

## CHAPTER 24

# MODEL ANSWERS TO DESCRIPTIVE QUESTIONS

This chapter deals with model answers to all types of descriptive questions such as Very Short Answer (VSA) type questions, Short Answers (SA) type questions and Long Answer (LA) type questions. The questions are randomly selected from different units, the answers are suggestive and written to provide approach and way of presentation. They are categorised under three headings as follows:

### ANSWERS TO VSA TYPE QUESTIONS

1. Identify the phylum in which adults exhibit radial symmetry and larva exhibit bilateral symmetry.  
Ans. In phylum echinodermata, adults show radial symmetry whereas larvae show bilateral symmetry.
2. What is the importance of pneumatic bones and air sacs in Aves?  
Ans. Pneumatic bones in Aves keep the body light and thus help in flight. Air sacs help in respiration and buoyancy.
3. What is metagenesis? Mention an example which exhibits this phenomenon.  
Ans. Alteration of generation is known as metagenesis. *Obelia* exhibits this phenomenon.
4. Which segments in earthworm are covered by a prominent dark band or clitellum?  
Ans. 14th - 16th segments.

5. What are sclerites present in cockroach?

Ans. In each segment of the body of cockroach, exoskeleton has hardened plates called sclerites.

6. How many times do nymphs moult to reach the adult form of cockroach?

Ans. 13 times moulting.

7. Identify the sex of a frog in which sound producing vocal sacs are present.

Ans. Male Frog.

8. What is the scientific term given to segments of earthworm?

Ans. Metameres.

9. A muscle fibre tapers at both ends and does not show striation. Identify the muscle fibre.

Ans. Smooth muscle fibre.

10. Name the different cell junctions found in tissues.

- Ans.
- Tight Junctions
  - Adhering Junctions
  - Gap Junctions

11. Give two identifying features of an adult male frog.

- Ans.
- Vocal Sacs.
  - Thumb pads/copulatory pads in thumb.

12. Smaller, lipid soluble molecules diffuse faster through cell membrane, but the movement of hydrophilic substances are facilitated by certain biomolecules named as \_\_\_\_\_.

Ans. Protein.

13. Osmosis is a special kind of diffusion, in which water diffuses across the cell membrane. The rate and direction of osmosis depends upon both \_\_\_\_\_.

Ans. Pressure and concentration gradient.

14. To an aquatic plant. Urea is added to make the plant grow faster, but after some time the plant dies. This may be due to \_\_\_\_\_.

Ans. Exosmosis.

15. Absorption of water from soil by dry seeds increases the \_\_\_\_\_, thus helping seedlings to come out of soil

Ans. Pressure.

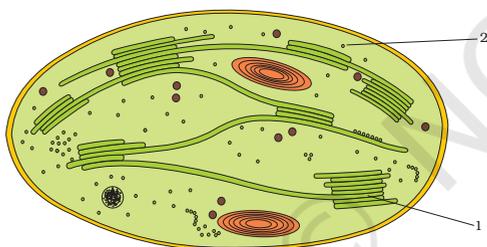
16. Water moves up against gravity and even for a tree of 20 m height, the tip receives water within two hours. The most important physiological phenomenon which is responsible for the upward movement of water is \_\_\_\_\_.

Ans. Transpirational pull.

17. The cytoplasm in a plant cell is surrounded by both cell wall and cell membrane. The specificity of transport of substances are mostly across the cell membrane, because \_\_\_\_\_.

Ans. The cell wall is freely permeable to water and substances in solutions but membrane is selectively permeable.

18. Examine the figure.



- a. Is this structure present in animal cell or plant cells?
- b. Can these be passed on to the progeny? How?
- c. Name the metabolic processes taking place in the part (1) and (2).

Ans.

- a. Plant cell.
- b. Yes, through female gametes.
- c. In part (1) - Photophosphorylation.  
In part (2) - Calvin cycle.

19.  $2\text{H}_2\text{O} \longrightarrow 2\text{H}^+ + \text{O}_2 + 4\text{e}^-$

Based on above equation, answer the following questions:

- a. Where does this reaction take place in plants?
- b. What is the significance of this reaction?

- Ans. a. Lumen of the thylakoids.  
b.  $O_2$  is evolved during this reaction, moreover electrons are made available to PS-II continuously.
20. Cyanobacteria and some other photosynthetic bacteria don't have chloroplasts. How do they conduct photosynthesis?
- Ans. Cyanobacteria and other photosynthetic bacteria have thylakoids suspended freely in the cytoplasm (i.e., they are not enclosed in membrane), and they have bacteriochlorophyll.
21. a. NADP reductase enzyme is located on \_\_\_\_\_.
- Ans. grana-lamellae.  
b. Breakdown of proton gradient leads to release of \_\_\_\_\_ .
- Ans. energy.
22. Fill in the places with appropriate word/words.
- a. A phase of growth which is the maximum and fastest is \_\_\_\_\_.
- b. Apical dominance as expressed in dicotyledonous plants is due to the presence of more \_\_\_\_\_ in the apical bud than in the lateral ones.
- c. In addition to auxin, \_\_\_\_\_ must be supplied to culture medium to obtain a good callus in plant tissue culture.
- d. \_\_\_\_\_ of a vegetative plants are the sites of photoperiodic perception.
- Ans. a. exponential/log phase of an S-curve.  
b. auxin/IAA  
c. cytokinin/Kinetin/6 BAP/Zeatin/etc.  
d. leaves.
23. Plant growth substances (PGS) have innumerable practical applications. Name the PGS you should use to
- a. Increase yield of sugar cane  
b. Promote lateral shoot growth  
c. Cause sprouting of potato tuber  
d. Inhibit seed germination
- Ans. a. GA3/gibberellin/gibberellic acid.  
b. Cytokinin zeatin/kinetin/Kn.

