. 2 D. 1 E. None. (1982:Q11)
12. One of the major causes of hemophilia is lack of A. fibrinogen B. amylase C. white blood corpuscle E. red blood. (1982:Q23)
13. When a person with blood belonging to group O has lost much blood due to an accident, he can be given blood belonging to A. group O only B. group A only C. group AB only D. group A and O E. group AB and O (1982:Q49)
14. An organism having one pair of identical genes is A. a heterozygote B. a hybrid C. an allelomorph D. a homozygote E. a diploid (1983:Q24)
15. What is the genetic ratio of the F<sub>2</sub> generation if members of F<sub>1</sub> generation are allowed to self-pollinate? A. 1tall: 3short B. 3 tall: 1 short C. 1 tall: 1 short D. 4 shorts: 0 tall E. 4 tall: 0 short. (1983:Q49)
16. The character-producing factors in living organisms are A. chromosomes B. alleles C. chromatids D. chromosomes E. genes. (1984:Q8)
17. A man with a normal haemoglobin (AA) marries a woman who has sickle-cell haemoglobin (SS). They have a child who has sickle-cell trait. Which of the following genotypes could be associated with the child's haemoglobin? A. AA B. OO C. AO D. AS E. SS. (1984:Q20)

18. If a child can receive blood from all donors, he belongs to the blood group A. O.B. A.C. B.D. AB E. AS. (1985:Q21)
19. The characters by which an organism is recognized are termed its A. phenotype B. genotype C. morphology D. anatomy E. physiology
20. The hereditary material in a cell is known as A. ADP B. CNS C. RNA D. ATP E. DNA. (1985:Q35)
21. If a woman who is a carrier of sickle cell trait (AS) married a man who is a sickler (SS) and they had four children how many of them would be normal. A. Three B. Two C. One D. None (1986:Q38)
22. Which of the following is an example of discontinuous variation? A. Skin coloration B. Left-handedness C. Body weight D. Height (1986:Q38)
23. A gene which expresses itself only in the homozygous condition is A. a mutant B. dominant C. recessive D. lethal (1987:Q40)
24. An example of monohybrid inheritance in man is A. lachrymatism B. cretinism C. hyperthyroidism D. albinism (1987:Q41)
25. If a plant, homozygous for round and yellow (RR;YY), is crossed with a wrinkled green type (rr;yy) all of the resulting seed will be A. blue and wrinkled B. round and yellow C. wrinkled and yellow D. round and greenish-yellow (1987:Q42)
26. The ratio of carriers to sicklers in the F1 generation derived from a parental cross of two carriers of haemoglobin S gene is A.3:1 B. 1:3 C.2:1 D. 1:2 (1987:Q43)
27. In which of the following crosses will all the female offspring be colour blind? A. colour blind mother x colour blind father. B. colour blind mother x normal father C. carrier mother x colour blind father. D carrier mother x normal father (1987:Q44)
28. If a dark-skinned woman (Bb) marries an albino man (bb) and they have four children, how many of the children will be dark-skinned? A. 3 B. 2 C.1 D.0. (1988:Q36)
29. A red - coloured flower when crossed with a white coloured one produced pink flowers. This is an example of A. complete dominance B. blending inheritance C. interaction of genes D. back crossing. (1988:Q37)
30. There will be agglutination when the A. Group A serum mixes with Group A erythrocytes B. Group A serum mixes with Group B erythrocytes C. Group AB serum mixes with Group O erythrocytes D. Group B serum mixes with Group B erythrocytes. (1989:Q22)
31. When the two alleles present in an organism are of the same type, the genotype is described as A. heterozygous B. heterogamous C. homozygous D. homologous. (1989:Q37)
32. If parents with blood groups AB and OO produce six children A. three of them will have group B B. two of them will have group A C. all the offspring will have group O D. none of them will have group A. (1989:Q38)
33. Which of the following is a sex-linked character? A. Sickle-cell anaemia B. Tongue rolling C. Skin colour D. Colour blindness (1989:Q39)
34. In an organism where the 2n number of chromosomes is 16, the number of chromosomes in each gamete will be A. 32 B. 16 C. 8 D. 4 (1990:Q36)
35. What would be the result of the first filial generation (F1) and the second filial generation (F2) of a monohybrid cross between pure line normal-winged Drosophila flies and pure line short-winged flies of the gene if the normal wing is dominant? A. F1 flies all short-winged and F2 flies all normal-winged. B. F1 flies all normal-winged and F2 flies all short-winged. C. F1 flies all short-winged and three-quarters of F2 flies are short-winged D. F1 flies all normal-winged and three-quarters of F2 flies are normal-winged. (1990:Q37)
36. What stage during cell division is represented in the figure above A. prophase B. metaphase C. anaphase D. telophase (1990:Q38)
37. An individual in the AB blood group is a universal recipient for blood conation because A. all the red blood cells do not carry antigen B. all the red blood cells carry antigen A C. all the red blood cell carry antigen B D. there are no anti-A and anti-B antibodies in the serum. (1990:Q39)
38. Haemophilia results from the mutation of the genes A. in the sex chromosomes B. which control skin colour C. which control the mechanism for blood-clotting D. which control the formation of haemoglobin. (1990:Q40)
39. The greatest contribution to genetic studies was made by A. Thomas Morgan B. Gregor Mendel C. Charles Darwin D. Robert Hooke. (1991:Q37)
40. The exchange of genes between homologous chromosomes is called A. test cross B. back cross C. crossing-over D. mutation. (1991:Q38)
41. When two heterozygous mate, the dominant trait will appear in A. the F1 generation only B. the F2 generation only C. both the F1 and F2 generations D. neither the F1 nor F2 generation. (1991:Q39)
42. Which of the following characters is NOT sex linked? A. River blindness B. Baldness. C. Haemophilia D. Colour Blindness (1991:Q40)
43. Which of the following is true of the children of a haemophilic man who marries a woman that is not haemophilic and does not carry the trait? A. All their sons will be haemophilic. B. All their daughter will be haemophilic. C. All their daughters will be carriers. D. All their sons will be carriers. (1992:Q40)
44. A child with blood group genotype different from those of both parents and with a mother of genotype OO, can only have a father of genotype A. A B. B C. AB D. OO. (1992:Q41)
45. If R and r denote the genes for a character, the offspring of the cross between RR and Rr are A. RR, 2Rr, rr B. 2RR, 2Rr C. 2RR, 2Rr D. 4Rr. (1992:Q42)
46. A mammal with red fur and long ears was crossed with another having white fur and short ears. If the offspring had red fur and short ears, then the A. characters are linked B. characters are not linked C. parents are related D. parents are not related. (1992:Q43)
47. Pawpaw seeds collected from a tree with many desirable agronomic qualities did not give rise to plants of desirable characters as the parent because A. seeds are not reliable for propagating plants B. uncontrolled out-crossing can introduce unwanted variability C. vegetative propagation is the best form of reproduction for all crops D. seeds were not physiologically mature at harvest. (1992:Q44)
48. Women do not suffer from colour blindness A. because the trait is sex-linked B. only men are colour blind C. the genes are recessive and sex-linked D. the genes occur on both the X and Y chromosomes. (1992:Q45)
49. The hereditary material of the cell is A. the RNA B. protein C. the DNA D. carbohydrate. (1992:Q46)
50. The theory of natural selection was developed by A. Lamarck and Darwin B. Darwin and Wallace C. Wallace and Mendel D. Mendel and Lamarck. (1992:Q49)
51. Fossil records found in sedimentary rocks offer some explanation for the theory of evolution because A. the deposits have remains of organisms characteristic of when they were formed B. different strata have remains of organisms of the same kind C. only organisms with strong parts are fossilized D. most animals and plant fossils bear little resemblance to present day living specimens (1992:Q50)

- On what structures are the units of inheritance situated?  
 A. Golgi bodies B. Ribosomes C. Chromosomes D. Endoplasmic reticulum. (1993:Q1)
- Which of the following is an example of discontinuous variation observed in man? A. Skin colours B. Tongue rolling C. Body weight D. Height. (1993:Q46)
- During blood transfusion, agglutination may occur when  
 A. Contrasting antigens react with contrasting antibodies  
 B. Similar antigens react with similar antibody C. two different antigens react with each other D. two different antibodies react with each other. (1993:Q47)

Gamete from one parent

	S	s
S	SS	Ss
s	Ss	ss

S = smooth  
 s = wrinkled

In the illustration above, the genotypes of the offspring are  
 A. 1 heterozygous smooth : 2 homozygous smooth : 1 wrinkled  
 B. 1 homozygous smooth : 2 heterozygous smooth : 1 wrinkled  
 C. 2 homozygous smooth : 2 wrinkled  
 D. 3 heterozygous smooth : 1 wrinkled (1993:Q48)

- The differences and similarities among living things account for  
 A. diversity B. stability C. competition D. evolution. (1994:Q41)
- People with sickle-cell anaemia have haemoglobin A. S and are homozygous recessive B. A and are heterozygous recessive C. S and are heterozygous recessive D. A and are homozygous recessive. (1994:Q42)
- In the gene locus for eye colour in humans, the allele for brown eyes is dominant over the allele for blue eyes. If a homozygous brown-eyed girl has a brother with blue eyes, what are the likely phenotypes of their parents' eye colour? (Eye colour is not a sex-linked trait). A. Both parents have blue eyes. B. Their father has blue eyes and their mother has brown eyes. C. Both parents have brown eyes. D. Their mother has blue eyes and their father has brown eyes. (1994:Q43)
- If a woman's genotype is Tt Qq Rr, what would be the gene content of her eggs? A. TQr, tqr B. TQR, tqr C. tQr, tQr D. tQr, TQR. (1994:Q44)
- The sex-linked defect in which very slight cut produces severe bleeding is known as A. anaemia B. anorexia C. haemophilia D. haemolysis (1994:Q45)
- A man who has the trait for colour blindness marries a normal woman. What percentage of their children would be sufferers, carriers and normal respectively? A. 25% and 50% B. 25%, 50% and 25% C. 50%, 25% and 25% D. 25%, 37.5% and 37.5%. (1994:Q46)
- The anatomical evidence usually used in support of all evolutionary relationship among whales, humans, birds and dogs is the possession of A. thick skin B. pentadactyl limb C. tail D. epidermal structures. (1994:Q50)
- Human height is an example of a feature which depends on both A. genotype and phenotype B. genetic and environmental factors C. mother's genotype and environmental factors. D. phenotypic and environmental factors. (1995:Q39)
- A person with type O blood can donate to a patient with type A because the donor's blood A. lacks antigens B. lacks anti-A antibodies C. lacks anti-B antibodies D. has both anti-A and anti-B antibodies. (1995:Q40)
- The DNA molecules is a chain of repeating A. nucleosides B. nitrogenous bases C. sugar phosphates D. nucleotides (1995:Q41)
- The specific number of chromosomes in each somatic cell is represented by A. 2N B. 23 C. 2N D. N. (1995:Q42)
- A man with blood group A is married to a woman with blood group A. Which of the following group combinations possible if the family has three children? A. B, A, AB. B. A, B, C, AB, AB. D. A, O, A. (1995:Q43)

