TEACHER'S HANDBOOK

STELLAR LEARNING

Biology

10

On Board! BOOKS

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Life Processes

Checkpoint (Page 6)

1. What do you understand by photosynthesis?

Ans. Photosynthesis is the process by which green plants make their own food in the presence of sunlight. Green plants take in carbon dioxide from air and water from soil and convert it into carbohydrate and releases oxygen in the presence of sunlight and chlorophyll.

2. Define vascular bundle.

Ans. Vascular bundles are the conducting tissues in vascular plants. It is composed of xylem and phloem.

3. Name the living components of xylem and phloem.

Ans. The living component of xylem is xylem parenchyma while that of phloem are sieve tube, companion cell and phloem parenchyma.

4. What are the main functions of the connective tissue?

Ans. The main functions of connective tissue are binding, supporting and packing different organs of the body together.

5. Name the different types of blood cells in humans.

Ans. The different types of blood cells in humans are red blood cells (RBCs), white blood cells (WBCs) and platelets.

6. Name three different ways of exchange of gases in animals.

Ans. The exchange of gases in animals takes place by the process of diffusion. There are many ways by which animals exchange gases. Animals like earthworm exchange gases through skin, aquatic animals like fish through gills and mammals through lungs.

7. How do plants carry out excretion?

Ans. Plants remove their waste products by different methods.

(i) The main waste products produced by plants are carbon dioxide (during respiration) and oxygen (by photosynthesis). During day time, carbon dioxide is reused by plants to make food by the process of photosynthesis. The oxygen produced in the process is removed by plants through stomata. The plants also get rid of carbon dioxide through stomata at night.

(ii) Some plants store some of their waste products in the body part, like fruits, bark and leaves in a way that they do not harm the plant as a whole. The plant get rid of these wastes by the shedding of leaves, peeling of bark and felling of fruits.

(iii) Some plants remove their waste products as secretions. For example, the plants secrete a number of waste products like gum, resin and latex. These plant wastes are useful to human beings.

8. What is the structural unit of human kidney?

Ans. The nephron is the structural and functional unit of human kidney.

(I) Nutrition

Check Your Progress 1

(Page 11)

Multiple-Choice Questions

1. The process in which water is split during photosynthesis is

(a) plasmolysis. (b) photolysis.
(c) hydrolysis. (d) glycolysis.

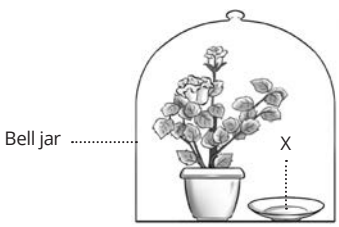
Ans. (b) photolysis.

2. The process of obtaining food by *Amoeba* is known as

(a) dialysis. (b) cytokinesis.
(c) phagocytosis. (d) amoebiasis.

Ans. (c) phagocytosis.

3. Observe the experimental setup shown below. Name the chemical indicated as 'X' that can absorb the gas which is evolved as a byproduct of respiration.



(a) NaOH (b) KOH
(c) $Ca(OH)_2$ (d) K_2CO_3

Ans. (b) KOH

4. An organism which breaks down the food material outside the body and then absorbs it is

(a) a plant parasite, *Cuscuta*
(b) an animal parasite, Tapeworm
(c) a bacterium, *Rhizobium*
(d) a fungus, *Rhizopus* **(CBSE 2023)**

Ans. (d) a fungus, Rhizopus

Very Short Answer Type Questions

5. Which raw material is responsible for release of oxygen in photosynthesis? What do you mean by photolysis of water?

Ans. Water.

Photolysis is the splitting of water molecules into hydrogen and oxygen by the energy absorbed from sun during photosynthesis.

6. What happens to extra glucose or carbohydrate in an animal body?

Ans. Extra glucose is stored in the form of glycogen in animal body.

7. State the function of chlorophyll during photosynthesis.

Ans. Chlorophyll absorbs sunlight for the process of photosynthesis.

8. Some organisms derive nutrition from plants or animals without killing them. What are these organisms called? Write one example.

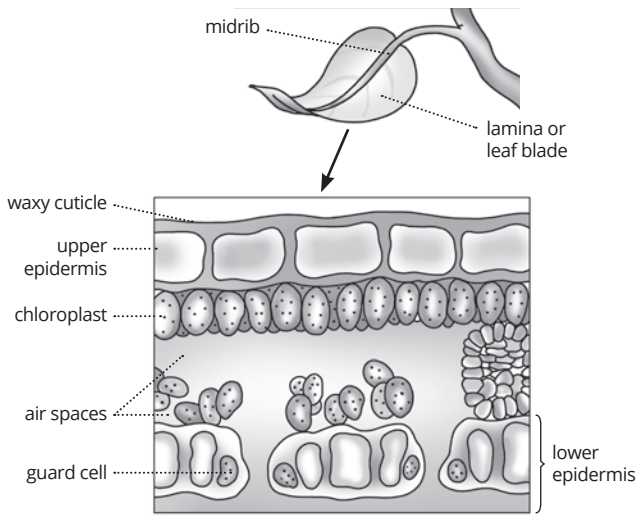
Ans. Parasites. *Cuscuta*.

9. Stomata of desert plants remain closed during the day. Explain how and when they take up carbon dioxide to perform photosynthesis.

Ans. Stomata of desert plants remain closed during the day to minimize the water loss. Therefore, carbon dioxide is taken up by the desert plants at night and stored as an intermediate product which is acted upon by the light energy absorbed by the chlorophyll during the day.

10. Draw a labelled diagram of cross-section of a leaf. **(CBSE 2016)**

Ans.



Cross section of a leaf

11. What is the mode of nutrition in fungi? How does holozoic nutrition differ from saprophytic nutrition?

Ans. Nutrition in fungi is saprophytic.

Differences between holozoic and saprophytic nutrition:

Holozoic nutrition	Saprophytic nutrition
(i) It is the mode of nutrition which involves ingestion of food particles which is then digested inside the body.	It is the mode of nutrition in which organisms obtain nutrients from dead and decaying organic matter by extracellular digestion.

(ii) This type of nutrition takes place in five steps: ingestion, digestion, absorption, assimilation and egestion	This type of nutrition takes place by absorption of break-down products.
(iii) Examples: *Amoeba*, Human beings	Examples: Fungi and some bacteria

12. What is the significance of photosynthesis?

Ans. The process of photosynthesis occurs in green plants which are the primary producers in a food chain. It provides food for all. It fixes atmospheric carbon dioxide (produced by respiration and other activities) and releases oxygen in the atmosphere. Thus, it is the ultimate source of oxygen and energy for all living organisms.

Short Answer Type Questions

13. (a) What will happen if green plants disappear from the earth?

(b) Two similar green plants are kept separately in oxygen free containers, one in dark and the other in continuous light. Which one will live longer? Give reasons.

Ans. (a) Green plants are the source of food and oxygen for all organisms on earth. If all green plants disappeared from earth, life would not be possible on earth in the absence of food and oxygen.

(b) The plant kept in dark would be unable to carry out photosynthesis; hence, oxygen will not be produced. It would kill the plant. The plant kept in light would be able to carry out photosynthesis and hence produce oxygen. Therefore, this plant would live for a longer duration.

14. Describe an experiment to show that sunlight is essential for photosynthesis.

Ans. To show that light is necessary for photosynthesis.

Procedure

Take a potted plant and destarch its leaves by keeping it in dark for 2–3 days.

Take a black paper and cut simple 'L' shape in it making a stencil. Cover a leaf with the paper. Leave the set-up in daylight for 4–6 hours.

Detach the leaf and test it for presence of starch.

Observation

You will observe that only the part of the leaf that could get light through the cut out design and the other exposed parts of the leaf turn blue-black showing the presence of starch in them.

Conclusion

This shows that light is necessary for photosynthesis.

15. (a) Photosynthesis converts energy X into energy Y. What are X and Y?

(b) Leaves of a healthy potted plant were coated with vaseline. Will the plant remain healthy for long? Give reasons for your answer.

Ans. (a) X is light energy and Y is chemical energy.