- c. C<sub>2</sub>H<sub>4</sub>/Ethylene.
- d. ABA/Abcisic acid.

24. The food mixes thoroughly with the acidic gastric juice of the stomach by the churning movements of its muscular wall. What do we call the food then?

Ans. Chyme.

25. Trypsinogen is an inactive enzyme of pancreatic juice. An enzyme, enterokinase, activates it. Which tissue/ cells secrete this enzyme?

Ans. Intestinal mucosa.

26. In which part of alimentary canal does absorption of water, simple sugars and alcohol takes place?

Ans. Stomach.

27. Name the enzymes involved in the breakdown of nucleotides into sugars and bases?

Ans. Nucleotidases and Nucleosidases.

28. Define digestion in one sentence.

Ans. The process of conversion of complex food substances in the digestive system to simple absorbable forms is called digestion.

29. What do we call the type of teeth attachment to jaw bones in which each tooth is embedded in a socket of jaw bones?

Ans. Thecodont.

30. Stomach is located in upper left portion of the abdominal cavity and has three major parts. Name these three parts:

Ans. Cardiac, fundic and pyloric.

31. Does gall bladder make bile?

Ans. No.

32. A fluid filled double membranous layer surrounds the lungs. Name it and mention its important function.

Ans. Pleural fluid is found in between the two membranes of lung and it reduces the friction on the lung surface.

33. Name the primary site of exchange of gases in our body?

Ans. Alveoli.

34. Cigarette smoking causes emphysema. Give reason.

Ans. Cigarette smoking causes damage of the alveolar walls leading to decreased respiratory surfaces for exchange of gases.

35. What is the amount of  $O_2$  supplied to tissues through every 100 mL. of oxygenated blood under normal physiological conditions?

Ans. 5mL. of oxygen / 100 mL. of oxygenated blood.

36. A major percentage (97%) of  $O_2$  is transported by RBCs in the blood. How is the remaining percentage (3%) of  $O_2$  transported?

Ans. Through Plasma.

37. Name the blood component, which is viscous and straw coloured fluid.

Ans. Plasma.

38. Complete the missing word in the statement given below:

a. Plasma without \_\_\_\_\_ factors is called serum.

Ans. clotting.

b. \_\_\_\_\_ and monocytes are phagocytic cells.

Ans. Neutrophils.

c. Eosinophils are associated with \_\_\_\_\_ reactions.

Ans. allergic.

d. \_\_\_\_\_ ions play a significant role in clotting.

Ans. Calcium.

e. One can determine the heart beat rate by counting the number of \_\_\_\_\_ in an ECG.

Ans. QRS complex.

39. Name the vascular connection that exists between the digestive tract and liver.

Ans. Hepatic portal system.

40. Given below are the abnormal conditions related to blood circulation. Name the disorders.

- a. Acute chest pain due to failure of O<sub>2</sub> supply to heart muscles.

Ans. Angina.

- b. Increased systolic pressure.

Ans. High blood pressure.

41. State the functions of the following in blood.

- a. Fibrinogen

Ans. Blood coagulation

- b. Globulin.

Ans. Immunity i.e., defence mechanism of body

- c. Neutrophils

Ans. Phagocytosis

- d. Lymphocytes

Ans. Immunity

42. Name two actively transported substances in glomerular filtrate.

Ans. Glucose and aminoacids,

43. Mention any two metabolic disorders, which can be diagnosed by analysis of urine.

Ans. Glycosuria and Ketonuria,

44. What are main processes of urine formation?

Ans. The main processes are filtration, reabsorption, secretion and concentration/ dilution,

45. Sort the following into actively or passively transported substances during reabsorption of GFR.

Ans. Actively transported – glucose, aminoacids and Na<sup>+</sup>

Passively transported – nitrogenous wastes and water

46. Name the cells/tissues in human body,

- a. Which exhibit amoeboid movement.

Ans. macrophages.

- b. Which exhibit ciliary movement.

Ans. ciliated epithelium of nasal passage.

- c. Which exhibit muscular movement.

Ans. muscles of limbs and tongue.

47. Locomotion requires a perfect coordinated activity of muscular, \_\_\_\_\_, and \_\_\_\_\_ systems.

Ans. Skeletal and Neural.

48. The three tiny bones present in middle ear are called ear ossicles. Write them in correct sequence beginning from ear drum.