- The F1 of a cross between a tall and a dwarf plant was tall The F was advanced to F2. How many of 120 F2 plant will be dwarf? A. 30 B. 60 C. 90 D. 120 (1995:Q44)
- The sons of a colour-blind woman will be colour blind regardless of the state of the father because A. the egg determines the phenotype of the son B. sons inherit the sex chromosomes of their mothers C. the father's sex chromosome is weaker in sons D. sex-linked traits express dominance in females. (1995:Q45)
- The least evidence in support of the theory of evolution is provided by the study of A. anatomy B. ecology C. geology D. embryology. (1995:Q49)
- From which group of animals are the mammals generally believed to have most recently evolved? A. Reptiles. B. Fishes. C. Amphibians. D. Birds (1995:Q50)
- One reason for the success of Mendel's work is that he  
 A. was the first to carry out research work on modern genetics B. introduced quantitative and qualitative elements into his work C. selected two characteristics only at a time for study D. drew up his laws of inheritance based on his knowledge of chromosomes (1997:Q43)
- The homozygous condition HbS HbS results in sickle cell anaemia whereas HbA HbA has the sickling trait. What is the probability that a couple with the sickling trait will give birth to one normal child? A. 1/2 B. 1/4 C. 1/8 D. 0. (1997:Q44)
- Which of the following characters is NOT sex-linked?  
 A. Albinism B. Baldness. C. Haemophilia D. Colour blindness. (1997:Q45)
- Fossil records found in sedimentary rocks offer some explanation for the theory of evolution because A. the deposits have remains of organisms characteristic of when they were formed B. different strata have remains of organisms of the same kind of only organisms with strong parts are fossilized D. most animal and plant fossils bear little resemblance to present day living specimens. (1997:Q49)
- Long neck in giraffes is used illustrate the theory of A. use and disuse B. origin of species C. origin of life D. natural selection. (1997:Q50)
- The natural tendency of organism as they evolve is to  
 A. decrease in size B. increase in number C. develop specialized structures D. feed indiscriminately (1998:Q3)
- One of the ways in which body cells differ from gamete cells is in the  
 A. type of centromeres they contain B. number of chromosome pairs they contain C. type of chromatids they contain D. number of chromosomes they contain. (1998:Q35)
- In blood transfusion, agglutination occurs when  
 A. white blood cells from two individuals meet B. two different antibodies meet C. two different antigens meet D. contrasting antigens and antibodies meet. (1998:36)
- After one week of life, the weights of five chicks of the same sex hatched simultaneously from the eggs the same hen and fed on the same diet were 45g, 40g 35g, 33, and 30g. This is an example of A. growth rate B. natural selection C. variation D. mutation. (1998:Q39)
- The phenotype of an individual can be summed up as the  
 A. totality of the expressed traits B. individual's physical appearance C. individual's entire genetic make-up D. physiological traits of the individual. (1998:Q40)
- The correct increasing order of size for the cell components responsible for heredity is  
 A. chromosome DNA nucleus gene B. DNA Gene chromosome nucleus D. Chromosome nucleus DNA gene D. DNA gene nucleus chromosome. (1998:Q41)
- A sex-linked character cannot be passed on directly from  
 A. father to son B. mother to daughter C. mother to son D. father to daughter. (1998:Q42)



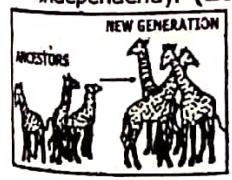
84. The best explanation for the theories of natural selection is that A. all organisms have equal capacity for survival in their habitats B. organisms have varying capacities for survival in their habitats C. organisms compete for resources and better competitors survive and thrive D. habitats allow only organisms that will not have to compete for survival. (1998:Q49)
85. The basic point of impact by changes which produce mutation is the A. gametes B. chromosomes C. phenotype D. zygote. (1998:Q50)
86. If the offspring of a cross between brown mouse (bb) and a black mouse (BB) are allowed to interbreed, how many different genotypes would result? A. 2 B. 3 C. 4 D. 5 (1999:Q43)
87. The biological factor that is unique to each individual is the A. DNA B. eye colour C. blood group E. RNA (1999:Q44)
88. From an evolutionary standpoint, the older a fossil bearing rock is the more likely it is to contain A. Aves as opposed to amphibians B. invertebrates as opposed to vertebrates C. angiosperms as opposed to algae D. vertebrates as opposed to invertebrates. (1999:Q45)
89. Which of the following is one of Lamarck's theories? A. some variations are more favorable to existence in a given environment than others B. all living organisms are constantly involved in a struggle for existence C. the size of a given population remains fairly constant D. new species originate through the inheritance of acquired traits. (1999:Q48)
90. A cross between an albino female and a genetically normal male will result in offspring that are A. all albino B. all phenotypically normal C. all genetically normally D. half albino and half normal (2000:Q40)
91. The surest way to combine the best qualities of both parents and the offspring is by A. cross-breeding B. inbreeding C. selective breeding D. pure breeding (2000:Q42)
92. Blood grouping in human beings is derived from combination of A. two different alleles B. four different alleles C. three different alleles D. two different genes. (2000:Q43)
93. The older fossil-bearing rocks, in contrast to the more recent ones, are more likely to contain A. animals rather than plant remains B. invertebrates rather than birds C. flowering plants rather than mosses D. reptiles rather than fishes (2000:Q44)
94. The mutation theory of organic evolution was propounded by A. Gregor Mendel B. Hugo Vries C. Jean Lamarck D. Charles Darwin (2000:Q47)
95. Both recessive and dominant characters are found A. on different chromosomes in the cell B. at the same locus of a homologous chromosome C. mother's sex cell D. mother's X chromosome (2001:Q38)
96. The probability of a baby being a boy or a girl depends on the condition of the A. father's sex cell B. father's somatic chromosome C. mother's sex cell D. mother's X chromosome (2001:Q39)
97. Which of the following statements is true of blood groups and blood transfusion? A. Group O is the universal recipient B. Group A can donate to group A only C. Group AB is the universal recipient D. Group B can donate to group B only (2001:Q40)
98. A tall plant crossed with a dwarf one produces offspring of which half are tall and half are dwarf what are the genotypes of the parents? A. TT, Tt B. Tt, Tt C. TT, tt D. Tt, Tt (2001:Q42)
99. In man, the ability to roll the tongue is a variation classified as A. anatomical B. physiological C. structural D. morphological (2001:Q43)
100. Darwin is considered the first scientist who correctly explained the theory of A. special creation B. spontaneous generation C. use and disuse D. organic evolution (2001:Q44)
101. In his theory of evolution, Darwin implied that A. the struggle for existence among living organisms is sporadic B. the most successful organisms are those that best adapt to their environment C. organs of the body which are not regularly used by an organism will disappear D. my traits acquired by an organism during its lifetime can be passed on to its offspring (2002:Q22)
102. The structure that is common in the embryos of mammals, amphibians, birds, fishes and reptiles and which is an evidence of their common ancestry is the A. eye B. chorion C. allantois B. gill slits (2002:Q25)
103. To select and retain the desirable trait of large body size with farmer has observed in his herd, the farmer needs to A. feed the animals in the herd with more food B. cross-breed his animals with a different herd C. inbreed the animals in his herd D. prevent diseases in his herd (2002:Q45)
104. In a population of living things, the parameters of size, height, weight and colour are example of A. discontinuous variations B. continuous variations C. physiological variations D. non-heritable variations (2002:Q46)
105. If XN is the dominant allele for normal vision and Xn the recessive allele for colour-blindness, a boy with the genotype Yxn will A. have normal vision B. be colour-blind C. be totally blind D. be a carrier of colour-blindness (2002:Q47)
106. The first four children of a couple were all girls. The probability that the fifth will also be a girl is A. 1/5 B. 1/4 C. 1/3 D. 1/2 (2002:Q48)
107. Genetic counseling is important when a marriage is planned between a A. Rh woman and Rh man B. Rh woman and Rh man C. Rh woman and Rh man D. Rh woman and Rh man (2002:Q49)
108. What proportion of the offspring of a cross between two heterozygous parents will exhibit the recessive condition phenotypically? A. 1/4 B. 1/2 C. 3/4 D. 4/4 (2002:Q50)
109. Homologous pairs of chromosomes separate during A. cleavage B. cytolysis C. mitosis D. meiosis (2003:Q26)
110. If a DNA strand has a base sequence TCA, its complementary strand must be A. ATG B. GAT C. TAG D. AGT (2003:Q38)
111. A man and his wife are both heterozygous for the sickle cell trait. The likely percentage of their offspring that will be either carriers or sicklers is A. 75% B. 25% C. 50% D. 100% (2003:Q39)
112. If the pair of alleles for baldness is given as Bb, a female carrier will be denoted by A. XBY B. XBXB C. XbY D. XBxB (2003:Q40)
113. An organism that has been extensively used to test the chromosome theory of heredity is A. Drosophila melanogaster B. Homo sapiens C. Zea Mays D. Musca domestica. (2003:Q41)
114. A feature associated with the Y-chromosome in humans is A. long eyelashes B. prominent fingernails C. facial hair D. enlarged breast (2003:Q42)
115. An argument against Lamarck's theory of evolution is that A. a disused part is dropped off in the offspring B. disuse of body part cannot weaken the part C. acquired traits cannot be passed onto the offspring D. traits cannot be acquired through constant use of body parts. (2003:Q45)
116. Which of the following requires the use of carbon dating to prove that evolution has occurred? A. biochemical similarities B. molecular records C. comparative anatomy D. fossil records (2003:Q49)
117. Paternity disputes can most accurately be resolved through the use of A. fingerprinting B. blood group typing C. DNA testing D. tongue-rolling. (2004:Q42)
118. In a Mendelian cross of red and white varieties of the four o'clock plant, the F1 generation expressed incomplete dominance by having flowers which are A. white B. red C. pink D. multi coloured. (2004:Q43)