(b) Coating the leaves of a healthy potted plant with vaseline will block the stomata of the leaves. The plant will not get carbon dioxide for photosynthesis and oxygen for respiration. Plant will not be able to carry out transpiration as well. In addition, vaseline layer will prevent the plant from receiving sunlight. Hence, it will not remain healthy for long and ultimately will die.

16. In the context of the statement "chlorophyll is necessary for photosynthesis" answer the following questions.

(a) What are variegated leaves? Give an example.

(b) When leaf is boiled in alcohol, what happens to the colour of the leaf and the colour of the solution?

(c) In what form is the carbohydrate produced, stored in the plant? Why is chlorophyll necessary for photosynthesis? **(CBSE 2024)**

Ans. (a) Variegated leaves have chlorophyll only in patches. For example, *Tradescantia.*

(b) When leaf is boiled in alcohol it turns colourless. Chlorophyll is extracted from the leaf by boiling alcohol. The alcohol becomes greenish.

(c) By photosynthesis carbohydrate is produced in the form of glucose, which is then stored in the plant in the form of starch.

Chlorophyll is the photosynthetic pigment that captures light energy from sunlight which is the first step in photosynthesis.

Long Answer Type Questions

17. Draw a labelled diagram of a stoma. Explain the role of stomata in the process of photosynthesis.

Ans. Plants obtain carbon dioxide for photosynthesis through tiny pores called stomata. Each stoma is surrounded by a pair of guard cells. The guard cells control the opening and closing of stomatal pores. When water enters into the guard cells, they become turgid and swell. As a result, they become curved and stomatal pores open. When the guard cells lose water, they shrink and become flaccid. As a result, the stomatal pores close.

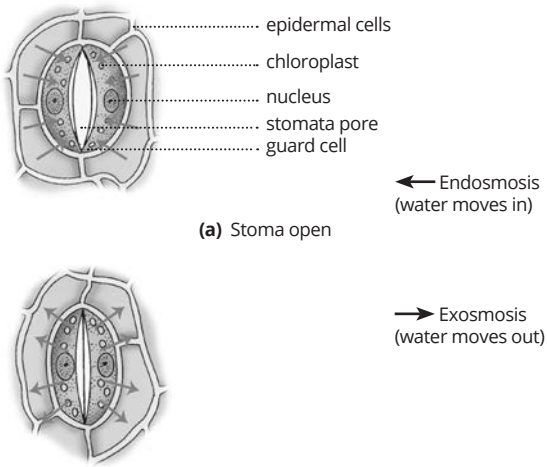


Diagram of a Stoma

18. Describe an activity to show the necessity of chlorophyll for photosynthesis in plants.

Ans. To show that chlorophyll is necessary for photosynthesis

Procedure

Take a plant with variegated leaves which has chlorophyll only in patches. Such leaves can be found in plants like *Coleus*, *Tradescantia* and *Croton*.

Destarch its leaves by placing the plant in dark for 2–3 days.

Place the plant again in day light for about 4–6 hours. Test a leaf for the presence of starch.

Observation

Only the parts which were green previously, turn blue-black with iodine.

Conclusion

This shows that chlorophyll is necessary for photosynthesis.

Check Your Progress 2

(Page 16)

Multiple-Choice Questions

1. The pancreas pours its secretions into the
- (a) oesophagus.
- (b) stomach.
- (c) large intestine.
- (d) duodenum.

Ans. (d) duodenum.

2. Excess glucose is stored in the form of glycogen in the
- (a) villi.
- (b) lymph.
- (c) blood.
- (d) liver.

Ans. (d) liver.

3. Which of the following enzymes is not present in the pancreatic juice?
- (a) Trypsin
- (b) Ptyalin
- (c) Amylase
- (d) Lipase

Ans. (b) Ptyalin

4. Consider the following statements about small intestine and select the one which is NOT correct:
- (a) The length of the small intestine in animals differs as it depends on the type of food they eat.
- (b) The small intestine is the site of complete digestion of food.
- (c) The small intestine receives secretions from liver and pancreas.
- (d) The villi of the small intestine absorbs water from the unabsorbed food before it gets removed from the body via the anus.

(CBSE 2023)

Ans. (d) Villi absorb digested food in soluble form in the small intestine.

Very Short Answer Type Questions

5. Name the following.
- (a) Digestive enzyme present in the saliva of human beings.
- (b) Ring of muscles that controls the release of food from the stomach into the small intestine.
- (c) The inactive form of pepsin.
- (d) The part of the alimentary canal where digestion and absorption of food occurs.

Ans. (a) salivary amylase
- (b) pyrolic sphincter
- (c) pepsinogen
- (d) small intestine

6. Which type of medium is required for the proper functioning of intestinal juice? Why?

Ans. Alkaline medium is required for the proper functioning of intestinal juice. It is essential for the action of pancreatic enzyme.

7. Name one enzyme which digests proteins. In which part of the alimentary canal do the pancreas and liver pour their secretions?

Ans. Pepsin.

Pancreas and liver pour their secretions into duodenum.

8. Name the enzymes found in the pancreatic juice.

Ans. Trypsin, chymotrypsin, amylase and lipase are present in the pancreatic juice.

9. How is the required pH maintained in the stomach and small intestine?

Ans. Gastric gland present on the walls of stomach releases hydrochloric acid which maintains an acidic medium in the stomach.

Alkaline pH of small intestine is maintained by bile juice secreted by liver.

10. What is the role of pepsin and lipase in digestion of food?

Ans. Pepsin enzyme acts on proteins present in the food. It breaks down proteins into peptones.

Lipase acts on emulsified fats and converts them to fatty acids and glycerol.

11. What are the major end products of digestion of proteins, carbohydrates and fats?

Ans. The major end products of digestion are amino acids for proteins, glucose for carbohydrates, and fatty acids and glycerol for fats.

Short Answer Type Questions

12. (a) Mention the role of HCl in stomach.

(b) What function is served by the following?

(i) Gastric sphincter

(ii) Anal sphincter

Ans. (a) Hydrochloric acid is secreted by gastric glands in the stomach. Its role in stomach is to:

(i) provide an acidic medium which is essential for the activity of gastric enzyme, pepsin. It converts inactive pepsinogen to active pepsin enzyme.

(ii) kill the bacteria which might have come along with the food.

(b) (i) Gastric sphincter controls the release of food from stomach to small intestine.

(ii) Anal sphincter regulates the release of undigested food from rectum to outside through the anus.

13. What substances are present in the pancreatic juice? What are their functions?

Ans. Pancreatic juice is produced by pancreas. The pancreatic ducts open in the duodenum part of small intestine and pour their secretion there. The enzymes present in the pancreatic juice are trypsin, pancreatic amylase and lipase.

Trypsin: It acts on proteins and converts them into polypeptides.

Amylase: It acts on starch and complex sugars and converts them to maltose.

Lipase: It acts on emulsified fats and converts them to fatty acids and glycerol.

14. Differentiate between large intestine and small intestine.

Ans.

Small intestine	Large Intestine
(i) The small intestine is highly coiled tube, about 7.5 m in length.	The large intestine is wider than the small intestine but is shorter in length, about 1.5 m long.
(ii) The different parts of the small intestine are: duodenum, jejunum and ileum.	The different parts of long intestine are: caecum, colon and rectum.
(iii) It receives secretions from liver and pancreas and its wall also secretes digestive juices for complete digestion of food.	No digestion of food takes place in large intestine.
(iv) Villi are present on the inner wall of small intestine for absorption of digested food.	Villi are absent. It is the site for absorption of water and electrolytes.

15. (a) What will happen if mucus is not secreted by the gastric glands?

(b) How would digestion of food be affected if the bile duct is completely blocked?

(c) Name the organ which performs the following functions in humans.

(i) Absorption of digested food

(ii) Absorption of water

Ans. (a) If mucus is not secreted by the gastric glands, hydrochloric acid secreted by the gland will corrode the walls of the stomach.

(b) If the bile duct is completely blocked, bile juice will not be delivered to the small intestine, hence, emulsification of fat will not occur which will largely affect the digestion of fat. In addition, the acidic food coming from stomach will not turn alkaline due to lack of bile salts. Thus pancreatic enzymes will not work efficiently in acidic medium.

(c) (i) Small intestine

(ii) Large intestine

Long Answer Type Questions

16. Name the digestive glands associated with the alimentary canal in humans. Give the name of secretion of these glands along with their functions.