Ans. malleus, incus, stapes.

49. Rearrange the following in the correct order of involvement in electrical impulse movement-

Synaptic knob, dendrites, cell body, Axon terminal, Axon.

Ans. Dendrites - Cell body - Axon - Axon terminal -Synaptic knob.

50. Comment upon the role of ear in maintaining the balance of the body and posture.

Ans. The crista and macula are the specific receptors of the vestibular apparatus responsible for maintenance of balance of the body and posture.

51. Specific cells of the retina enable us to see coloured objects around us, what are they?

Ans. Cone cells of the retina enable us to see the coloured objects around us.

52. Arrange the following in the order of reception and transmission of sound wave from the external auditory canal:

Cochlear nerve, ear drum, stapes, incus, malleus, cochlea.

Ans. Ear drum, malleus, incus, stapes, cochlea, cochlear nerve.

53. There are many endocrine glands in human body. Name the gland which is absent in male and the one absent in female.

Ans. In Males - Ovary. In Females - Testis.

54. Which of the two adrenocortical layers, zona glomerulosa and zona reticularis lies outside enveloping the other?

Ans. Outer layer - Zona glomerulosa

Inner layer - Zona reticularis

55. What is erythropoiesis? Which hormone stimulates it?

Ans. Formation of RBC is known as erythropoiesis and the hormone erythropoietin stimulates the process.

## ANSWERS TO SA TYPE QUESTIONS

1. Differentiate between:

a. Open Circulatory System and Closed Circulatory System

Ans.	<b>Open Circulatory System</b> The blood is pumped out of the heart into sinuses and the cells and tissues are directly bathed in it.	<b>Closed Circulatory System</b> The blood is circulated within a network of vessels.
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b. Oviparous and Viviparous.

Ans.	<b>Oviparous</b> Animals which lay eggs are called oviparous	<b>Viviparous</b> Animals which give birth to their young ones are called viviparous.
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c. Direct Development and Indirect Development

Ans.	<b>Direct Development</b> Animals which do not have a larval stage in their development are said to exhibit direct development.	<b>Indirect Development</b> Animals which have a larval stage, which do not resemble the adult in their development are said to exhibit indirect development.
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2. Fill up the blank spaces appropriately

Phylum/Class	Excretory Organ	Circulatory Organ	Respiratory Organ
Arthropoda	A	B	Lungs/ Gills/ Tracheal System
C	Nephridia	Closed	Skin/Parapodia
D	Metanephridia	Open	E
Amphibia	F	Closed	Lung

Ans.

A = Malpighian Tubule/ coxal glands/ antenary glands/ green glands

B = Open

C = Annelida

D = Mollusca

E = Feather like gills

F = Kidney

3. Give two examples of roots that develop from different parts of the angiospermic plant other than the radicle.

Ans. The roots that arise from parts of plant other than radicle are called adventitious roots.

Pneumatophores – for respiration

Stilt roots – for support

Prop roots – for support.

4. While eating peach or pear it is usually seen that some stone like structures get entangled in the teeth, what are these stone like structures called?

Ans. The structures that get entangled in the teeth while eating fruits like peach and pear are actually the stone cells or brachysclereids which are unbranched, short and isodiametric type of sclereids. These stone cells usually occur in groups and provide grit or stone like hardness that get entangled in the spaces between teeth.

5. Palm is a monocotyledonous plant, yet it increases in girth. Why and how?

Ans. A palm tree is a monocotyledonous plant and like all other monocot the stems do not have primary cambium in the vascular bundles. However, with age the tree grows in diameter, though slowly, as a result of growth of the ground tissue. A secondary cambium may be formed in the hypodermal region of the stem. The later forms the conjunctive tissue and patches of meristematic cell. The activity of the meristematic cells result in the formation of secondary vascular bundles.

6. Give the location of hepatic caeca in a cockroach? What is their function?

Ans. A ring of 6-8 blind tubules called hepatic caeca are present at the junction of foregut and midgut.

Hepatic caeca secrete digestive juice.

7. Frogs are beneficial for mankind, justify the statement.

Ans. Frogs are beneficial for mankind as they can eat some crop pests and protect crop. Frogs maintain ecological balance as they are an important component of food chain and food web in the ecosystem. They are edible in some countries.

8. Common name of some animals are given in Column A, write their scientific name in Column B.

A	B
a. Tiger	<u>Panthera tigris</u>
b. Peacock	<u>Pavo cristatus</u>
c. Housefly	<u>Musca domestica</u>

9. When a freshly collected *Spirogyra* filament is kept in 10% potassium nitrate solution, it is observed that the protoplasm shrinks in size:

- What is this phenomenon called?
- What will happen if the filament is replaced in distilled water?

- Ans.
- This phenomenon is called plasmolysis. (The shrinkage of protoplast from the cell wall under the influence of a strong solution/ hypertonic solution is called plasmolysis.
  - If filaments are replaced in water the protoplast starts swelling. It comes in contact with cell wall and cell regains its original size. The swelling up of plasmolyzed protoplast under the influence of a weak solution or water is called deplasmolysis.