119. Identical twins inherit their genes from A. different eggs and sperms B. the same egg and sperm C. two eggs and a sperm D. one egg and two sperms. (2004:Q44)
120. Sex-linked genes are located on A. Y chromosomes B. X chromosomes C. homologous chromosomes D. X chromosomes. (2004:Q45)
121. An evidence of the relationship between living organisms and their extinct relatives can best be obtained from A. embryology B. comparative anatomy C. comparative physiology D. paleontology. (2004:Q50)
122. Which of the following is the best explanation for a child who is phenotypically short and born of two tall parents? A. The father possesses a gene for shortness B. The mother possesses a gene for shortness C. Nature makes the child short D. Both parents genes for shortness. (2005:Q44)
123. A yellow maize is crossed with a white maize and the first filial generation produce yellow maize only. The white trait is said to exhibit A. dominance B. recessiveness C. codominance D. incomplete dominance (2005:Q45)
124. An evidence of a common ancestry for fishes, amphibians, reptiles, birds and mammals is the A. possession of wings by birds and bats B. cold bloodedness of fishes, amphibians and reptiles C. presence of gill clefts in vertebrate embryos D. possession of scales by fishes and reptiles (2005:Q50)
125. Hassan and Hussain. This is probably because A. Hassan inherits genes for tallness and fatness from the father B. they have dissimilar genotypes C. Hussain is endowed with genes for shortness and thinness. D. They are raised in different environments. (2006:Q18)
126. The two normal types of sex chromosomes are A. XXY and XYY B. XX and XYY C. XY and XXY D. XX and YY (2006:Q19)

Use the diagram below to answer questions 127 and 128

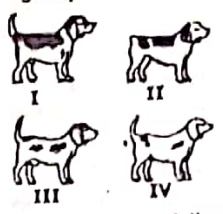


127. The diagram represents the structure of A. proteins B. chromosomes C. RNA D. DNA. (2006:Q20)
128. The part labeled I represents the A. base pairs B. ribose sugar C. phosphate linkage D. deoxyribose sugar. (2006:Q21)
129. One advantages of variation in a species population is that individuals A. with favored traits become dominant, B. easily reach their reproductive age, C. are easily recognized by mates D. are better adapted to changes (2006:Q22)
130. Mendel's second law of inheritance states that A. alleles combine randomly B. alleles segregate independently C. alleles separate predictably D. chromosomes segregate independently. (2006:Q23)

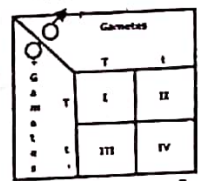


131. The change in the length of the necks of the giraffes shown was brought about by A. geographical isolation B. predation C. symbiosis D. natural selection. (2006:Q24)
132. The variation illustrated is A. discontinuous B. morphological C. physiological D. biochemical. (2006:Q25)
133. The evidence that supports the advancement of ferns over mosses is derived from A. comparative anatomy B. molecular records C. biochemical similarities D. physiological records. (2006:Q34)
134. Which of the following vertebrates has the most simple structured heart? A. Reptile B. Fish C. Mammal D. Amphibian (2006:Q35)
135. The theory which supports the view that the large muscles developed by an athlete will be passed on to the offspring was proposed by A. Lamarck B. Darwin C. Mendel D. Pasteur. (2007:Q14)

136. An accurate identification of a rapist can be carried out by conducting a A. RNA analysis B. DNA analysis C. blood group test D. behavioural traits test (2007:Q46)

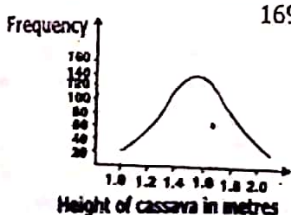


137. If the dogs are offspring of a monohybrid cross and the gene G for grey head is dominant over its allele g, the individual whose genotype is likely to be gg is A. II B. I C. IV D. III (2007:Q47)
138. Which of the following will be true of dog II which lost its tail in an accident it mates with dog III? A. none of its offspring will be born without a tail B. 3/4 of its offspring will be born without tails C. All of its offspring will be born without tails. (2007:Q48)
139. Which of the following is true of a cloning? A. it is welcomed as an ethically and morally sound science. B. Only one cell of the original organism is needed to initiate the process C. The done is similar to but not exactly like the original organism. D. It involves the asexual multiplication of the tissues of the original organisms. (2007:Q49)
140. An example of a sex-linked trait is the A. ability to grow long hair in females B. color of the skin in humans C. ability to roll the tongue D. possession of facial hair in adult humans. (2007:Q50)
141. Which of the following is a major cause of variation among organism? A. inbreeding B. Backcrossing C. Sexual reproduction D. Gene dominance. (2008:Q40)
142. The Rhesus factor of blood was first identified in a category of A. monkeys B. human females C. human males D. chimpanzees. (2008:Q41)



143. Which of the four offspring of the cross will be short T the gene for tallness is dominant to t? A. I B. II C. III D. IV. (2008:Q42)
144. The genotype ratio of the offspring of the cross is A. 1:2 B. 1:2:1 C. 1:1:1:1 D. 3:1 (2008:Q43)
145. Genetically modified food products have not become universally accepted because A. they are not tasty as others produced by conventional means B. they are usually costlier than others produced by conventional means C. their effects on human consumers is not yet fully understood D. the technology can be applied only in developed countries. (2008:Q44)
146. Which of the following is the most advanced evolutionary development in plants? A. Possession of unicellular structures B. development of flowers C. dispersal of spores D. development of secondary thickening (2008:Q49)
147. The natural process that produces adaptive evolutionary changes is A. mutation B. gene flow C. genetic drift D. natural selection. (2008:Q50)
148. The uniqueness of an individual organism in a population is accounted for by A. evolution B. variation C. adaptation D. mutation. (2009:Q39)
149. A phenotypic character with intermediate forms that can be graded from one extreme to the other is referred to as A. discontinuous variation B. continuous variation C. a mutant D. a genome (2009:Q40)
150. A farmer's assumption that the seed from a good harvest will produce a good yield is explained by the theory of A. evolution B. adaptation C. variation D. hereditary (2009:Q41)

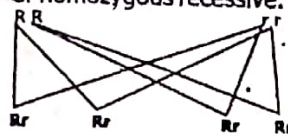
151. In Mendelian inheritance, discontinuous characters are controlled by the A. centromeres B. alleles C. chromosomes D. chromatids (2009:Q42)
152. A woman with the ability to roll her tongue (Tt) marries a man who cannot roll his tongue (tt). What is the probability of each of their children being a tongue roller? A. 100% B. 75% C. 50% D. 25%. (2009:Q43)
153. A health condition that is known to have resulted from gene mutation is A. haemophilia B. color blindness C. sickle-cell anaemia D. anaemia. (2009:Q44)
154. According to Darwin, the driving force behind evolutionary change is A. natural selection B. genetic drift C. mutation D. gene flow. (2009:Q50)
155. A dilute solution of phenylthiocarbamide tasted bitter to some people and is tasteless to others. This is an example of A. discontinuous variation B. morphological variation C. continuous variation D. taste bud variation (2010:Q41)
156. A pair of genes that control a trait is referred to as A. recessive B. dominant C. a hybrid D. an allele. (2010:Q45)
157. The chromosomes number of a cell before and after the process of meiosis is conventionally represented as A.  $n$  B.  $n-2n$  C.  $2n-n$  D.  $2n-2n$ . (2010:Q46)
158. If both parents are heterozygous for a trait, the probability that an offspring will be recessive for that trait is A.  $\frac{1}{2}$  B.  $\frac{1}{4}$  C. 1 D.  $\frac{3}{3}$ . (2010:Q47)
159. At what stage in the life history of a mammal is the sex of an individual set? A. At puberty B. At birth C. At conception D. At adolescence. (2010:Q48)
160. The flippers of a whale and the fins of a fish are examples of A. coevolution B. continuous variation C. convergent evolution D. divergent evolution. (2010:Q50)
161. The inheritable characters that are determined by a gene located only on the X-chromosome is A. homozygous B. dominant C. recessive D. sex-linked (2011:Q42)
162. If the cross of a red-flowered plant with a white-flowered plant produces a pink-flowered plant, it is an example of A. mutation B. linkage C. codominance D. incomplete dominance (2011:Q43)
163. Which of the following theories was NOT considered by Darwin in his evolutionary theory? A. Use and disuse B. Competition C. Variation D. Survival of the fittest (2011:Q44)
164. The crossing of individuals of the same species with different genetic characters is A. non-disjunction B. inbreeding C. cross breeding D. polygenic inheritance (2011:Q45)
165. The number of alleles controlling blood groups in humans is A. 5 B. 2 C. 0 D. 3 (2011:Q46)
166. During blood transfusion, agglutination may occur as a result of the reaction between A. two different antibodies B. similar antigens and antibodies C. contrasting antigens and antibodies D. two different antigens. (2011:Q47)
167. The fallacy in Lamarck's evolutionary theory was the assumption that A. acquired traits are seldom formed B. traits are acquired through the use of body parts C. traits are acquired through disuse of body parts D. acquired traits are heritable. (2011:Q48)
168. The wings of a bat and those of a bird are examples of A. continuous variation B. divergent evolution C. convergent evolution D. coevolution (2011:Q50)



170. The largest number of cassava plants has an approximate height of A. 1.4m B. 1.6m C. 1.8m D. 2.0m (2012:Q39)
171. Which of the following is true in blood transfusion? A. a person of blood group AB can donate blood only to another person of blood group AB B. Persons of blood groups A and B can donate or receive blood from each other C. a person of blood group AB can receive blood from persons of blood group A or B D. A person of blood group O can donate only to a person of blood group O. (2012:Q40)
172. A yellow maize is planted and all the fruits obtained are of yellow seeds. When they are cross-bred, yellow seeds and white seeds are obtained in a ratio 3:1. The yellow seed is said to be A. non-heritable B. sex-linked C. a recessive trait D. a dominant trait. (2012:Q41)
173. When a colour-blind man marries a carrier woman. What is the probability of their offspring being colour blind? A. 25% B. 50% C. 75% D. 100% (2012:Q42)
174. The correct pairing for DNA is A. adenine - thymine and guanine-cytosine B. adenine - guanine and thymine - cytosine C. adenine - cytosine and guanine - thymine D. adenine-adenine and cytosine - cytosine. (2012:Q43)
175. The use and disuse of body parts and the inheritance of acquired traits were used to explain A. Darwin's theory B. Lamarck's theory C. genetic drift D. gene flow. (2012:Q44)
176. From the study of Galapagos finches, Darwin derived his theory of evolution from A. comparative anatomy B. comparative physiology C. fossil remains D. comparative embryology. (2012:Q50)
177. To which blood group do universal recipients belong? A. A B. O C. AB D. B. (2013:Q44)
178. The clumping together of red blood cells is A. fusion B. transfusion C. compatibility D. agglutination. (2013:Q45)
179. The genetic make-up of an organism is described as A. allele B. chromosome C. phenotype D. genotype. (2014:Q28)
180. Whorls, arches, loops and compounds are types of variation on A. eye color B. fingerprints C. hair color D. blood group. (2014:Q42)
181. Whorls, arches, loops and compounds are types of variation in A. eye colour B. fingerprints C. hair colour D. blood group (2014:Q43)
182. One of the advantages of outbreeding is A. pests tolerance B. disease tolerance C. fast growth D. tall height. (2014:Q45)
183. An individual with blood group AB can receive blood from those in blood groups(s) A. A, B, AB and O B. A, AB, and O only C. AB only D. A and B only. (2014:Q46)
184. All living organisms are constantly involved in a struggle for existence. This was proposed by A. Morgan B. Darwin C. Lamarck D. Wallace. (2014:Q49)
185. Adaptation radiation is illustrated in A. modified insect mouth parts B. dentition in mammals C. wings in birds and bats D. appendages in insects. (2014:Q50)

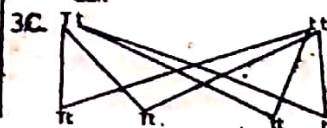
#### CHAPTER 24: ANSWERS

- 1E. True-breeding (or pure line) means homozygous dominant or homozygous recessive.