Ans. The digestive glands associated with the alimentary canal in humans are salivary glands, gastric glands, pancreas, liver and intestinal glands.

(i) Salivary gland secretes saliva. Saliva contains water, salt, mucus and enzyme called salivary amylase (also known as ptyalin) and lysozyme. Lysozyme is an anti-bacterial agent which kills bacteria present in the food. The salivary amylase present in saliva begins the digestion of carbohydrates in the mouth by breaking down some starch into maltose. Saliva moistens food particles and helps in their swallowing.

(ii) Gastric glands present in the walls of stomach produce hydrochloric acid, mucus and pepsin enzyme. Hydrochloric acid makes the food acidic and pepsin digests protein. It also kills the bacteria which might have come along with the food. Mucus protects the stomach lining from the action of hydrochloric acid.

(iii) Pancreatic juice is produced by pancreas. The enzymes present in the pancreatic juice are trypsin, pancreatic amylase and lipase. Trypsin acts on proteins and converts them into polypeptides. Amylase acts on starch and complex sugars and converts them to maltose. Lipase acts on emulsified fats and converts them to fatty acids and glycerol.

(iv) Liver is the largest gland in the human body. The digestive functions of liver include secretion of bile juice which emulsifies fats and creates an alkaline medium which is essential for the action of pancreatic enzyme.

(v) The small intestine secretes intestinal juice which contains a mixture of several enzymes. The action of these enzymes causes proteins to convert into amino acids, carbohydrates into glucose and fats into fatty acids and glycerol.

17. Draw a labelled diagram of human digestive system and label the following parts.

(a) Part in which starch digestion is initiated.

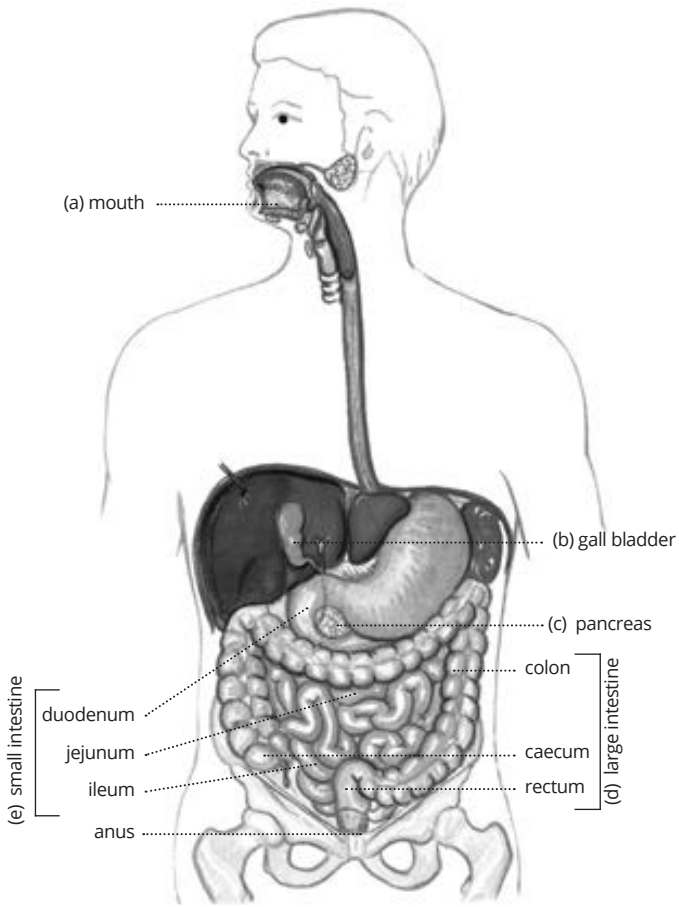
(b) Organ in which bile is stored.

(c) The gland that secretes digestive enzymes and hormones.

(d) Part of alimentary canal where water is reabsorbed.

(e) Part of gut where finger-like projections are present to facilitate absorption of digested food. **(CBSE 2016)**

Ans.



Digestive system and associated digestive glands in humans

Higher Order Thinking Skills (HOTS) Questions

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1. Plants generally store carbohydrates in the form of starch but not in the form of glucose or sucrose. Give one reason in support of such storage.

Ans. Starch is a large polymer which is insoluble in water and it does not affect the osmotic concentration of the cell. Glucose and sucrose are readily soluble in water and hence affect the osmotic concentration of the cell. Therefore, plants store carbohydrates in the form of starch.

2. Explain why desert plants take up carbon dioxide at night and utilize it during the day in the synthesis of carbohydrates.

Ans. Desert plants close their stomata during day time and open at night to prevent loss of water by transpiration. So they take up carbon dioxide at night through open stomata and convert it into an intermediate compound which is acted upon by the light energy absorbed by chlorophyll during the day time.

3. Lipase solution was added to milk. After 30 minutes, the milk became more acidic. Give reasons.

Ans. Lipases are enzymes which splits fats into fatty acid and glycerol. Therefore, when lipase solution is added to milk, it breaks down fats in the milk to fatty acids making the milk acidic.

4. Food does not pass through the digestive system by 'gravity'. This is clear from the fact that we can digest the food even if we are lying down. Explain the logic behind the passage of food through our digestive system.

Ans. The lining of alimentary canal has muscles that contract rhythmically so that the food can be pushed down easily. This action is known as peristalsis. The movement of muscles help the passage of food through the gut.

5. The stomach of a patient had to be removed on medical grounds. What special diet would you recommend him and why?

Ans. Absence of stomach causes digestion problem in the patient therefore, a light diet is recommended. The food will move too quickly into the small intestine in the absence of stomach, therefore, the patient should take small meals throughout the day.

6. It is not necessary to produce amylase in an inactive form in our body. But it is so in the case of trypsin. Give reasons.

Ans. Trypsin is a protein digesting enzyme so if it is present in active form, it will start digesting the proteins present in the body walls and glands. So it has to be secreted in inactive form. On the other hand, amylase acts on starch which is not a constituent of tissue lining of gut or glands. So it is not necessary to produce amylase in inactive form in our body.

Self-Assessment

(Page 18)

Multiple-Choice Questions

1. Which of the following enzymes get mixed with food in our mouth?

(a) Trypsin (b) Cellulose
(c) Pepsin (d) Amylase

Ans. (d) Amylase

2. During photosynthesis, oxygen is evolved from

(a) CO_2. (b) water.
(c) glucose. (d) chlorophyll.

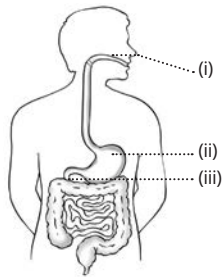
Ans. (b) water.

3. The food in autotrophs is reserved in the form of

(a) proteins. (b) fatty acids.
(c) glycogen. (d) starch.

Ans. (d) starch.

4. Identify the option that indicates the correct enzyme that is secreted in location (i), (ii) and (iii).



(a) (i)-lipase, (ii)-trypsin, (iii)-pepsin
(b) (i)-amylase, (ii)-pepsin, (iii)-trypsin
(c) (i)-trypsin, (ii)-amylase, (iii)-carboxylase
(d) (i)-permease, (ii)-carboxylase, (iii)-oxidase

Ans. (b) (i)-amylase, (ii)-pepsin, (iii)-trypsin

5. The pancreas pours its secretion into

(a) oesophagus. (b) stomach.
(c) large intestine. (d) duodenum.

Ans. (d) duodenum.

6. Generally, food is broken and absorbed within the body of organisms. In which of the following organisms is it done outside the body?

(a) *Amoeba* (b) Mushroom
(c) *Paramoecium* (d) Lice **(CBSE SP 2024)**

Ans. (b) Mushroom

7. A stoma closes when

(i) it needs carbon dioxide for photosynthesis.
(ii) it does not need carbon dioxide for photosynthesis.
(iii) water flows out of the guard cells.
(iv) water flows into the guard cells.

The correct reason(s) in this process is/are

(a) (i) only (b) (i) and (iii)
(c) (ii) and (iii) (d) (ii) and (iv) **(CBSE 2024)**

Ans. (c) (i) and (iii)

Assertion–Reason Type Questions

For question numbers 8 to 14, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct

explanation of the assertion.