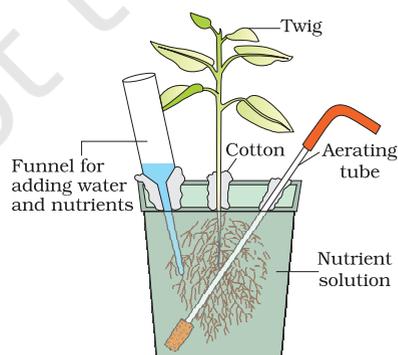
10. How is sulphur important for plants? Name the amino acids in which it is present.

- Ans. Sulphur, besides being present in some amino acids essential for protein synthesis, is also a constituent of several coenzymes, vitamins and ferredoxin which are involved in some biochemical pathway.

11. How are organisms like *Pseudomonas* and *Thiobacillus* of significance in nitrogen cycle?

- Ans. *Pseudomonas* and *Thiobacillus* carry out denitrification process wherein the nitrate present in the soil is reduced to nitrogen thus contributing to the atmospheric nitrogen.

12. Carefully observe the following figure



- a. Name the technique shown in the figure and the scientist who demonstrated this technique for the first time?

Ans. Hydroponics, Julius von Sachs.

- b. Name atleast three plants for which this technique can be employed for their commercial production.

Ans. Tomato, seedless cucumber, lettuce.

- c. What is the significance of aerating tube and feeding funnel in this set-up?

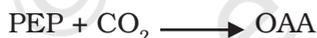
Ans. Aerating tube ensures adequate aeration of the root for optimum growth of the plant. The funnel is used to release water and nutrients into the container with nutrient solution. This solution needs to be replaced every day or two for maximum growth.

13. Which is the most crucial enzyme found in root nodules for  $N_2$  fixation? Does it require a special pink coloured pigment for its functioning? Elaborate?

Ans. Nitrogenase. Yes, it does require the presence of a pink coloured pigment in the nodule called leg-haemoglobin for its functioning. This pigment helps in scavenging oxygen as nitrogenase functions under anaerobic condition.

14. Succulents are known to keep their stomata closed during the day to check transpiration. How do they meet their photosynthetic  $CO_2$  requirements?

Ans. Succulent (water storing) plants such as cacti, euphorbias fix  $CO_2$  into organic compound using PEP carboxylase at night, when the stomata are open.



The organic compound (malic acid) accumulates throughout the night and is decarboxylated during the day to produce  $CO_2$ .

15. Chlorophyll 'a' is the primary pigment for the light reaction. What are accessory pigments? What is their role in photosynthesis?

Ans. Accessory pigments are those pigments, which assist in photosynthesis by capturing energy from light of different wavelengths. e.g., chlorophyll-b, Xanthophylls and carotenoids.

Role in Photosynthesis:

- They absorb wavelength of light not absorbed by chlorophyll 'a' and transfer the energy to chlorophyll.
- They also protect chlorophyll a from photo-oxidation.

16. *Nicotiana tabacum*, a Short Day Plant, when exposed to more than critical period of light fails to flower. Explain.
- Ans.
- Some plants require a periodic exposure to alternate light and dark for its flowering response. This phenomenon is termed photoperiodism.
  - The requirement of light exposure is critical. The SDP plants, when exposed to light period in excess of critical period fail to flower,
  - Those plants which require exposure to light period at critical or more than critical period for its flowering response are called long-day-plant.
  - Nicotiana tabacum*, fails to flower if exposed to more than critical period of light because it is a SDP.
17. What are the structural characteristics of
- Meristematic cells near root tip
  - The cells in the elongation zone of the root
- Ans.
- The meristematic cells near root tip are characterised by:
    - rich protoplasm,
    - large conspicuous nucleus
    - thin and cellulosic cell wall-primary in nature
    - fewer vacuoles
    - greater number of mitochondria
    - numerous (abundant) plasmodesmata
  - The cells in the elongation zone of a root are characterized by
    - increased vacuolation
    - enlarged size/dimension
    - deposition of new cellulosic cell walls.
18. A gardener finds some broad-leaved dicot weeds growing in his lawns. What can be done to get rid of the weeds efficiently?
- Ans. The dicotyledonous plant grow by their apical shoot meristems while grasses (which make lawns) possess intercalary meristem. Certain auxins, such as synthetic 2, 4-Dichlorophenoxyacetic acid (2,4-D) when applied in excess can damage the shoot apical meristems but they do not cause any damage to the intercalary meristems. Thus, when 2, 4-D is sprayed on lawns, only the dicots get killed and the lawns become free of weeds.

19. What is pancreas? Mention the major secretions of pancreas that are helpful in digestion.

Ans. Pancreas is a gland having exocrine and endocrine portions involved in secreting digestive enzymes as well as hormones.

Major secretions of pancreas involved in digestion are inactive enzymes listed below:

- a. Trypsinogen
- b. Chymotrypsinogen
- c. Procarboxypeptidases
- d. Amylases
- e. Lipases
- f. Nucleases

20. Name the part of the alimentary canal where major absorption of digested food takes place. What are the absorbed forms of different kinds of food materials?