R = round r = wrinkle

- 2E. Gene is the most precise here Gene - chromosome - nucleus - cell





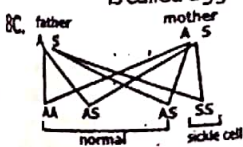
5E.



An interplay of genetic and environmental forces produces a character. For instance, a genetically tall individual (TT) may be dwarfed if undernourished (environmental) during his formative years. He is a universal donor, while group AB is universal recipient.

**NOTES:**

- The ABO system is based on the antigen type found in the red blood and this in turn determines the antibody in the serum.
- Blood Group A individual**
  - Antigen A.
  - Antibody: Anti-B
  - Possible genotype:  $I^A I^A$  or  $I^A I^O$
  - Donors: A and O
  - Recipient: A and AB
- Blood Group B individual**
  - Antigen B
  - Antibody: Anti A
  - possible genotype:  $I^B I^B$  or  $I^B I^O$
  - donors: B and O
  - Recipients: B and AB
- Blood Group AB individual**
  - antigens; A and B
  - Antibody: Nil
  - Possible Genotype:  $I^A I^B$
  - Donors A, B, AB, O
  - Recipients: AB
- Blood Group O individual**
  - Antigen; Nil
  - Antibodies: Anti-A and Anti B
  - possible genotype:  $I^O I^O$
  - Donors; O
  - Recipients: A, B, AB, and O
- The antigens above are called **agglutinogens** while the antibodies are **agglutinins**
- An antigen would not have similarly named antibody i.e its corresponding antibody is in the contrasting blood group Blood group A has antigen A but Anti-B antibody
- The clumping of red blood cells when there is a donor-recipient mismatch during blood transfusion is called agglutination.



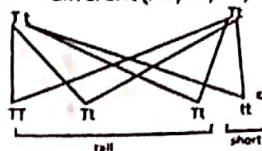
AA = Homozygous Normal  
 AS = Heterozygous carriers normal but with sickle trait  
 SS = Homozygous sickler with sickle cell disease.

**NOTES:**

- The couple above are better advised not to marry each other as the likelihood of producing a sickler is 25%
- Sickle cell disease arises from abnormal gene which produces sickle-shaped haemoglobins that predisposes red blood cells to haemolysis.

- 9E. See Q5 · 10E. See Q4
- 11E. Blindness or one-eyedness is an acquired trait hence, it is not inheritable.
- 12A. Fibrinogen is a clotting factor and its synthesis is hampered by a faulty gene in haemophilia (bleeder's disease) whereby the sufferer (haemophiliac) has prolonged bleeding even from minor injuries. It might be fatal even in infancy.  
 See Q7

14D. i.e Identical allele or allelomorphs e.g AA, TT, RR etc. In heterozygote, the allelemorphic forms of the genes are different (AS, Tt, Rr)



15B. Consider Q5 whereby Tt genotype is produced throughout the first filial generation F1. therefore F2 is as shown.

16E. See Q2

17D. All their children would be normal but with sickle trait (as carriers)

18D. See Q7

19A. Phenotype is the outward manifestation of the underlying genetic constitution or genotype but not without the input of the environment.

**NOTE:**

- TT and Tt are tall (phenotype) because of their genotype
- tt is short for same reason.
- Genotype cannot be determined at a glance unless we do some back-cross

20E. The DNA (deoxyribonucleic acid) is the molecular basis of heredity.



22B. The entire human population can be divided into two groups: Left handed and right-handed individuals

**NOTES:**

- There is no intermediate group here and any other of such trait is discontinuous
- Other examples of discontinuous variation
  - \* sex = Male or female
  - \* ABO system = A, B, AB, or O
  - \* Rhesus factor = +ve or -ve
  - \* Tasters and Non-tasters of PTC
  - \* Finger prints. Tongue rolling - Rollers or non-rollers
- In continuous variation, there is no distinct groups and there are a lot of intermediate between any given extremes
- Continuous variation \* height \* weight \* various shades of skin color

23C. If the dominant gene is present, the recessive gene is masked and can only be expressed in later generations.

24D. Albinism is controlled by a single pair of genes and they must be recessive

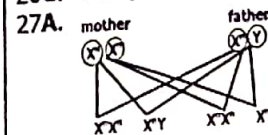
Normal: AA

carrier: Aa

Albino: aa

25B. Since round → is dominant over wrinkled → and yellow (Y) over green (y) Dihybrid cross

26C. See Q8



**NOTES:**

- Gene for normal vision or colour blindness is found on sex chromosomes hence, it is a sex-linked character.
- However, the gene is found only on X chromosomes while Y chromosomes have none
- For a woman to be colour blind she must be homozygous recessive and this is very rare.
- Thus female are usually carriers (XNXn) of the trait and may transmit the recessive allele to their male children who will be colour blind (XnY)
- In the scenario above, all children male and female are color blind.

keys XNXN - normal female  
 XNXn - carrier female  
 XnXn - female sufferer (rare)  
 XNY - Normal male  
 XnY - Male sufferer (common)

6. Haemoglobin is similarly inherited and is sex linked
- 28B. Just work it out and compare Q3
- 29B. or incomplete dominance such that the presence of one allele modifies the other to produce a third phenotype.  
 $F_1 \rightarrow RR \text{ vs. } rr = 4(Rr) = \text{all pink [work it out]}$   
 $F_2 \rightarrow Rr \text{ vs. } rr \text{ [work it out]}$
- NOTE:**
1. Blending inheritance should not be confused with co-dominance.
  2. In co-dominance, both alleles are fully expressed phenotypically without one affecting the other.
  3. For example, the allele  $I^A$  in the ABO blood system is codominant with  $I^B$  in a heterozygote  $I^A I^B$  and that is why they are written in separate bold letter instead of cases like  $I^A I^B$  or  $I^B I^A$  since no one dominates the other.
- 30B. Group A is incompatible with B and vice versa (see Q7)
- 31C. It is only chromosomes that could be homologous(D)
- 32A. **working it out**  $\rightarrow I^A I^a \text{ vs. } I^A I^A$
- 33D. See Q27
- 34C. Somatic cell is diploid (2n) while germ or sex cell is haploid (n) as the halving of chromosome complement occurs in the meiotic division during gametogenesis.
- 35D. **work it out**
- 36C. **AT PROPHASE**
1. Nuclear membrane begins disintegrate
  2. Chromosomes shorten and thicken and become more visible now as chromatids.
  3. Centrioles begin to separate radiating spindle fibres (mitotic spindles)
- AT METAPHASE**
1. Nuclear membrane disappears
  2. Spindle fibres formed between the centrioles which are now at the opposite poles
  3. The sister chromatids are aligned at the equator.
- AT ANAPHASE**
1. Sister- chromatids separate and begin to move to the opposite poles of the cell(as in the diagram)
  2. The movement is as a result of contraction of the spindle fibres
- AT TELOPHASE**
1. Nuclear envelop develops around each set of chromatids
  2. New centrioles forms at each end
  3. The cell begins to divide into two equal halves by a constriction to eventually form two daughter cells.
- 37D. See Q7 38C. See Q12
- 39B. He was even the pioneer geneticist laying the foundation for other giants in the field such as Thomas Morgan who first used the veritable tool of genetic studies, the fruitfly (*Drosophila melanogaster*)
- 40C. Whereby fragment from one chromosome is exchanged with another from the homologous chromosomes.
- NOTES:**
1. The homologous chromosomes lie side by side and are known as bivalents each with a pair of chromatids
  2. Sister chromatids join at centromere but bivalents join and exchange strands (crossing over) at chiasmata (singular chiasma)
  3. Crossing over only occurs in meiosis (during gametogenesis) but not in mitosis (during growth)
  4. Crossing over gives rise to new combinations of alleles on chromosomes resulting in more pronounced variation among a population of organism

- 41C. Just work it out as before
- 42A. It is not even a genetic disease - see chapter
- 43C. **work it out**
- 44C. Note that males are either normal (XHY) or haemophilic (XhY). Thus the child would be blood group A or B and this is different from father's group AB and mother's group O.
- 45C. Work it out.
- 46B. In linkage, the original red fur-long ears coupling would have segregated together and inherited together but here they have segregated independently of each other such that the following are possible in F2 generation.
- Red fur - long ears  
 Red fur - short ears  
 White fur - long ears  
 White fur - short ears
- 47B. Pawpaw trees of unknown qualities have participated in the breeding process
- 48C. See Q27 49C. See Q20
- 50A. Jean Lamarck's theory of use and dis-use organs suggested retaining desirable acquired traits in subsequent generation to cope with the environment while Darwin's theory of natural selection suggested the survival of the individuals with variations that offered competitive advantage and the elimination of the unfit and maladjusted.
- 51A. Such that a stratum is presumed evolutionarily older than the one above it.
- 52C. See Q2 53B. See Q22
- 54B. Blood group A is incompatible with Blood group B because Antigen A in A will react with Anti A in B and vice versa [revisit Q7 so as not to be tempted by option (A)]  
**NOTE:** Anti A, although similarly named, is the contrasting antibody to Antigen A
- 55B. SS = Homozygous smooth  
 Ss = Heterozygous smooth  
 ss = (homozygous) wrinkled
- 56A. Diversity allows us to classify organisms into groups- Taxonomy
- 57A. i.e haemoglobin S can only manifest in the absence of the dominant haemoglobin A hence, it must be homozygous (SS)
- 58C. **work it out**  
 Both parents are heterozygous and since brown is dominant over blue both are brown eyed.
- 59B. Segregation of alleles is in meiosis.
- 60C. See Q12
61. **work it out** - No option was correct
- 62B. They more or less have five (penta-) digits on each limb.
- 63B. Consider Q6
- 64A. See Q7. Note that both Anti A and Anti B are present in blood group O and the anti A is expected to react with Antigen A of the recipient. This, however, does not happen as the recipient's blood dilutes the donor's so much that agglutination would not occur.
- 65D. DNA = poly nucleotide
- NOTES:**
1. A nucleotide has 3 components:
    - a. deoxyribose sugar
    - b. Nitrogen base
    - c. Phosphate backbone
  2. The sugar moiety is a derivative of the pentose sugar ribose from which an oxygen atom has been removed (deoxy-)
  3. The nitrogenous base could be any of the following.
 

a. Adenine (A)	b. Guanine (G)
c. Thymine (T)	d. Cytosine (C)
  4. The DNA actually has two strands of polynucleotide chains twisted on each other to produce a double helix structure as proposed by Watson and Crick

5. A nitrogenous base on a strand pairs only a specific base on the other 'complementary' strand and the correct pairings are G-C, C-G, A-T, T-A.
6. Bases on opposite strands are held together by hydrogen bonds.