(b) Both A and R are true but R is not the correct explanation of the assertion.

(c) A is true but R is false.

(d) A is false but R is true.

8. **Assertion:** During photosynthesis, solar energy gets converted into biochemical energy.
Reason: The pigment present in the chloroplast is known as leucoplast.

Ans. (c)

9. **Assertion:** Living organisms constantly require food for their survival.
Reason: Food serves as the source of energy required to maintain life.

Ans. (a)

10. **Assertion:** Plants store their sugars in the form of starch.
Reason: Animals store their sugars in the form of glycogen.

Ans. (b)

11. **Assertion:** Small intestine does not have any protection against the partially digested acidic food.
Reason: The acidic food is neutralized by the bile before it enters the small intestine.

Ans. (a)

12. **Assertion:** The three pairs of salivary glands in the mouth secrete saliva.
Reason: Human digestion begins in the stomach.

Ans. (c)

13. **Assertion:** *Cuscuta* is a saprophytic plant.
Reason: Heterotrophic organisms derive their food from other sources.

Ans. (d)

14. **Assertion:** All green plants are photoautotrophic.
Reason: Green plants purify air by releasing oxygen in the air.

Ans. (b)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

15. Despite the benefits of healthy eating, most adults do not regularly engage in such behaviours due to their busy lifestyle. Rahul, a young professional as an example has a high pressure job with no proper timings for his meals. Skipping lunch and exercise is a part of his daily routine due to hectic life. He is fond of spicy and fried junk food and consume burger and pizza very often. Of late he has been complaining of acidity for which his doctor has prescribed antacids.

I. (a) What is meant by acidity?

(b) Do you think taking antacids is the only solution?

(c) (i) Suggest any dietary or lifestyle change which will help him get rid of the problem.

OR

(ii) Name the components of gastric juice.

Ans. (a) Acidity can be defined as the condition in which acid produced by our stomach moves up into the oesophagus causing discomfort and burning sensation in chest.

(b) No, there are home remedies for the treatment of acidity.

(c) (i) Dietary or lifestyle changes to avoid acidity includes –

(a) eating smaller and frequent meals

(b) avoiding lying down for few hours after a meal

OR

(ii) Gastric juice consists of water, HCl, enzymes, electrolytes and mucus.

II. (a) Which of the following is meant by acidity in digestive system?

(i) Increased amount of acid in small intestine

(ii) Decreased amount of acid in stomach

(iii) Increased amount of acid in stomach

(iv) Decreased amount of acid in small intestine

Ans. (iii) Increased amount of acid in stomach

(b) Antacids are administered for acidity. Antacids mainly contain

(i) calcium carbonate.

(ii) magnesium hydroxide.

(iii) aluminum hydroxide.

(iv) all of these.

Ans. (iv) all of these.

(c) Which of the following one should avoid to get rid of acidity problem?

(i) Vegetables

(ii) Carbonated beverages

(iii) Ginger

(iv) Non-citrus fruits

Ans. (ii) Carbonated beverages

(d) What are the components of gastric juice?

(i) Pepsin, HCl, lipase

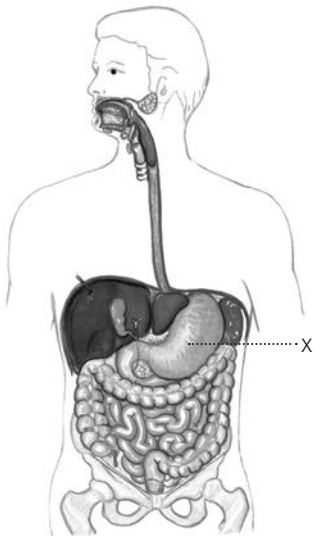
(ii) Amylase, lipase, HCl

(iii) Pepsin, amylase, HCl

(iv) Only pepsin

Ans. (i) Pepsin, HCl, lipase

(e) The organ 'X', as shown in the given figure, contains acid. This acid has certain functions. Select the incorrect one from the following.



(i) It kills bacteria entering through food.

(ii) During acidity, backflow of acid may occur in oesophagus and cause heartburn.

(iii) It maintains the environment of 'X' at pH 2.5–5.5.

(iv) It activates pepsinogen.

Ans. (iii) It maintains the environment of 'X' at pH 2.5–5.5.

16. The gall bladder is a small sac-like organ located on the underside of the liver and is a part of biliary system. Rajeev's grandmother had stones in her gall bladder because of which it had to be removed. After the surgery, she has been put on a very simple diet including steamed food which consists of low fat.

I. (a) Where is bile produced?

(b) Mention any two functions of bile.

(c) (i) What is emulsification?

OR

(ii) Why bile is not considered as true digestive juice?

Ans. (a) Bile is produced in the Liver.

(b) Bile juice plays an important role in emulsification of fats and creating an alkaline medium for the action of pancreatic enzymes.

(c) (i) The process of break down of oil droplets or fat globules into small globules, forming a milky emulsion to facilitate further digestion of fats is known as emulsification.

OR

(ii) Bile is not considered as true digestive juice because it is devoid of enzymes.

II. (a) Bile is formed in

(i) gall bladder.

(ii) pancreas.

(iii) liver.

(iv) duodenum.

Ans. (iii) liver.

(b) Bile helps in fat digestion by converting

(i) fat to emulsified fat.

(ii) emulsified fat to fatty acid.

(iii) emulsified fat to glycerol.

(iv) all of these.

Ans. (i) fat to emulsified fat.

(c) Acidic chime is converted to alkaline chime in duodenum through the action of

(i) rennin. (ii) trypsin.

(iii) bile. (iv) lipase.

Ans. (iii) bile.

(d) Emulsification is

(i) converting fat into fatty acid.

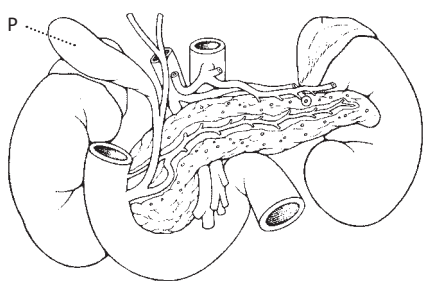
(ii) breaking down of oil into smaller droplets.

(iii) breaking down of fat into glycerol.

(iv) breaking down of protein.

Ans. (ii) breaking down of oil into smaller droplets.

(e) A person is found with some complications of organ 'P' as shown in the given figure. On examination, doctor found the reason.



Select the incorrect option from the following regarding the condition of the patient.

(i) He is suffering from gall stones.

(ii) Gall stones are majorly made of magnesium.

(iii) He may be cured by surgery.

(iv) Gall stones may also obstruct his bile duct.

Ans. (ii) Gall stones are majorly made of magnesium.

Very Short Answer Type Questions

17. Name the process that links light energy with chemical energy. Name the cell organelle where photosynthesis occurs.

Ans. Photosynthesis.

Chloroplast

18. Name the muscular and tubular part of the alimentary canal corresponding to the neck region of human. Name the first part of small intestine.

Ans. Oesophagus.

Duodenum

19. Which part of alimentary canal receives bile from liver? "Bile juice do not contain any enzyme but is essential for digestion." Justify the statement.

Ans. Duodenum part of small intestine. Bile juice contain bile salts which plays an important role in emulsification of fats, that is breaking of larger fat globules into smaller fat globules so that pancreatic enzymes can act on them. Thus bile is essential for fat digestion.

20. What features help the plants to make food by the process of photosynthesis?

Ans. Chlorophyll, a green pigment found in plants, is necessary for photosynthesis.

This pigment is present in the cell organelle called chloroplasts. Chloroplasts are mostly present in green leaves to carry out the process of photosynthesis. It absorbs sunlight for the process of photosynthesis.

21. (a) Give reason why herbivorous animals have longer, small intestines than carnivorous animals?

(b) Although 'Pepsin' and 'Trypsin' are both protein digesting enzymes yet they differ from each other. Justify this statement by giving one difference between them. **(CBSE 2024)**

Ans. (a) Herbivores have longer small intestines than carnivores because they need more time to digest plant material, which is tougher to break down and requires more enzymatic processing. The extended small intestine allows for greater surface area and longer digestion, helping herbivores extract the nutrients they need from plants.