Ans. Small intestine is the part of alimentary canal where digested food materials are mainly absorbed.

Amino acids (proteins), monosachharides like glucose, fructose galactose, etc. (carbohydrate) and fatty acids and glycerol (fats) are different absorbable forms of food materials.

21. State the different modes of  $\text{CO}_2$  transport in blood.

Ans. Nearly 20-25% of  $\text{CO}_2$  by RBCs

Nearly 70% of  $\text{CO}_2$  as bicarbonates

Nearly 7% of  $\text{CO}_2$  as dissolved state in plasma.

22. Compared to  $\text{O}_2$ , diffusion rate of  $\text{CO}_2$  through the diffusion membrane per unit difference in partial pressure is much higher. Explain.

Ans. Solubility is an important factor deciding diffusion rate. As the solubility of  $\text{CO}_2$  is 20-25 times higher than  $\text{O}_2$ , diffusion of  $\text{CO}_2$  through the diffusion membrane per unit difference in partial pressure is much higher.

23. Differentiate between Blood and Lymph.

Ans. Blood is a connective tissue consisting of a fluid matrix, plasma and formed elements (RBCs, WBCs & Platelets). Blood flows in blood vascular system comprising heart, arteries and veins.

Lymph is a colourless fluid containing specialized lymphocytes (imparting immunity to the body), but devoid of RBCs. Lymph flows in the lymphatic system and it absorbs fats.

24. Briefly describe the following:

- a. Atherosclerosis
- b. Thrombocytes

Ans. **Atherosclerosis:** Sometimes deposition of calcium, fat, cholesterol and fibrous tissues occurs in the blood vessel (e.g., coronary artery) supplying blood to the heart muscles. This condition makes the lumen of arteries narrower affecting blood supply to heart; which leads to Coronary Artery Disease (CAD) also referred to as atherosclerosis.

**Thrombocytes:** Blood platelets are cell fragments produced from megakaryocytes (they are special cells in the bone marrow) and also referred as thrombocytes. Normal blood contains 1,50,000 - 3,50,000 platelets  $\text{mm}^3$ . Thrombocytes release a variety of substances like thrombokinase, most of which are involved in blood clotting. A significant drop in the count of blood platelets can lead to Clotting disorders which will lead to excessive blood loss from the body.

25. a. What is the major site where RBCs are formed.

Ans. Bone marrow

b. Which part of the heart is responsible for initiating and maintaining the rhythmic activity of the heart.

Ans. Sino-Atrial Node (S.A. Node)

c. Name the reptile which has four chambered heart.

Ans. Crocodile

26. What is the role played by Renin-Angiotensin in the regulation of kidney function?

Ans. Renin is released from JGA on activation due to fall in the glomerular blood pressure/flow. Renin converts angiotensinogen in blood to angiotensin-I and further to angiotensin-II. Angiotensin-II being a powerful vasoconstrictor, increase the glomerular blood pressure and thereby GFR. Angiotensin-II also activates the adrenal cortex to release aldosterone. Aldosterone causes reabsorption of  $\text{Na}^+$  and water from the distal parts of the tubule. This also leads to an increase in blood pressure and thereby GFR. This is generally known as the Renin - Angiotensin mechanism.

27. The following parts in our body have specific name in Osteology, write against each.

Ans.

- |                  |          |
|------------------|----------|
| a. Knee cap -    | patella  |
| b. Collar bone - | clavicle |
| c. Skull -       | cranium  |

28. Write a few lines about Gout.

Ans. When metabolic waste-uric acid crystals are accumulated in bones, then it results into inflammation of bone and joints thereby causing pain. This disorder of skeletal system is called gout.

29. What are the point for articulation of pelvic and pectoral girdles?

Ans. The components of pelvic girdle are ilium, ischium and pubis. It articulates with femur through acetabulum.

The component of pectoral girdle are scapula and clavicle. It is the glenoid cavity of pectoral girdle in which head of humerus articulates.

30. What is the role-played by lutenizing hormones in males and females respectively?

Ans. LH stimulates the synthesis and secretion of androgens called male hormones. In females, LH is essential for ovulation.

In females, LH induces ovulation of fully mature follicles (graafian follicles) and maintains the corpus luteum formed from the remnants of the graafian follicles after ovulation.

31. What is the role of second messenger in hormone action?

Ans. Hormones which do not enter the target cell, interact with specific receptors located on the surface of the target cell membranes and generates second messengers (e.g., CAMP) on the inner side of plasma membrane. The second messenger, in turn, carries out all the hormonal functions.

32. Old people have weak immune system. What could be the reason?

Ans. Thymus is degenerated in old individual resulting in a decreased production of thymosins. As a result the immune responses of old persons become weak.