86C. See Q34

- 87D. Since group A could be I<sup>A</sup>A or I<sup>A</sup>O
- 88A. work it out
- 89B. X and Y chromosomes of the father contributes nothing to normal vision.
- 90B. Ecology studies organisms as they are currently constituted without recourse to their ancestral past.
- 91A. Mammals and birds are believed to have evolved separately from the amphibians although mammals much later
- 92C. He focused his attention on a single variable at a time and this variable is a single pair of contrasting characters such as white and red petals, smooth and wrinkled seed etc.

**NOTES:**

1. When a characteristics controlled by a pair of contrasting genes (alleles) are studied as above, it is called monohybrid inheritance.
2. Our idea of chromosomes (D) had not been established in the time of Mendel nor the word 'gene' yet coined.

Taking a clue from Q8, probability is 1/4

Albinism is autosomal recessive

**NOTES:**

1. There are two types of chromosomes:
  - a. Autosomal chromosomes
  - b. Sex chromosomes
2. In human for instance, there are 23 pairs (46) of chromosomes whereby the first 23 pairs (44) are autosomes and the remaining pair is sex.
3. Sex chromosomes determine maleness or femaleness
4. A character is autosomal if its genes are found on autosomal chromosomes while it is sex-linked if found as chromosomes
5. A character is recessive if it is only expressed phenotypically only when it is homozygous i.e in the absence of dominant gene.

75A. See Q51

76A. By Jean Lamarck

**NOTES:**

1. The theory is valid in that organ constantly used gets bigger (hypertrophy) while the one not put into use shrinks (atrophy)
2. However, it is invalid in that acquired trait (as in hypertrophied organs) is inheritable.

77C. Structures to make them more adapted to their environment.

78D. Body cells (soma) contain twice (2n) the number of chromosomes contained in gamete cells(n) and the chromosomes are in pairs in soma but single in gamete (sex) cells

79D. See Q7

80C. Continuous variation; variation means differences which include both physical (appearance) and physiological traits (e.g blood group)

82B. See also Q2

83A. From Q27, the father only contribute Y chromosomes to the son and Y chromosomes has no sex-linked gene on it.

84C. While the ones with less competitive advantage are wiped off.

85B. And if a number of genes are involved the mutation affect many characters.

**NOTE:** Point mutation involves a single gene

**86B. work it out**

87A. No two individuals except identical twins share the same DNA sequence hence, we do use the term "DNA fingerprint"

88D.

89. See Q76

**90B. work it out**

Phenotypically, they are all normal but genetically, they are carriers of albino trait.

91B. In breeding involves offspring that are closely related.

92A. Alleles A and B, neither of which dominates the other.

93B. See Q88

94B. Mendel = Genetics  
Hugo de Vries = Mutation  
Jean Lamarck = Use and disuse organ  
Darwin = Natural selection in organic evolution.

95B. Homologous Chromosomes are a pair of chromosomes which carry the same set of genes at identical locations on them.

96A. Or more precisely, the father's sex cell carrying Y chromosome for boy or X - chromosomes for girl.

97C. See Q7

98B. Work out (B) to confirm.

**99B. PHYSIOLOGICAL VARIATIONS**

1. Behavioural patterns
2. Ability to roll the tongue
3. Blood groups
4. Ability to taste PTC.

**MORPHOLOGICAL VARIATIONS**

1. size
2. weight
3. color
4. fingerprints.

100D. See Q94

102D. The gill-slit stage suggests a common ancestors for all vertebrates.

103C. See Q91

105B. See Q27

**107A. RHESUS INCOMPATIBILITY**

1. Every individuals is either rhesus positive (Rh+) or rhesus negative (Rh-) and neither ordinarily has any health consequences.
2. The classification is based on the presence or otherwise if a certain protein (rhesus factor) on the surface of the individual red blood cells (as in ABO system)
3. Most people are Rh= while Rh- is rare
4. A Rh-woman who marries a Rh= man may have a Rh=baby (Q107) and if the foetal blood enters the maternal blood especially during childbirth, the mother develops antibodies against the rhesus factor but this baby is unaffected having been born.
5. Rhesus negative foetus in subsequent pregnancy, however, might be adversely affected since the antibodies developed earlier can cross the placental barrier to cause haemolysis of many red blood cells.
6. This results in hemolytic anaemic a condition usually symptomised by jaundice in the neonate (newborn) and if not treated, is fatal.

108A. See Q 8 and 15

109D. While sister chromatids separate in mitosis

110D.



111A. See Q8

112D. Bb - heterozygote (carrier) XX - female

113A. The fruitfly, first used by Thomas Morgan (see Q39)

114C. An exclusively male characteristic mediated by Y-chromosome

115C. See Q76

116D. Dating is used to estimate the ages of rocks in which fossils are found so as to conjure possible evolutionary trend.

- 117C. DNA fingerprints can be used to solve crimes and settle paternity disputes.
- 118C. See Q 29      Pink = faint red.
- 119B. The angle fertilized egg (now a zygote) undergoes repeated mitosis and at a stage divides into two separate halves, each a foetus. Since the genetic make-up or constitution of the single foetus has been established before division, it follows that both foetuses have the same DNA fingerprint.
- 120D. The corresponding loci for such genes on Y - chromosomes are empty.
- 121D. Paleontology is the study of the old ancient world especially using archeological approach, study of fossil deposits and radioactive dating.  
**NOTE:** Comparative biology is not possible since the relatives are extinct.
- 122D. Both parents are heterozygous tall (Tt, Tt) = 9tt)
123. White trait is overshadow by the dominant yellow
124. See Q102.
125. Identical twins are genotypically identical and their equally identical phenotype may be affected by difference of environment (see also Q6)
- 126D. See Q4
- 127D. The double helix structure of the DNA
128. Base pairs linked by hydrogen bond
- 129D. Variation gives room for adaptation and those whose variation cannot withstand the environmental changes perish.
- 130B. The law of independent assortment of gene which states that each character (allele) behaves as a separate unit and is inherited independently of any other character.  
**NOTE:**
1. The first law of inheritance is called the law of the segregation of genes.
  2. It states that genes are responsible for the development of an individual and that they are independently transmitted from one generation to another without undergoing any attraction.
- 131D. Long neck is more suited to feeding on leaves from tall trees hence, short-neck trait was eliminated by natural selection - Jean Lamarck.
- 132B. I.e it is structural
- 133A. Ferns are more structurally complex than mosses
- 134B. Fish - Amphibians - reptiles - birds - mammals  
**NOTES:**
1. Fish has 2-chamber heart - 1 auricle, 1 ventricle
  2. Amphibians has 3 chambers - 2 auricles, 1 ventricle
  3. Reptile has 3 chambers - 2 auricles, 1 partially divided ventricle
  4. Birds and mammals have 4 chambers - 2 auricles, ventricles
  5. The trend also advances from single circulation system to double circulation
- 135A. See Q76      136B. See Q117
- 137C. Non - grey head must be homozygous recessive.
- 138A. A loss of tail is acquired trait and is not inheritable.
- 139B. The single cell from the original organism is made to grow into a new organism genetically identical to the present organism  
**NOTES:**
1. It is the harvested all that undergoes a sexual multiplication not the tissue of the original organism.
  2. The growing single cell may be made to undergo repeated divisions before differentiation to produce many copies of the original organism.
- 140A. Long hair is peculiar to the female sex.
- 141C. Sexual reproduction involves crossing over (meiosis) and random assortment of genes (recombination of genes) during in fertilization

**NOTE!**

1. Spontaneous changes in genes or chromosomes - mutation - also results in variation during sexual reproduction.
  2. Asexual reproduction produces a clone of the parent i.e offspring which are genetically identical to the ONLY parent unless mutation occurs.
- 142A. Rhesus monkey is a small south Asian monkey often used in scientific experiment as "rhesus factor" is named after this scientific tool.
143. Iv - tt homozygous recessive short.
- 144B. I: I/ III: IV = TT: 2Tt: tt = 1: 2: 1
145. Aside raising some social and ethical questions, many consumer are not sure of the potential azards of such food including cancer, drug resistance microbes etc.
- 146B. Flowering plants (angiosperms) are the most advances of plants.
- 147D. This suggests the survival of individuals whose adaptive variation are more suited to the environment and these traits are transmitted to subsequent generations.
- 148B. No two individuals are exactly alike.
- 149B. See Q22
- 150D. The theory of heredity (now a law) states that it is the tendency of the offspring to possess characteristics similar to wither of or both its parents while the theory of variation states that there is a tendency for the offspring to be different from their ancestors and from members of the same species.
- 151B. This is called single - factor inheritance involving a pair of alleles for each character but continuous characters are controlled at chromosomal level by multiple genes at different loci - polygenic inheritance.
- 152C. Work it out to obtain Tt, Tt, tt  
Probability of tongue rolling -  $2/4 \times 100\% = 50\%$
- 153C. This is the mutation in the gene for normal haemoglobin A to produce abnormal haemoglobin S  
**NOTES:**
1. The mutated gene substitutes valine for glutamic acid in the normal amino acid sequence of haemoglobin, a protein.
  2. Haemoglobin is easily sicked and leads to severe anaemia.
- 155A. See Q94
- 155A. Tasting PTC is discontinuous a physiological (see Q22 and 99).
- 156D. There are usually a pair of genes called alleles involves n, the expression of the contrasting forms of a particular trait such a Height = tall or short Haemoglobin = A or S etc. Alleles = Allelomorphs = Allelomorph pair
- 157C. Reduction division (Q34 / 78)  
 $2n$  meioticis  $n$
- 158B. Using Tt x Tt are obtain TT, Tt, Tt and tt hence probability of recessive (tt) is 1/4
- 159C. At the very moment when sperm cell carrying X- or Y- chromosomes enters (fertilizes) the ovum or egg cell which carries only X- Chromosome  
X-sperm Vs X- ovum - female  
Y - sperm Vs X - ovum - male
- 160C. Convergal evolution involves many superficially similar species which arise from different ancestral species and their structural convergence is as a result of their similar habitats.  
**NOTES:**
1. Divergent evolution involves many species arising from the same ancestral species to fill different niche in a habitat or to fill a variety of habitats e.g Darwin's finches
  2. Different ancestors + similar habitat = convergent evolutive.