(b) Pepsin and trypsin are both protein-digesting enzymes, but they differ in their activation sites and pH preferences. Pepsin works in the acidic environment of the stomach (pH 1.5–2), breaking down proteins into smaller peptides. Trypsin, on the other hand, functions in the more neutral environment of the small intestine (pH 7–8) and further breaks down peptides into amino acids.

Short Answer Type Questions

22. You have eaten boiled rice for lunch. Make a list of enzymes that will act upon the rice and the changes it will undergo before being absorbed in the small intestine.

Ans. Boiled rice is rich in starch. Partial digestion of starch present in boiled rice begins in the mouth where salivary amylase converts starch to maltose. Further digestion will take place in the small intestine which receives secretion from pancreas. Pancreatic amylase present in pancreatic juice acts on starch and other complex carbohydrates to form sugar like maltose. The intestinal juice secreted by glands present on walls of small intestine completes the process of digestion which breaks down maltose to glucose.

23. Differentiate between chyme and chyle.

Ans. Chyme is the partially digested food in the form of a paste in the stomach. It is acidic in nature. It is pushed to the small intestine for further digestion.

Chyle is the completely digested food in the form of a liquid in the small intestine. It is subjected to absorption by walls of small intestine.

24. (a) What is the internal energy reserve in plants and animals?

(b) How desert plants perform photosynthesis if their stomata remain closed during the day? **(CBSE 2023)**

Ans. (a) ATP is the internal energy reserve for plants and animals.

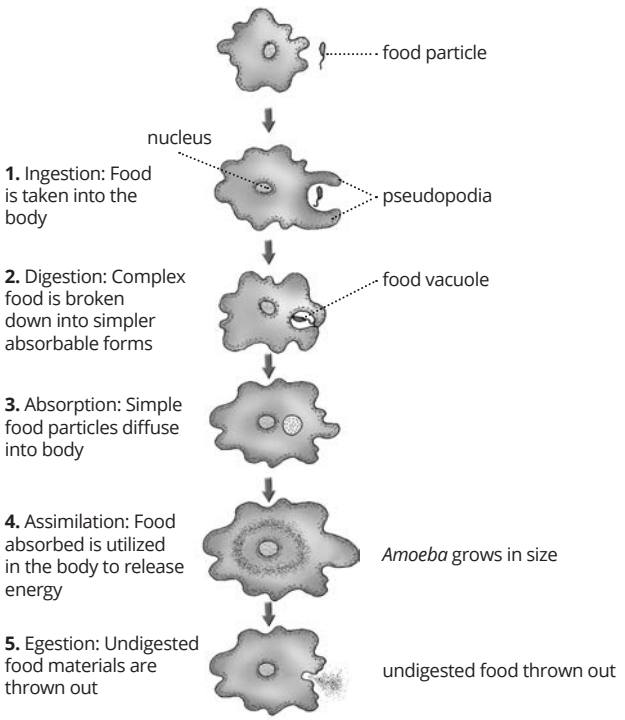
(b) Desert plants perform photosynthesis through a process called CAM (Crassulacean Acid Metabolism). During the night, their stomata open to absorb carbon dioxide, which is stored as organic acids. During the day, the stomata remain closed to conserve water, and the stored carbon dioxide is used for photosynthesis. This allows desert plants to minimize water loss while still conducting photosynthesis in extreme conditions.

Long Answer Type Questions

25. Describe the process of nutrition in *Amoeba* with the help of a diagram. **(CBSE 2016)**

Ans. Unicellular organisms like *Amoeba* feed on microscopic plants and animals present in water and decaying food particles. The mode of nutrition in *Amoeba* is holozoic and the process of obtaining food by it is termed as phagocytosis. Food particles or prey are captured by pseudopodia. The tips of pseudopodia encircling the prey fuse with each other. Thus, the food is ingested and a food vacuole is formed. Digestion in *Amoeba* is

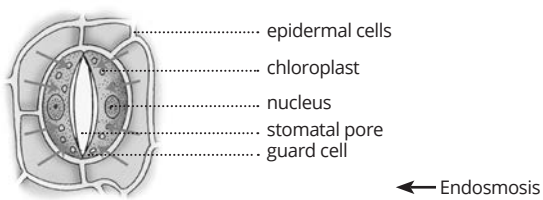
intracellular. Complex food is broken into simpler soluble form with the help of digestive enzymes of lysosome in the food vacuole. Digested food diffuses into the cytoplasm of the cell. This process is called absorption. The absorbed food is utilized or assimilated by *Amoeba* to derive energy for growth. The undigested and unabsorbed food is thrown out when the food vacuole comes up on the cell surface and bursts open. This process of throwing out undigested food is called egestion.



Nutrition in *Amoeba*

26. (a) Draw a diagram to show open stomatal pore and label the following:
(i) Guard cells (ii) Chloroplast
(b) State two functions of stomata.
(c) How do guard cells regulate the opening and closing of a stomatal pore?

Ans. (a)



Stoma

(b) Stomata helps in exchange of gases and loss of water by transpiration.
(c) The guard cells control the opening and closing of stomatal pores. When water enters into the guard cells, they become turgid and swell. As a result, they become curved and stomatal pores open. When the guard cells lose water, they shrink and become flaccid. As a result, the stomatal pores close.

Let's Compete

(Page 20)

Multiple-Choice Questions

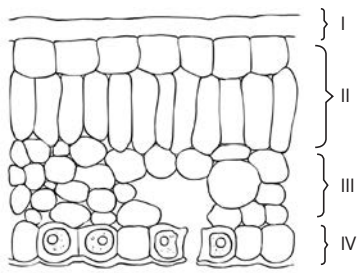
1. Pancreatic juice contains
(a) pepsin and trypsin.
(b) amylase and pepsin.
(c) pepsin and lipase.
(d) trypsin and lipase.

Ans. (d) trypsin and lipase.

2. A type of autotrophic nutrition.
(a) Holozoic nutrition
(b) Parasitic nutrition
(c) Chemosynthetic nutrition
(d) Saprophytic nutrition

Ans. (c) Chemosynthetic nutrition

3. In the given transverse section of the leaf identify the layer of cells where maximum photosynthesis occurs.



(a) I, II (b) II, III
(c) III, IV (d) I, IV

Ans. (b) II, III

4. Which of the following organisms have the longest small intestine?
(a) Autotrophs (b) Herbivores
(c) Carnivores (d) Omnivores

Ans. (b) Herbivores

5. Which of the following chemicals is used to detect the presence of starch?
(a) Iodine (b) Methylene blue
(c) Benedict's solution (d) Ninhydrin

Ans. (a) Iodine

6. Which of the following organs does not secrete digestive juices?
(a) Stomach (b) Liver
(c) Oesophagus (d) Small intestine

Ans. (c) Oesophagus

7. Opening and closing of pores is a function of

(a) chlorophyll. (b) stomata.

(c) guard cells. (d) chloroplast.

Ans. (c) guard cells.

8. Action of bile can be termed as

(a) hydrogenation. (b) oxidation.

(c) emulsification. (d) esterification.

Ans. (c) emulsification.

9. Bile juice is secreted by

(a) small intestine. (b) pancreas.

(c) stomach. (d) liver.

Ans. (d) liver.

10. Protein digestion begins in

(a) mouth. (b) oesophagus.

(c) stomach. (d) small intestine.

Ans. (c) stomach.

Life Skills

(Page 21)

1. Shreya had several plants grown in pots in the balcony of her house. One day she shifted one of the plants from the balcony to inside her house and kept it in her cupboard where there was no direct sunlight. After 3 days, she noticed that the leaves of the plant were looking pale and the plant had started wilting despite being watered well.

(a) What could be the reason for the leaves losing their colour and wilting?

(b) Which biological process was getting affected due to shifting of the plant in the cupboard?

(c) What should she do so that the plant gets healthy again?

Ans. (a) The leaves of the potted plant kept in the cupboard lost their colour and wilted as there was no sunlight. In the absence of sunlight, the rate of photosynthesis was limited and the formation of chlorophyll itself depends on the exposure of the plant to light. Since, the potted plant was kept in dark, chlorophyll was not formed and thus leaves turned yellow, lost their colour and wilted.