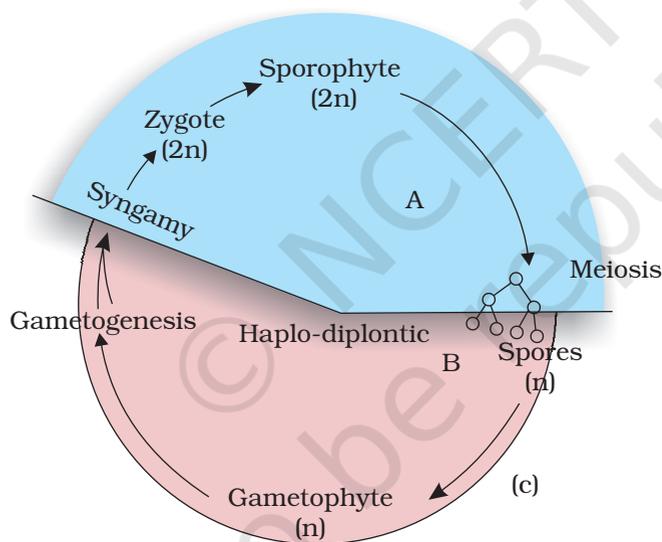
## ANSWERS TO LA TYPE QUESTIONS

1. With the help of a schematic diagram describe the haplo-diptontic life cycle pattern in plants.

Ans. In a sexually reproducing plant there is an alternation of generation between a haploid and a diploid phase of plant bodies. The haploid plant body is termed gametophyte while the diploid plant body is called sporophyte. The gametophyte produces gametes by mitosis while the haploid spores are produced by sporophyte following meiosis (reduction

division). Two gamete fuse together to produce a zygote which develops into the diploid sporophyte.

In a haplodiplontic life cycle pattern, such as in bryophyta or pteridophyta both the phases of life are multicellular. However, in bryophytes, the gametophytes are small, photosynthetic, independent and represent dominant phase. The partly or totally dependent, sporophyte is physically attached to the gametophyte. The (n) spores dispersed by sporophyte germinate into individual gametophytic plants. However, in pteridophytes the 2n (diploid) phase is dominant, well organized, independent while the n phase though also freeliving and independent is short lived and photosynthetic. In both of these groups of plants the mobile male gametes, antherozoid produced by sex organ antheridium, travel to archegonium (bearing an egg cell) via the medium of water. Egg cell is non motile hence the reproduction is oogamous.



Diagram

2. Lichen is usually cited as an example of 'symbiosis' in plants where an algal and a fungal species live together for their mutual benefit. What will happen if algal and fungal partners are separated from each other?
- Both will survive and grow normally and independent from each other.
  - Both will die
  - Algal component will survive while the fungal component will die.
  - Fungal component will survive while algal partner will die.

Based on your answer how do you justify this association as symbiosis.

Ans. Lichen is usually cited as an example of symbiosis in biology where in a fungal and an algal species live together for mutual benefit. The algal component synthesizes the food through photosynthesis which is utilized by the fungal species for its survival. The fungal component in return provides shelter and waste products that are consumed by algal species.

Experiments though have shown that algal component can grow independently when separated from fungal species. But same is not true with the fungal component which dies when separated from algal component. This association is, therefore, a typical case of master-slave relationship where fungus (master) has trapped the algal components (slave) for its own survival while giving nothing in return to it. Some authors consider this association as controlled parasitism or helotism due to the fact that sometimes the fungus sends its haustoria into the algal cells to derive nourishment.

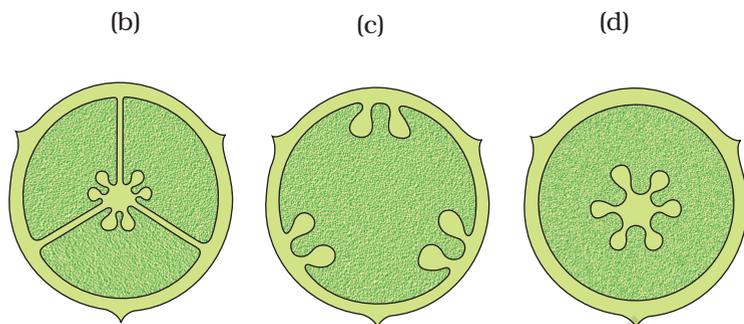
3. Distinguish between families fabaceae, solanaceae, liliaceae on the basis of gynoecium characteristics. Also write economic importance of any one of the above family.

Ans.

- a. Gynoecium
  - i. Fabaceae - Monocarpellary, ovary unilocular, marginal placentation
  - ii. Solanaceae - Bicarpellary syncarpous, carpels placed obliquely, bilocular, *axile* placentation
  - iii. Liliaceae - Tricarpellary, syncarpous, ovary superior, axile placentation
- b. Economic importance of fabaceae.
  - i. Source of pulses (gram, arhar)
  - ii. Edible oil (soyabean, groundnut)
  - iii. dye (*indigofera*)
  - iv. fibres (sunhemp)
  - v. fodder (Sesbania, Trifolium)
  - vi. ornamental (lupin)
  - vii. Medicine (mulaithi)

4. The arrangement of ovules within the ovary is known as placentation. What does the term placenta refer to? Name the different types of placentation seen in plants. Draw any three types of placentation in flowers as seen in T.S.