3. Same Ancestors + different habitat = Divergent evolution.  
 4. Co-evolution involves two interacting species which evolve together e.g flowering plant - pollinator co-evolution predator-prey co evolution.

161D. See Q27  
 163A. This is Lamarck's 162D. See Q29  
 165C. The gene controlling the ABO system has 3 allelic forms  
 1.  $I^A$  - determines the addition of Antigen A to red blood cells (RBC)  
 $I^B$  - determines the addition of Antigen B to RBC  
 $I^O$  - determines the addition of neither to RBC

**NOTE:**

1. The above produces six genotypes and 4 phenotypes of the ABO grouping.

Genotypes	Phenotypes
$I^A I^A$ or $I^A I^O$	Group A
$I^B I^B$ or $I^B I^O$	Group B
$I^A I^B$	Group AB
$I^O I^O$	Group O

3. Alleles  $I^A$  and  $I^B$  are co-dominant i.e neither masks the other.  
 4. Allele  $I^O$  is recessive

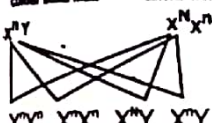
166B. e.g Antigen A (from group A) versus antibodies A (from group B)-see Q7 and 54

167D. See Q76  
 168C. Different ancestors, same environment (air) - see Q160  
 169C. Lots of intermediates between the extremes of 1.0 - 2.0m  
 170B. Cassava plants of height 1.6m are the most populous about 120

171A. See Q7  
 172D. As it marked the white seed trait in the previous generation.

173B. color blind man carrier woman

color blind man carrier woman



$X^C X^c$  - carrier daughter  
 $X^c X^c$  - colour blind daughter (rare)  
 $X^C Y$  - Normal Son  
 $X^c Y$  - color blind son  
 $2/4 \times 100 = 50\%$

174A. See Q65  
 175B. See Q94  
 176A. Structural adaptation of each species to its food type in terms of beak size and shape.

Anatomy - Biology of Structure  
 Physiology - Biology of Function

177C. See Q7  
 178D. See Q7

179D. Genotype = Genetic make-up = Genetic Constitution  
 Phenotype = Expressed traits (physical or physiological)  
 180B. All individuals belong to one of these four groups of fingerprint (discontinuous variation) although minute details produce unique individual prints.

181A. The woman is unlucky especially in (African setting) to have had her egg fertilized 10 times by X - chromosome-carrying sperm cells from the man.

182C. Leading to early maturity

183A. See Q7

184B. Darwinian theory of natural selection.

185. No option was right because adaptive radiation involves divergent evolution which entails  
 1. Common ancestry for the species  
 2. Very recent ancestor  
 3. Compensating for absent ecological niche in the habitat.

**2016 BIOLOGY QUESTIONS (COMPUTER BASED TEST)**

1. Which of the following conditions is NOT necessary for photosynthesis to take place? A. Chlorophyll B. Light C. Carbon(II) oxide D. Carbon (IV) oxide  
 2. Insects in which the maxillae are modified into a long proboscis, is A. housefly B. butterfly C. mosquito

- D. grasshopper  
 3. When a cell is placed in solution and the size of the cell increases, the concentration of solution is said to be A. Isotonic B. dilute C. hypotonic D. hypertonic  
 4. Which of the following plant hormone is responsible for ripening of fruits? A. Gibberellins B. Absciscic acid C. Ethylene D. Cytokinin  
 5. The ability of a living organism to detect and respond to changes in the environment is referred to as A. locomotion B. taxis C. Irritability D. growth  
 6. An example of an endospermous seed is A. bean seed B. cashew nut C. cotton seed D. maize grain  
 7. Which of the following theories was NOT considered by Darwin in his evolutionary theory? A. variation B. survival of the fittest C. use and disuse D. competition.  
 8. Which of the following protects the essential parts of the flower at bud stage? A. Stamens B. Sepals C. Petals D. Carpels  
 9. Which of the following is an agent of a sexually transmitted disease? A. Entamoeba histolytica B. Salmonella typhi C. Treponema pallidum D. Clostridium tetani  
 10. Which of the following animals has homodont dentition? A. Rat B. Man C. Lizard D. Pigeon  
 11. The movement of blood between the heart and all other parts of the body besides the lung is known as A. systemic circulation B. closed circulatory system C. pulmonary circulation D. single circulation system  
 12. If the cross of a red-flowered plant with a white flowered plant produces a pink flowered example of A. codominance B. Incomplete dominance C. mutation D. linkage  
 13. The largest amount of yolk is found in the egg of A. amphibians B. pisces C. reptiles D. aves  
 14. Fibrinogen and prothrombin play important roles in the A. deamination of proteins B. clotting of blood C. detoxication of substances D. storage of vitamins.  
 15. The pathogen that causes smallpox is A. picornavirus B. paramyxovirus C. herpesvirus D. poxvirus  
 16. The vector for the malaria parasite is a A. female Aedes mosquito B. female Anopheles mosquito C. female culex mosquito D. female culex mosquito  
 17. Which of the following pairs are social insects? A. Termite and locust. B. Ants and wasp C. Cockroach and bee D. Termite and bee.  
 18. Which of the following is NOT a method of conserving wildlife? A. Indiscriminate poaching B. Establishment of zoological gardens C. Enacting wildlife conservation laws. D. Establishment of game reserves.  
 19. The importance of the mouth-brooding behaviour in Tilapia is that it A. helps in keeping the young fish warm. B. affords protection from predation for the young fish. C. provides regurgitated nourishment to the young fish. D. helps the fish to live in a social group.  
 20. The type asexual reproduction that is common to both Paramecium and Protists is A. fragmentation B. budding C. sporulation D. fission  
 21. The micro-organisms that causes typhoid disease is A. trypanosome gambiense B. salmonella typhi C. entamoeba histolytica D. plasmodium sp.  
 22. A collection of population of all living organisms that exist in a habitat is referred to as A. niche B. ecosystem C. community D. environment  
 23. The theory of use and disuse of organs was promulgated by A. Alfred Wallace B. Charles Darwin C. Gene Lamarck D. Robert Hook  
 24. The theory of natural selection was postulated by A. Gregor Mendel B. Matthias Schleiden C. Charles Darwin D. Robert Hook.



25. The movement response of a cockroach away from a light source is A. negative phototropism B. positive phototaxis C. negative phototropism D. positive phototropism
26. Which of the following can cause shrinkage of living cells? A. Deionized water B. Hypotonic solution C. Isotonic solution D. Hypertonic solution
27. The ability of chameleon to change its colour rapidly is an adaptation for A. obtaining food B. attracting mate C. communication D. escaping detection
28. The function of the red head in male Agama lizards is to A. scare other males from the territory B. warn predators of the distastefulness of the animal C. attract female lizards for mating purposes D. conceal and camouflage the animal from predators
29. The activity of ptyalin is likely to decrease with an increase in the concentration of A. oxygen B. starch C. protein D. acid
30. Seed plants are divided into A. monocotyledons and dicotyledons B. tracheophytes and ferns C. angiosperms and gymnosperms D. thallophytes and bryophytes
31. The adaptive importance of the nuptial flight from termite colonies is to A. ensure cross-breeding between members of one colony and another B. disperse the reproductives in order to establish new colonies C. provide abundant food for birds and other animals during the early rains D. expel the reproductives so as to provide enough food for other members.
32. Which of the organisms represented are notable agricultural pests A. I and IV B. I and IV C. I and III D. II and III
33. The sequence of the one-way gaseous exchange mechanism in a fish is A. gills → operculum → mouth B. mouth → gills → operculum C. operculum → mouth → gills D. mouth → operculum → gills
34. In the nitrogen cycle, the nitrates in the soil are converted to atmospheric nitrogen by A. putrefying bacteria B. nitrogen-fixing bacteria C. nitrifying bacteria D. denitrifying bacteria
35. The relationship between a termite and the protozoan in its intestine is described as A. predation B. sapropliyism C. symbiosis D. parasitism
36. Erythrocytic phase of the life cycle of malaria parasite occurs in the A. liver of humans B. reticuloendothelial cells of humans C. Malpighian tubules of mosquito D. brain of humans
37. Which of the following organs regulates the levels of water, salt, hydrogen ions, and urea in the mammals? A. Kidney B. Colon C. Bladder D. Liver
38. The rate of transpiration is NOT affected by A. the weight of the stomata pores B. humidity C. temperature D. the size of the stomata pores
39. The crossing of individuals of the same species with different genetic characters is A. cross breeding B. polygenic inheritance C. non-disjunction D. inbreeding
40. The hereditary characters in plants and animals are located on the A. gene B. nucleus C. chromosome D. cell
41. The arrangement of ovules attached to the sides of a syncarpous ovary with a single chamber is referred to as A. free-central placentation B. axile placentation C. parietal placentation D. marginal placentation
42. When sickle cell carrier marries a normal woman, the probability of them having a normal offspring is A. 0.75 B. 0.25 C. 0.5 D. 1.
43. In which of the following groups of vertebrates is parental care mostly exhibited? A. Ayes B. Reptilia C. Amphibia D. Mammalia
44. An example of a non-bio degradable pollutants is A. dung B. bones C. ceramics D. woods

45. The bacteria that is found in the root nodules of leguminous plants is A. clostridium B. rhizobium C. nostoc D. azotobacter
46. Which of these organisms partly digest its food extracellularly? A. Housefly B. Cockroach C. Termite D. Mosquito
47. Strong, short and conical beak to pick and crush seeds is an adaptive feature of A. duck B. owl C. weaver bird D. hawk
48. The path followed by air as it passes through the lungs in mammals is A. bronchi → trachea → alveoli → bronchioles B. bronchioles → alveoli → bronchi → trachea C. trachea → bronchi → bronchioles → alveoli D. trachea → bronchioles → bronchi → alveoli
49. The part of the mammalian ear responsible for the maintenance of balance is the A. cochlea B. pinna C. perilymp D. ossicles
50. In which of the following species is the biomass of an individual the smallest? A. Tilapia sp. B. Agama sp. C. Bufo sp. D. Spirogyra sp.