(b) Photosynthesis is the biological process which was affected due to the shifting of the plant in the cupboard.

(c) Shreya should place the potted plant back in the balcony where sufficient sunlight is available for the plant to photosynthesize and chlorophyll formation or activation.

2. Dhruv is fond of eating *idlis* made of rice for dinner. He developed dental caries even when he brushed his teeth every morning.

(a) Trace the various steps of the *idli's* digestion from the time it is placed in the mouth to the time it reaches the small intestine.

(b) What could be the possible reason of dental caries?

(c) If you were Dhruv's friend, what will you advise him to prevent dental caries?

Ans. (a) *Idli* is made of rice which is rich in starch and lentil which is rich in protein. The digestion of *idli* starts by ingestion in the mouth, to the buccal cavity and completes in small intestine where its protein completes its digestion to form amino acid and starch forms glucose.

The three pairs of salivary glands in the mouth secrete saliva. Saliva contains an enzyme salivary amylase which breaks starch and complex carbohydrates into maltose.

From mouth the food is passed through the oesophagus into stomach.

In the stomach the food is acted upon by the gastric juice which contains hydrochloric acid and gastric enzymes which breaks the proteins into proteoses and peptones.

In the small intestine food is mixed with bile juice, pancreatic juice and intestinal juice.

Pancreatic juice contains several enzymes namely, trypsin which acts on proteins and converts them into polypeptides, amylase that acts on starch and produces maltose. The intestinal juice also contains enzymes by the action of which the nutrients in *idli* is completely digested into amino acid and glucose and converted into a liquid form called chyle which is further subjected to absorption in the small intestine.

(b) Dental caries are caused due to a bacterium *Streptococcus mutans* which acts on sugars and produces acids that soften the enamel. As a result, gradual softening of enamel and dentine takes place. Bacteria along with food particles accumulate on the teeth and form dental plaque which can lead to inflammation and infection around teeth.

(c) I would have advised Dhruv to brush his teeth twice a day, that is, in the morning and after having dinner to prevent dental caries.

(II) Respiration

Check Your Progress 1

(Page 27)

Multiple-Choice Questions

1. During the deficiency of oxygen in tissues, pyruvate is converted into lactic acid in

(a) mitochondria. (b) cytoplasm.

(c) chloroplast. (d) nucleus.

Ans. (b) cytoplasm.

2. Oxygen is needed by the body

(a) to purify the blood.

(b) to pump the blood in vessels.

(c) to aerate lungs.

(d) to produce food.

Ans. (a) to purify the blood.

3. In insects, gaseous exchange occurs through

(a) gills. (b) lungs.

(c) trachea. (d) body surface.

Ans. (c) trachea.

4. Yeast undergoes fermentation to produce

(a) ethanol and water.

(b) ethanol and carbon dioxide.

(c) carbon dioxide and water.

(d) ethanol.

Ans. (b) ethanol and carbon dioxide.

Very Short Answer Type Questions

5. How do roots absorb oxygen?

Ans. The root absorbs oxygen from the air present in between the soil particles through root hairs by the process of diffusion.

6. What makes exchange of gases in gills and lungs possible?

Ans. Large surface area, richly supplied by blood capillaries make it possible to exchange gases in gills and lungs.

7. Name two organisms respiring anaerobically. Why is anaerobic respiration less efficient?

Ans. Yeast and few bacteria like *Clostridium.* Incomplete oxidation of food takes place in anaerobic respiration so less ATP is produced and therefore, it is less efficient.

9. Name the energy currency in the living organisms. Where is it produced?

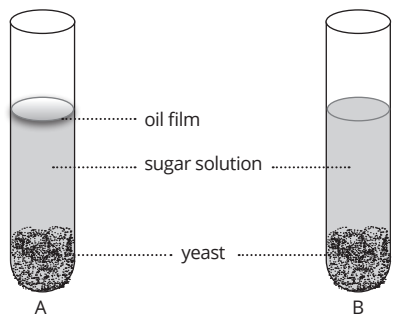
Ans. ATP (Adenosine triphosphte)

It is produced during the process of respiration in the cell. In case of aerobic respiration, it is produced in the mitochondria while in anaerobic respiration, it is produced in the cytoplasm.

10. Why is the breathing rate of aquatic animals faster than land animals?

Ans. Aquatic animals use oxygen dissolved in water for respiration. Since the amount of oxygen dissolved in water is much lesser than that present in air, the breathing rate in aquatic animals is much faster than land animals, so that they can get required oxygen.

11. In the test tubes A and B shown below, yeast was kept in sugar solution. Which products of respiraton would you expect in tubes A and B?



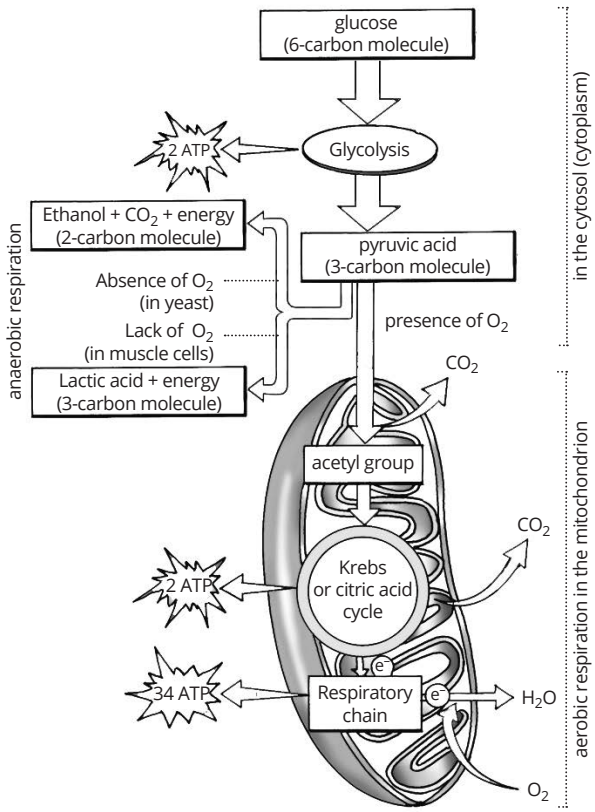
Ans. Yeast respires anaerobically in the absence of oxygen and aerobically in the presence of oxygen. In test tube A, anaerobic respiration will take place due to oil layer which will prevent the diffusion of air into the solution. Therefore, ethanol and carbon dioxide will be produced in test tube A. In test tube B, oxygen will diffuse into the solution and aerobic respiration will occur. Therefore, carbon dioxide and water will be produced in test tube B.

12. With the help of a schematic flow chart, show the breakdown of glucose in a cell to provide energy

(a) in the presence of oxygen

(b) in lack of oxygen **(CBSE 2023)**

Ans.



Short Answer Type Questions

13. Describe three vital differences between aerobic and anaerobic respiration.

Ans. Differences between aerobic and anaerobic respiration

Aerobic respiration	Anaerobic respiration
aerobic respiration takes place in the presence of free oxygen	anaerobic respiration takes place in the absence of oxygen
a part of the respiration process, i.e. glycolysis, takes place in cytoplasm and a part of the respiration process, i.e. Krebs cycle, takes place in mitochondria	the whole process of respiration takes place in the cytoplasm
38 ATP molecules are produced by oxidation of one molecule of glucose	2 ATP molecules are produced by oxidation of one molecule of glucose
end products formed are CO_2 and H_2O	end products formed are ethyl alcohol (C_2H_5OH) and CO_2 (in yeast); lactic acid (in humans)

14. Name the four main types of respiratory organs in animals. Also, write their three common features.

Ans. The four main types of respiratory organs found among animals are body surface or skin, air tubes or trachea, gills and lungs. Earthworms live in the soil and respire through their skin. In insects, gaseous exchange occurs through a system of tubes called the tracheal system. Gills are the respiratory organs in aquatic organisms like prawns, mussels, fish and tadpoles. Lungs serve as respiratory organs in organisms with terrestrial mode of life such as frogs, lizards, birds and human beings. In frogs, exchange of gases occurs both through lungs and skin.