Ans. The ovules are female reproductive structures and borne in the ovary of the flower. The number, structure, their position in the ovary varies in different plants. They also differ in mode of attachment with the ovary wall. At the point of attachment there is a cellular ridge or cushion of cells called placenta. The mode of attachment of ovule to the placenta is known as placentation which is of the following types: (a) Parietal (b) Marginal (c) Axile (d) Free central (e) Basal.



Axile Placentation    Parietal placentation    Free central placentation

5. Explain the digestive system of cockroach with the help of a labelled sketch.

Ans. The digestive system consists of alimentary canal and digestive glands. The alimentary canal of cockroach is divided into foregut, midgut and hindgut. The mouth opens into a short tubular pharynx, leading to a narrow tubular passage, the oesophagus, which opens into a sac like crop used for storing food. The crop is followed by a gizzard or proventriculus. Gizzard consists of six - chitinous plates called teeth which helps in grinding food. The entire foregut is lined by cuticle. A ring of six - eight blind tubular structures called hepatic or gastric caecae is present at the junction of foregut and midgut which secrete digestive juice. At the junction of midgut and hindgut is present another ring of yellow colored thin filamentous malpighian tubules which help in removal of excretory products from haemolymph. The hindgut is broader than midgut and is differentiated into ileum, colon and rectum. The rectum opens out through anus.

6. It is observed that deficiency of a particular element showed its symptoms initially in older leaves and then in younger leaves.

- a. Does it indicate that the element is actively mobilized or relatively immobile? Name two elements which are highly mobile and two which are relatively immobile.

Ans. It is actively mobilized. Highly mobile- nitrogen, magnesium  
Relatively immobile- calcium, boron

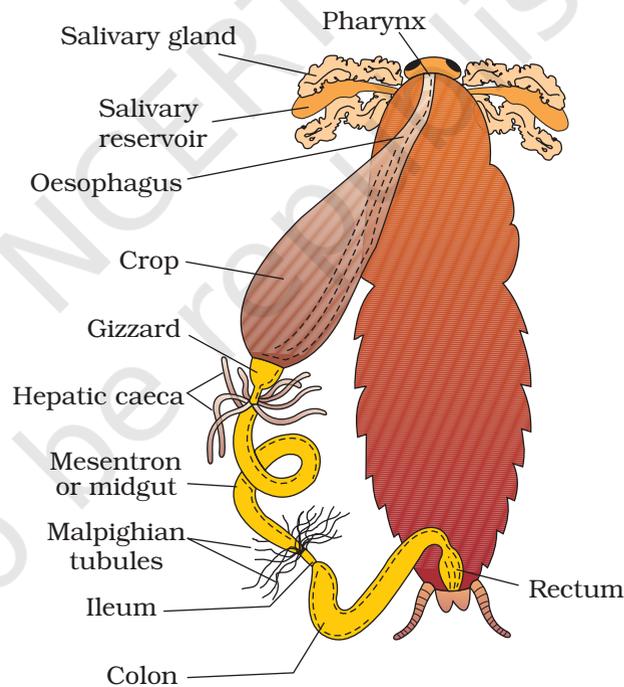
- b. How is the aspect of mobility of elements important to horticulture and agriculture?

Ans. Symptoms of deficiency of mobile elements are more pronounced in older leaves and symptoms of deficiency of relatively immobile element appear first in younger leaves. This information can be utilised by horticulturist and agriculturist to get a broad idea of the deficiency elements in plants.

7. Explain the mechanism of breathing with neat labelled sketches

Ans. Breathing involves two stages.

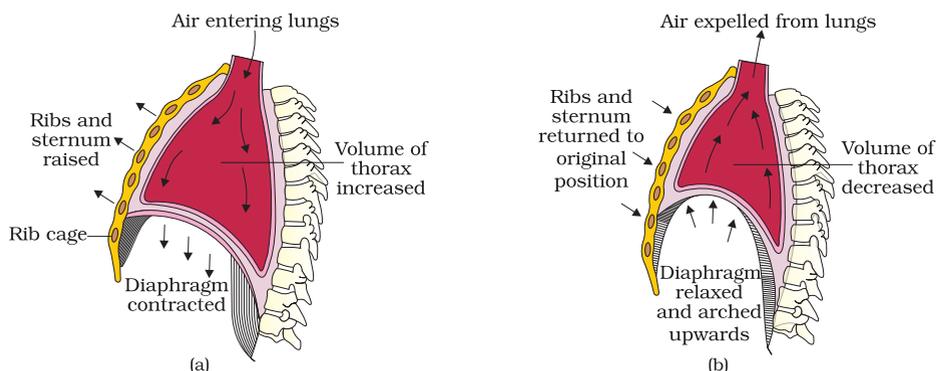
- a. **Inspiration:** Inspiration is initiated by the contraction of diaphragm, which increases the volume of thoracic chamber in the anterioposterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of thoracic chamber in the dorso-ventral axis also. Such



an increase in thoracic volume leads to a similar increase in pulmonary volume resulting in decreased intra-pulmonary pressure to less than atmospheric pressure. This causes the movement of external air into the lungs. i.e., inspiration.