**2016 ANSWERS**

- 1C. Carbon(II)oxide is an air pollutant.
- 2B. Proboscis for sucking nectar from flower nectary.
- 3C. The interior of cell has higher solute concentration than the solution hence water moves into the cell (endo-osmosis) (see chapter 2)
- 4C. Ethene is even used artificially to ripen fruits.
- 5C. Irritability is so pronounced in animals that a nervous system is developed for irritability.
- 6D. Maize stores its food in its prominent endosperm while others store theirs in their conspicuous cotyledons
- 7C. "Use and disuse" theory by Jean Lamarck.
- 8B. The outermost whorl of the flower protecting the inner whorls.
- 9C. Causative agent of Syphilis
- 10C. In fact, reptiles (e.g. lizard), fishes (e.g. tilapia) and amphibians (e.g. frog) have homodont dentition while aves or birds (e.g. pigeon) have zero dentition (no teeth). Only mammals (e.g. rat and man) among the vertebrates have heterodont dentition
- 11A. ....while to the lungs only is pulmonary circulation (C)
- 12B. see chapter 24
- 13D.
- 14B. They are clotting factors.
- 15D.
- 16B. ...carrying plasmodia spp.
- 17D. Termites and (honey) bees are organised into specialised castes in a community where division of labour thrives. Avoid option A because locust is not a social insect although it is a pregarious insect
- 18A. Indiscriminate killing of animals
- 19B. When the danger goes away, the mother fish release the shoal/school of young fishes from its mouth
- 20D. Fragmentation in spirogyra; budding in hydra and yeast; binary fission in bacteria; protists and paramecium
- 21B. **NOTE**
1. The Rhyming of typhoid and typhi, also:  
 Cholera → Vibrio cholerae  
 Gonorrhoea → Neisseria gonorrhoeae  
 Tetanus → Clostridium Tetani  
 Tuberculosis → Mycobacterium tuberculosis
2. JAMB might hide the species name for you as in 2017 Q13.
- 22C. Similar organisms which freely interbreed = species  
 No of a particular species in a habitat = population  
 PA + PB + PC .... = community where  
 PA = population of species A etc  
 Community of living organisms + abiotic component = of

the environment ecosystem (see chapter 22)

- 35C. See Q7
- 35D. Which states that the most suited organisms are chosen
- 36A. Away = -ve towards = +ve
- 36B. Photo = light Taxism = the whole organism moves
- 36C. Water moves from an area of low solute concentration within the cell to the area of higher solute concentration of the hypertonic solution (ex-osmosis) hence the cell shrinks compare Q3)
- 36D. So as to blend with its prevailing background.
- 37A. It is an index of sexual dimorphism and it is largely employed in courtship behaviour.
- 37B. Ptylin works best in alkaline medium (pH of saliva = 8.4).
- 37C. In fact, one of the functions of HCl produced in the stomach is to stop the enzymatic actions of ptylin.
- 37D. Note: Acidic pH is required in the alimentary canal.
- 38A. Angiosperms + cryinnsperms = spermatophytes (seed plants)
- 38B. Monocot + Dicot = Angiosperms
- 38C. Nuptial means marital
- 38D. I (grasshopper) and IV (caterpillar or butterfly larva) eat plant leave tendrils.
- 39A. Consider the literal meaning of the idiom "drink like a fish". A fish draws water into its mouth and passed it over the gills, the water exit the gill via the operculum after its oxygen content has been removed. Next time you see a fish "out of water", observe the flaring of its opercula.
- 39B. See chapter 22
- 39C. More precisely in recent times "mutualism" in a win-win (++) situation of mutual benefit to both organism.
- 39D. The erythrocytic phase occurs in the red blood cell (erythrocytes)
- 40A. The liver produces some of these wastes as the chief "metabolizer" of the body but it is a functional kidney that regulates their amount in the body as an excretory outlet.
- 40B. Option A even makes no sense or how do you measure the weight of stomatal pores?
- 40C. While inbreeding is the crossing of closely-related members of a species (especially first-degree relatives) to retain their desired qualities.
- 40D. While the gene itself is found at a precise location called locus (plural = loci) on the chromosome (C)
- Note: Chromosome is found in the nucleus (B) of the cell (D)
- 41D. work it out
- 42C. In fact, parental care is throughout life (of the young) in man. Imagine your parents being responsible for your feeding, clothing, shelter JAMB fee and classes, schooling and others up till now.
- 43B. Bones cannot be degraded by microbial activities hence skeletal remains of dead body exist for years. Little wonder we bury the dead or cremate them to forestall their bones constituting an unsightly sight.
- 43C. Symbiotic bacteria (Nitrogen fixing bacterium)
- 43D. Read up the "fungal garden" in a termite colony.
- 44C. See chapter 23
- 44D. The trachea bifurcates into left and right bronchi (singular: bronchus) and each bronchus gives rise to many bronchioles (small bronchi) that terminate in many alveoli (the respiratory functional units of the lungs)
- 45A. No option is right. The cochlea is for hearing, while the semicircular canal is for balance
- 45B. See chapter 22

**2017 QUESTIONS (COMPUTER BASED TEST)**

- The piercing and sucking mouth parts are found in A. grasshoppers B. mosquitoes C. termites D. cockroaches
- hormones that regulate plant growth are A. gibberellins

- and auxins B. auxin and gibberellins C. cytokinins and abscisic acid D. ethylene and gibberellins
- Which of the following pair of organisms exhibit parasitic association? A. insect and plant B. cattle and egret C. shark and remora D. tsetse fly and cattle
- Which of the following group of animals can withstand the rigour of the arid land? A. locust, camel, lizard and snakes B. monkeys, chameleon, earthworm and grasshopper C. monkeys, grasshopper, snail and snakes D. lungfish, duck, butterfly and lizards
- Suture joints found in the A. hip B. ankle C. skull D. elbow
- The organelle responsible for osmoregulation in paramecium is A. flame cell B. nephridia C. contractile D. malpighian tubule

Use the diagram to answer the questions that follow

7. The excretory organ of earthworm is represented by A. IV B. I C. III D. II

8. The platelets in mammalian blood are responsible for A. transporting oxygen B. initiating clotting C. removing carbon(IV)oxide D. destroying micro-organisms
9. The most important factor that determines the different types of vegetation is A. light B. wind C. temperature D. rainfall
10. When testing for the presence of starch in a leaf, the reason for dipping the decolorised leaf in hot water is to A. detect the starch B. kill the leaf C. soften the leaf D. remove the chlorophyll
11. The relationship between remora and shark can best be described as A. parasitism B. amensalism C. mutualism D. commensalism
12. The major characteristic of a fresh water habitat is the possession of A. high turbidity B. high density C. low salinity D. high current
13. The causative organism of cholera is A. Clostridium sp B. shigellasp C. vibrio sp D. salmonella typhi
14. The process that takes place in the dark stage of photosynthesis is A. oxidation of water B. photolysis of water C. oxidation of carbon(IV) oxide D. reduction of carbon(IV) oxide
15. Chlorofluorocarbons are air pollutants that originates from A. crude oil refining B. coal mining C. motor vehicle exhaust D. cooling system
16. Which of the following is organ level of organisation? A. Volvox sp B. paramecium caudatum C. hydra viridis D. onion bulb
17. The simplest form of reproduction is A. conjugation B. budding C. spore formation D. binary fission
18. Which of the following is a characteristic of wind-pollinated flower? A. flowers lack nectar B. flowers are conspicuous C. flowers have perianths D. flowers are bisexual

Use the diagram to answer the questions that follows

19. The most efficient unit in terms of water conservation is represented by A. IV B. I C. III D. II

20. The process required for formation of gamete in sexual reproduction is A. implantation B. fertilisation C. mitosis D. meiosis
21. In an experiment to determine the humus in a soil sample the following results were obtained
- |                                   |      |
|-----------------------------------|------|
| Mass of dish                      | 20g  |
| Mass of dry soil                  | 7.5g |
| Mass of dish + soil after burning | 25g  |

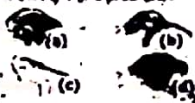
- The percentage of humus in the given sample is  
 A. 9.1 B. 37.5 C. 12.5 D. 33.3
22. The presence of termites and earthworms in soil promote  
 A. porosity and fertility B. porosity and aeration C. aeration  
 and fertility D. acidity and aeration
23. In a 15m<sup>2</sup> habitat, the total number of Tridax counted using a  
 1.6m<sup>2</sup> quadrant thrown randomly 50 times was 400. What is  
 the Tridax A. 12 B. 16 C. 8 D. 5
24. Which of the following is a sex-link character? A. Dwarfism  
 B. Albinism C. Tongue rolling D. Colour blindness
25. The outer-most tissue of the herbaceous roots is the  
 A. cuticle B. pericycle C. epidermis D. endodermis
26. The respective tissues that transport water and  
 manufactured food in plants are A. xylem and phloem  
 B. phloem and tracheid C. phloem and xylem D. xylem and  
 tracheid
27. An adaptive feature of plants in the savanna is A. fissured  
 bark B. few grasses C. tall trees D. long lifespan
28. A grasshopper's cuticle becomes green during the season  
 and black after fire. The reasons for the change is A. obtain  
 food B. predators C. secure mates D. escape detection
29. Which of the following is the most advanced plant? A. mercuria  
 B. dryopteris C. chlamydomonas D. spirogyra
30. The soil type with the least ability to retain nutrients is A. sandy  
 loam B. clayey loam C. loam D. sand
31. A humming bird is able to feed on nectar because its beak is  
 A. short, slender and ridged B. short, strong and conical  
 C. long, slender and slightly curved D. long, wide and  
 slightly curved

Use diagram to answer the questions 32 and 33



32. The part labelled III acts as  
 A. water outlet B. food strainer  
 C. exchange surface D. blood  
 transporter
33. The part labelled II is the  
 A. arch B. filament C. slit  
 D. raker

34. The effect of overcrowding is A. immigration B. reduced  
 competition C. emigration D. reduced mortality
35. The vertebrae that allows the skull to nod and rotate are  
 A. axis and cervical B. atlas and thoracic C. axis and atlas  
 D. atlas and cervical
36. The component of the cell that determines paternity resides  
 in the A. centrosome B. ribosome C. nucleus D. mitochondria



37. Which of the following  
 beak type is an adaptation  
 for aquatic feeding?

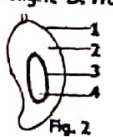

38. The insect-trapping by the leaves of Venus flytrap is an  
 example of A. adaptive coloration B. structural adaptation  
 C. environmental adaptation D. behaviour adaptation
39. Morphological variation in humans include A. height,  
 skin colour and tongue rolling B. weight, finger prints and body  
 shape C. height, weight and blood group D. skin colour,  
 blood group and height

40. Which of the following is correct about blood transfusion?  
 A. Group AB can only receive from groups A and B and not  
 from group O B. Group O can receive from groups A and B  
 and from AB C. Group B can only donate to blood group B  
 not to AB and O D. Group O can donate to groups A, B and  
 AB but cannot receive.