All respiratory organs have three common features:

(i) Large surface area to get enough oxygen

(ii) Thin walls for easy diffusion and exchange of respiratory gases

(iii) Rich blood supply for transporting respiratory gases

15. Given below is the chemical equation for a certain process:

$$C_6H_{12}O_6 \xrightarrow[\text{no } O_2 \text{ required}]{\text{glycolysis}} \text{Pyruvate}$$

$$\xrightarrow[\text{no } O_2 \text{ required}]{\text{in cytoplasm}} C_2H_5OH + 2CO_2 + \text{Energy}$$

(a) Name the process.

(b) Where does this process occur?

(c) What will happen if pyruvate gets oxygen for chemical reaction? Write the resultant compounds and chemical equation.

Ans. (a) Anaerobic respiration (fermentation).

(b) Carried out in yeast in the cytoplasm of the cell.

(c) In presence of oxygen, aerobic respiration, i.e. complete oxidation of pyruvate will take place in the mitochondria of the cell.

For reaction see bottom of the page.

$$\underset{\substack{\text{glucose}\\(\text{6-carbon molecule})}}{C_6H_{12}O_6} \xrightarrow[\text{no } O_2 \text{ required}]{\text{glycolysis in cytoplasm}} \underset{(\text{3-carbon molecule})}{\text{Pyruvate}} \xrightarrow[(\text{in presence of oxygen})]{\text{in mitochondria } 6O_2} \underset{\text{carbon dioxide}}{6CO_2} + \underset{\text{water}}{6H_2O} + \underset{(\text{38 ATP})}{\text{Energy}}$$

Aerobic respiration

Long Answer Type Questions

16. (a) Describe the exchange of gases which takes place in the leaves of a plant
(i) during daytime, and
(ii) at night.
(b) State the basic differences between the process of respiration and photosynthesis.

Ans. (a) The exchange of gases in leaves occur through the stomata. The gases in the sub-stomatal air chambers diffuse through the intercellular spaces between the mesophyll cells in the leaf. The direction of diffusion of these gases depends upon the requirement of the plant and the environmental conditions. Plants respire throughout the day while photosynthesis occurs only in presence of sunlight.

(i) During daytime, carbon dioxide produced by plants is used by them in photosynthesis. Some of the oxygen produced during photosynthesis, is utilised by the plants in respiration and the rest is released in air. Thus, there is a net diffusion of carbon dioxide into the leaves and oxygen out of the leaves, during day time.

(ii) At night, when no photosynthesis occurs, no oxygen is released. Thus, oxygen from air diffuses into the leaves to carry out respiration and carbon dioxide thus produced diffuses out of the leaves into the air. So, there is a net diffusion of oxygen into the leaves and carbon dioxide out of the leaves during night.

(b)

Respiration	Photosynthesis
(i) Respiration occurs in all living organisms.	Occurs only in green plants and some photosynthetic bacteria.
(ii) It is independent of light and occurs during day time as well as night time.	Occurs only in presence of sunlight during daytime.
(iii) Catabolic process resulting in breakdown of carbohydrate.	Anabolic process resulting in the build up of carbohydrate molecules.
(iv) Energy is released in the process.	Energy is absorbed from the sun and is converted to chemical energy stored in the form of carbohydrate.

17. (a) Draw a schematic flow chart to show the breakdown of glucose by various pathways during respiration.
(b) "Respiration is a vital function of the body." Justify this statement.

Ans. (a) Refer reactions given at the bottom of the page.

(b) The food taken in during nutrition is used in the cells to provide energy for various life processes. This energy is released during the process of respiration. The oxygen taken in during respiration is transported to cells for carrying out oxidation of food.

(i) Aerobic respiration

$$\underset{\substack{\text{glucose}\\(\text{6-carbon molecule})}}{C_6H_{12}O_6} \xrightarrow[\text{no } O_2 \text{ required}]{\text{glycolysis in cytoplasm}} \underset{(\text{3-carbon molecule})}{\text{Pyruvate}} \xrightarrow[6O_2]{\text{in mitochondria}} \underset{(\text{in presence of oxygen})}{} 6CO_2 + 6H_2O + \text{Energy}$$

carbon dioxide; water; (38 ATP)

(ii) Anaerobic respiration

$$\underset{\substack{\text{glucose}\\(\text{6-carbon molecule})}}{C_6H_{12}O_6} \xrightarrow[\text{no } O_2 \text{ required}]{\text{glycolysis in cytoplasm}} \underset{(\text{3-carbon molecule})}{\text{Pyruvate}} \xrightarrow[\text{in absence of oxygen}]{\text{in cytoplasm}} \underset{\substack{\text{ethyl alcohol}\\(\text{2-carbon molecule})}}{2C_2H_5OH} + 2CO_2 + \text{Energy}$$

carbon dioxide; (2 ATP)

$$\underset{\substack{\text{glucose}\\(\text{6-carbon molecule})}}{C_6H_{12}O_6} \xrightarrow[\text{no } O_2 \text{ required}]{\text{glycolysis in cytoplasm}} \underset{(\text{3-carbon molecule})}{\text{Pyruvate}} \xrightarrow[\text{lack of oxygen}]{\text{in cytoplasm}} \underset{\substack{\text{lactic acid}\\(\text{3-carbon molecule})}}{2C_3H_6O_3} + \text{Energy}$$

(2 ATP)

The energy released during respiration is immediately stored in the form of ATP (adenosine triphosphate) in the cells of the body. This ATP molecule is used to fuel all other activities in the cell. ATP is the energy currency for cellular processes. ATP is a high energy molecule. Whenever there is an energy requirement, ATP is broken down to give rise to a fixed amount of energy. This energy is used to drive the endothermic reactions that are taking place in the cell.

This energy from ATP is used for body functions like protein synthesis, contraction of muscles, conduction of nerve impulse and many other activities taking place in the body related to functioning of cells. So without respiration, body will not get energy to carry out different functions. Therefore, respiration is a vital function of the body.

Check Your Progress 2

(Page 33)

Multiple-Choice Questions

1. Which of the following structures is a common passage for air and food?

(a) Pharynx (b) Larynx
(c) Trachea (d) Oesophagus

Ans. (a) Pharynx

2. Lungs have a large number of alveoli for

(a) maintaining a spongy texture and proper shape.
(b) more surface area for diffusion of gases.
(c) more space to increase volume of inspired air.
(d) more nerve supply.

Ans. (b) more surface area for diffusion of gases.

3. The epiglottis guards the opening of

(a) oesophagus. (b) eustachian tube.
(c) larynx. (d) trachea.

Ans. (c) larynx

4. Exhalation is brought about by relaxation of

(a) intercostal muscles.
(b) intercostal and diaphragm muscles.
(c) diaphragm muscle.
(d) none of the above.

Ans. (b) intercostal and diaphragm muscles.

Very Short Answer Type Questions

5. Name the principle involved in gaseous exchange. Why are lungs divided into very small sac like structures called alveoli?

Ans. Diffusion of gases occurs from a region of high concentration to a region of low concentration. Lungs are divided into numerous alveoli to increase the surface area for exchange of gases.

6. Name the organ through which air enters the larynx. State one function of mucous membrane inside the nasal passage.

Ans. Pharynx.

Mucus check the entry of microbes and dust particles in the respiratory passage. If dust particles enter the nasal cavity, they get stuck to mucus and are thrown out by the movement of cilia.

7. Give the pathway travelled by a molecule of oxygen when it enters the body.

Ans. When a molecule of oxygen enters the body, it travels through nostrils, nasal cavity, pharynx, larynx, trachea, bronchi and bronchioles to alveolar sacs.

8. Why is it harmful to respire through mouth than through nasal openings?

Ans. The inner surface of the nasal passage is lined by fine hairy ciliated epithelium and mucus secreting cells. Both cilia and mucus check the entry of microbes and dust particles in the respiratory passage. If dust particles enter the nasal cavity, they get stuck to mucus and are thrown out by the movement of cilia. If one respires through mouth, all the fine dust particles and microbes will enter the body.

9. The breathing cycle is rhythmic, whereas exchange of gases is a continuous process. Comment upon this statement.

Ans. The breathing cycle is rhythmic as it consists of regular inhalation and exhalation of air. The exchange of gas is a continuous process because there is always a residual volume of gas in the lungs so that absorption of oxygen and release of carbon dioxide continues.