- b. **Expiration:** The inter-costal muscles return the diaphragm and sternum to their normal positions with relaxation of the diaphragm. This reduces the thoracic volume and thereby the pulmonary

volume. As a result an increase in intra-pulmonary pressure to slightly above the atmospheric pressure causes the expulsion of air from the lungs i.e., expiration.



8. Explain different types of blood groups and donor compatibility by making a table.

Ans. ABO blood grouping is based on the presence or absence of two surface antigens on the RBCs namely A and B. Similarly, the plasma of different individuals contain two natural antibodies anti-A and anti-B. Blood group 'A' carries antigen-A and antibodies-B. The donor's group for blood group A are A and O. Blood group B carries antigen-B and antibodies-A. The donor's group for blood group B are B and O. Blood group AB carries antigens A and B but no corresponding antibodies so, the compatible donor's group for blood group AB are A, B, AB and O hence, blood group 'AB' is also called as "universal acceptor". Blood group 'O' carries no antigens but carries antibodies both A and B hence its compatible donor's group is only 'O' but it is a compatible donor group for all the blood groups. A, B, AB and O hence, blood group 'O' is called as 'universal donor'.

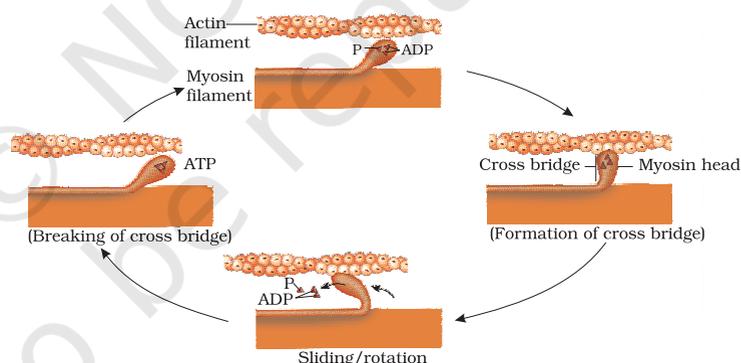
**Blood groups and donor compatibility**

Blood Group	Antigen on RBCs	Antibodies in Plasma	Donor's Compatibility
A	A	Anti-B	A, O
B	B	Anti-A	B, O
AB	A . B	Nil	AB, A, B, O
O	Nil	Anti - A, B	O

9. Discuss the role of Ca<sup>2+</sup> ions in muscle contraction. Draw neat sketches to illustrate your answer.

Ans. Muscle contraction is initiated by a neural signal, which after reaching neuromuscular junction or motor end plate releases a neurotransmitter, as a result an action potential in the sarcolemma is generated. Action potential spreads through muscle fibre and causes the release of calcium ions into the sarcoplasm. Increase in  $\text{Ca}^{2+}$  level leads to the binding of calcium with a subunit of troponin on actin filaments and thereby removes the masking of active sites for myosin. Utilising the energy from ATP hydrolysis, the myosin head now binds to the exposed active site on actin to form a cross-bridge. This pulls the attached actin filaments towards the centre of 'A' band. The 'Z' line attached to these actins are also pulled inwards thereby causing shortening of the sarcomere, i.e., contraction.

A new ATP binds to myosin head and the cross-bridge is broken. The ATP is again hydrolysed by the myosin head and the cycle of cross-bridge formation and breakage is repeated causing further sliding. The process continues till the  $\text{Ca}^{++}$  ions are pumped back to the sarcoplasmic cisternae resulting in masking of actin filaments and breakage of all cross bridges. This cause the return of 'Z' lines along with filaments back to their original position, i.e., relaxation.



11. Differentiate between pectoral and pelvic girdle.

Ans. Pectoral and pelvic girdle help in the articulation of upper and lower limbs respectively. Each girdle is made of two equal halves.

Each half of a pectoral girdle consists of clavicle and scapula. Scapula is a large triangular flat bone. There is glenoid cavity at the joint of scapula, clavicle and acromian process, which articulates with the head of humerus to form the shoulder joint.

Each half of pelvic girdle is formed by three bones-iliac, ischium and pubis. At the point of their fusion; there is a cavity called acetabulum to which the head of femur articulates.

12. On an educational trip to Uttaranchal, Ketki and her friends observe that people in many localities have swollen necks. Please help Ketki and her friends to find out the solution to the following questions:

a. Which disease are these people suffering from?

Ans. People with swollen necks are suffering from goitre.

b. How is it caused?

Ans. It is caused due to the deficiency of Iodine in our diet. Iodine is essential for the normal rate of hormone synthesis in the thyroid.

c. Which hormones could be decreased by this condition?

Ans. Tetraiodothyronine or thyroxine (T4) and triiodothyronine (T3)

d. What effect does this condition have on pregnancy?

Ans. Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to - i) stunted growth, ii) mental retardation, iii) low I Q, iv) abnormal skin and v) deaf-mutism.