- 1B. Mosquito pierces and sucks using its proboscis others are of  
 biting and chewing mouth parts
- 2B. See chapter 18
- 3D. Tse-tse fly harms the cattle
- 4A. Arid land is desert, semi-desert or (Sahel) Savanna region
- 5C. See chapter 12
- 6C. Contractile vacuoles accumulate and excrete excess water
- 7C. Nephridium in earthworm
- 8B. Platelets as thrombocytes (thrombus = clot)
- 9D. See chapter 22
- 10C. See chapter 10
- 11D. See chapter 23
- 12C. Marine habitat has high salinity
- 13C. Or Vibrio cholerae
- 14D. See chapter 10
- 15D. Coolants such as freon
- 16D. The onion bulb without its root is a shoot "system". Although  
 hydra is organismal, its highest level of organisation is tissue
- 17D. It involves ordinary splitting of a single "parent" cell into  
 two identical "daughter" cells which are "clones" of the  
 parent cell
- 18A. See chapter 16
- 19D. The kidney, of course, being technically the most  
 advanced structure here
- 20D. ...while mitosis is for growth, development and repair
- 21D. Mass of dish + soil burning = 20.0 + 7.5 = 27.5g  
 Mass of dish + soil after burning = 25.0g  
 Mass of humus burnt off = 27.5 - 25.0 = 2.5g  
 % of humus =  $\frac{\text{Mass of humus} \times 100\%}{\text{Mass of dry soil}}$   
 $= \frac{2.5 \times 100\%}{7.5} = 33.3\%$

- 22C. Note that "porosity" is a negative term
- 23D. No of Tridax per throw =  $\frac{400}{50} = 8/\text{throw}$
- Since the quadrant is 1.6m<sup>2</sup>, this means that there are 8  
 tridax per 1.6m<sup>2</sup> of the 15m<sup>2</sup> habitat  
 $\therefore$  The population density of tridax =  $\frac{8}{1.6} = 5$
- $\therefore$  There are 5 Tridax plant per unit area (1m<sup>2</sup>) of the habitat
- 24D. See chapter 24
- 25C. No cuticle in the root
- 26A. See chapter 13
- 27A. Bark to resist fire
- 28D. The grasshopper is using camouflage to blend with its  
 surrounding
- 29B.
- 30D. Nutrients are easily leached out of sandy soil
- 31C. See chapter 23
- 32C. I = gill arch that anchors the raker  
 II = gill raker for straining food  
 III = gill filament for gaseous exchange
- 33D. See Q32
- 34C. Organism tend to move from a crowded region to the  
 sparsely populated area
- 35C. See chapter 12
- 36C. Nucleus of the cell
- 37B. Heron
- 38B.
- 39B. See chapter 24
- 40D. See chapter 24

## BIOLOGY: 2019 UTME STRUCTURED QUESTIONS

1. A plant which grows in a soil that lacks nitrogen is likely to be  
A. epiphytic B. saprophytic C. carnivorous D. parasitic
2. The bright colours of the comb and feathers in the peacock are for  
A. sex differentiation B. beauty C. courtship D. defence.
3. A gene which expresses itself only in the homozygous condition is  
A. mutant B. dominant C. recessive D. lethal
4. The theory of mutation as the basis of heredity was propounded by  
A. Charles Darwin B. Hugo de Vries C. Gregor Mendel D. Jean Larmack
5. Which of the following characters is NOT sex-linked?  
A. Albinism B. Baldness C. Haemophilia D. Colour blindness.
6. Which of these instruments is used to demonstrate the response of roots and shoots to gravity?  
A. klinostat B. Manometer C. Potometer D. Photometer
7. The part of the brain that regulates most biological cycles in humans is  
A. olfactory lobe B. optic lobe C. medulla oblongata D. pineal body.
8. A severe deficiency of thyroxin results in  
A. diabetes mellitus B. sexual underdevelopment C. cretinism D. gigantism.
9. In which part of the human body does the secretion of the growth hormone occur?  
A. head region B. waist region C. neck region D. gonads
10. The hormone involved in parturition is  
A. Glycagon B. thyronine C. oxytocin D. secretin
11. Fertilization occurs in which part of the mammalian reproductive tract?  
A. cervix B. vagina C. uterus D. oviduct
12. A pair of monozygotic twins have  
A. same placenta and same umbilical cord B. different placentae and different umbilical cords  
C. same placenta but different umbilical cords D. different placentae but same umbilical cord
13. Asexual reproduction in spirogyra is by  
A. fragmentation B. binary fission C. conjugation D. budding
14. The part of the cell where respiration occurs is the  
A. mitochondria B. ribosome C. golgibody D. lysosome
15. The oxygen released during photosynthesis comes from  
A. carbondioxide B. sunlight C. chlorophyll D. water
16. Leaf to be tested for starch is placed in alcohol to  
A. soften it B. decolourize it C. harden it D. cool it
17. The nitrogenous base not found in DNA is  
A. cytosine B. adenine C. thymine D. uracil
18. One of the following contains digestive enzymes in the cell  
A. endoplasmic reticulum B. nucleus C. lysosome D. centrosome
19. A flower with inferior ovary is said to be  
A. perigynous B. epigynous C. hypogynous D. progynous
20. Which of the following is not necessary for germination  
A. light B. water C. air D. temperature
21.  The figure is a section of a drupe. The part numbered 2 is  
A. epicarp B. endocarp C. mesocarp D. pericarp
22.  The type of vegetative reproduction illustrated in the diagram is  
A. grafting B. adventitious bud C. sucker D. aerial layering.
23. Which of the following is not an excretory organ?  
A. Lungs B. Kidney C. Leaf D. Large intestine
24. The nephridia in the earthworm form part of the  
A. reproductive system B. respiratory system. C. circulatory system D. excretory system.
25. One of the following is also known as mitral valve  
A. tricuspid valve B. aortic valve C. semilunar valve D. bicuspid valve
26. Prolonged bleeding can arise from deficiency of the following except  
A. Iron B. calcium C. platelet D. vitamin K

27. Blood supply to the heart tissue itself is via  
A. renal artery B. ovarian artery C. carotid artery D. coronary artery
28. A plant that grows in brackish waters can be described as  
A. mesophyte B. halophyte C. hydrophyte D. Xerophyte
29. Which of the following vertebrae is entirely centrum  
A. cervical B. caudal C. thoracic D. lumbar
30. The numbers of pairs of cranial and spinal nerves in man are respectively  
A. 12 and 33 B. 33 and 12 C. 31 and 12 D. 12 and 31
31. The digestive enzyme found in the ileum is  
A. trypsin B. pepsin C. erepsin D. renin
32. One of the symptoms that arise from Rhesus incompatibility in the new born is  
A. oedema B. jaundice C. cough D. haemorrhage
33. Which of the following is known as cyanocobalamine?  
A. vitamin B6 B. vitamin C C. vitamin B12 D. vitamin D
34. A plant that becomes pale because it does not receive enough light is said to be  
A. variagated B. evergreen C. etiolated D. malnourished
35. A reptile always lays its eggs  
A. on trees B. on land C. in water D. in swamps
36. The pupal stage of the butterfly is known as  
A. larva B. maggot C. grub D. chrysalis
37. Which of the following is a viral disease?  
A. common cold B. leprosy C. syphilis D. gonorrhoea
38. A moss belong to the group called  
A. pteridophyta B. bryophyta C. schizophyta D. spermatophyta
39. The cell of a bacterium is described as  
A. unicellular B. eukaryotic C. prokaryotic D. multicellular
40. A red cell placed in distilled water undergoes haemolysis because of  
A. ex-osmosis B. endo-osmosis C. diffusion D. capillarity

## 2019 ANSWERS

- 1C. A carnivorous plant feeds on small insect for its source of nitrogen for protein synthesis
- 2C. The beautiful plumage of the peacock attracts the peahen in courtship
- 3C. A recessive gene only expresses itself in the absence of its dominant allelemorph
- 4B. See chapter 24
- 5A. The faulty gene in albinism is an autosome (hence unrelated to sex chromosomes)
- 6A. See Chapter 19
- 7D. See Chapter 19
- 8C. See Chapter 18
- 9A. The pituitary gland that produces the hormone is located in the head.
- 10C. Parturition = labour.  
Oxytocin is also involved in secretion of milk (milk let-down)
- 11D. Also known as fallopian tube or uterine tube
- 12C. For monozygotic (identical twins), they share same genome, same sex and same placentae having developed from a single sperm and a single ovum. However, they have different umbilical cord that link the single placenta separately to the interior of their respective bodies.
- NOTE:** Siamese (or conjoined) twins are identical twins with incomplete separation of the single original foetus into two separate individuals.
- 13A. Each spirogyra segment grows into a longer filament after fragmentation.
- 14A. The power house of the cell
- 15D. From photolysis of water

- 16B See Chapter 10
- 17D DNA → A - T - G - C  
RNA → A - U - G - C
- 18C Hence a cell can self-destruct if the lysosomal enzymes are indiscriminately released.
- 19B See Chapter 16
- 20A Seeds are usually placed/or planted within the soil where no light would reach but they still germinate. However, a seedling becomes long, thin and etiolated if denied light.
- 21C See Chapter 16
- 22B This is bryophyllum leaf illustrated.
- 23D Also recalled that faeces (undigested food) that passes through the large intestine (colon) is not an excretory product.
- 24D See Chapter 14
- 25D Note that tricuspid valve on the right and bicuspid valve on the left are the two atrioventricular valves within the heart. Semilunar valves are the aortic and pulmonary valves found at the exits of the aorta and pulmonary arteries respectively from the heart. The closure of these four valves produces the heart sounds heard in auscultation (listening to heart beat through a stethoscope)
- 26A Iron is not involved in blood clotting.
- 27D In coronary artery diseases, the occlusion of the lumens of these arteries can result in myocardial infarction (heart tissue becoming dead)
- 28B Brackish water is salty (halo = salt)
- 29B A caudal vertebra is a solid piece of centrum, all other features of a typical vertebra including the neural canal have vanished. After all, the spinal cord has since terminated at a superior level.
- 30D These nerves arising from the brain and the spinal cord constitute the so-called peripheral nervous system.
- 31C See Chapter 11
- 32B The neonate (newborn) is obviously jaundiced as a result of rapid haemolysis of its red blood cells. This is why it is called haemolytic disorder of the newborn or more technically **erythroblastosis foetalis**.
- 33C See Chapter 10
- 34C Revisit Q20
- 35B All reptiles whether aquatic or terrestrial lay their eggs on land. In contrast, an amphibian such as toad which lives more on land than in water, returns to water to lay its eggs.
- 36D See Chapter 7
- 37A See Chapter 21
- 38B See Chapter 4
- 39C See Chapter 3
- 40B Water moves from the exterior of the cell (hypotonic) into its interior. Thus the cell swells until it bursts (haemolyzes)

# Past Questions & Answers

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