10. State in brief the role of lungs in exchange of gases.

Ans. Lungs are the main respiratory organs where exchange of gases takes place. Alveoli present in the lungs provide a large surface area for exchange of gases.

11. During breathing cycle, what is the advantage of residual volume of air in lungs.

Ans. During each breathing cycle (breathing in and breathing out), the lungs always contain some air, called the residual volume so that there is sufficient time for the oxygen to be absorbed and for the carbon dioxide to be released.

Short Answer Type Questions

12. Why does the air passage not collapse when there is no air in it? **(CBSE 2016)**

Ans. The trachea or windpipe is a tube, that extends into the thoracic cavity. It lies on the ventral side of the oesophagus. The wall of trachea is

provided with incomplete C-shaped cartilaginous rings. These keep the trachea in dilated position and prevent it from collapsing under low pressure when there is no air in it and allow uninterrupted flow of air.

13. Haemoglobin plays an essential role of being a respiratory pigment in human beings. Justify this statement.

Ans. In human beings, haemoglobin is the respiratory pigment which has a high affinity for oxygen and is present in the red blood corpuscles. Haemoglobin combines with oxygen to form oxyhaemoglobin and delivers oxygen to the cells in different parts of the body. Therefore, haemoglobin plays an important role of being a respiratory pigment as diffusion alone cannot take care of oxygen delivery to all body parts in large sized animals such as humans.

14. How do the following contribute in inspiration during breathing?

(a) Ribs (b) Diaphragm

Ans. Inhalation or breathing in is always an active, energy-requiring process. It is brought about by simultaneous contraction of the following:

(a) Intercostal muscles of ribs which produces a forward (upward) and outward movement of the rib cage.

(b) Diaphragm muscles which straightens and contracts the diaphragm (due to its downward movement).

This results in an increase in the volume of thoracic (chest) cavity and is followed by an automatic increase in lung volume. As the lungs expand, the air pressure in them reduces, so air rushes into them from the atmosphere through the air passages.

15. (a) Why is respiratory pigment needed in multicellular organisms with large body size?

(b) Give reasons for the following

(i) Rings of cartilage are present in the throat.

(ii) Lungs always contain a residual volume of air.

(iii) The diaphragm flattens and ribs are lifted up when we breathe in.

(iv) Walls of alveoli contain an extensive network of blood vessels. **(CBSE 2024)**

Ans. (a) Oxygen is transported by the respiratory pigment haemoglobin in RBCs. When the body size of animal is large, the diffusion pressure alone cannot take care of oxygen delivery to all parts of the body.

(b) (i) Cartilaginous rings keep the trachea in dilated position and prevent it from collapsing.

(ii) The lungs always contain some air, called residual volume, so that there is sufficient time for the oxygen to be absorbed and for the carbon dioxide to be released.

(iii) This results in an increase in lung volume. As the lungs expand, the air pressure in them reduces and so air rushes into them from the atmosphere through the air passages.

(iv) The alveoli are surrounded by very thin blood capillaries carrying rich supply of blood. This maximizes the surface area for efficient gaseous exchange.

Long Answer Type Questions

16. (a) Draw a neat diagram of human respiratory system and label following parts on it.

(i) Larynx

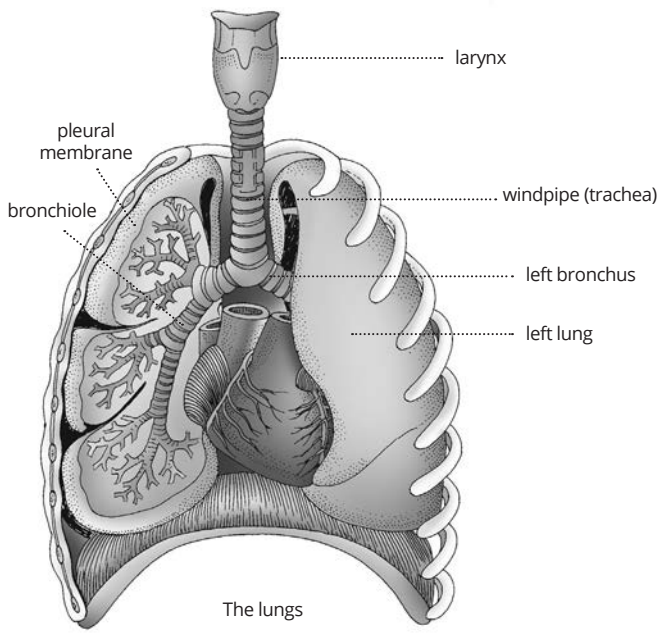
(ii) Trachea

(iii) Bronchus

(iv) Lungs

(b) Where does carbon dioxide enter the blood? How?

Ans. (a)



The lungs

(b) Carbon dioxide enters the blood from body tissues to the capillaries present in the tissue region by the process of diffusion.

In tissues, oxygen is used up in various metabolic activities and carbon dioxide is produced. Hence, in tissues the concentration

of oxygen becomes lower than that in the capillaries, whereas carbon dioxide is present in a greater concentration in tissues than in capillaries. Therefore, oxygen is diffused from blood in capillaries to tissues (body cells) due to its higher concentration in blood than tissues and carbon dioxide is diffused from body cells into capillaries due to its higher concentration in body cells and tissues.

17. (a) How many lobes are found in each lung in human beings?

(b) What prevents entry of food particles into wind pipe?

(c) Differentiate between inhaled air and exhaled air.

(d) Where does oxygen exit from the blood? How?

Ans. (a) The right lung is divided into three lobes whereas the left lung has two lobes.

(b) Epiglottis

(c) Inhaled air contain high concentration of oxygen and low concentration of carbon dioxide and water vapour while exhaled air has high concentration of carbon dioxide and water vapour and low concentration of oxygen. In addition, exhaled air is warmer than inhaled air.

(d) Oxygen exits from the blood in the tissue.

During breathing in, the air containing oxygen fills up alveoli of lungs. The concentration of oxygen is higher in alveoli than that in surrounding blood capillaries. Thus oxygen diffuses from the alveoli into the blood present in lung capillaries. The oxygen binds to haemoglobin to all parts of the body. In the tissues, oxygen is used up in various metabolic activities and hence the concentration of oxygen is lower in tissues than the blood capillaries. Therefore, oxygen is diffused from blood capillaries to tissues due to its high concentration in blood than tissues.

Higher Order Thinking Skills (HOTS) Questions

(Page 34)

1. During photosynthesis, plants take in CO_2 and give out O_2, while during respiration plants take in O_2 and give out CO_2. Photosynthesis usually occurs during daytime while respiration occurs continuously for 24 hours. Then, how does the balance of O_2 and CO_2 remain almost constant?

Ans. Since photosynthesis occurs during daytime only and respiration occurs for 24 hours, the concentration of carbon dioxide is expected to be more than oxygen. At night, when there is no photosynthesis occurring, CO_2 generation is the major exchange activity going on. But during the day, CO_2 generated during respiration is used up for photosynthesis, hence there is no CO_2 release. Instead, oxygen release is the major event at this time. This balances the concentration of oxygen and carbon dioxide.

2. Suppose the lining of trachea in our body was composed of squamous epithelium instead of ciliated epithelium. How could it affect the respiratory system? Explain.

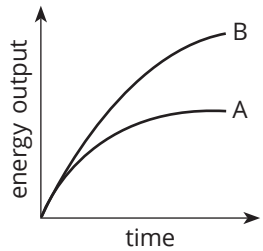
Ans. Ciliated epithelium helps in the prevention of entry of dust particles or microbe. If it is made of squamous epithelium, the removal of dust particles or any other foreign substance would not have been possible. Due to this the bronchioles may get blocked thereby adversely affecting the gaseous exchange.

3. Diffusion of gases occurs in the alveolar region only and not in the other parts of respiratory system. Why?

Ans. Alveoli are the actual sites of respiratory exchange. Alveoli are tiny air sacs across which gaseous exchange takes place. These alveoli are in close association with capillaries and provide a large surface area for gaseous exchange. Each alveolus has a dense network of blood capillaries on its outside. There are over 480 million alveoli present in the lungs. The total surface area of all the alveoli is about 80 square metres which is almost equal to the area of a tennis court. Hence, diffusion of gases occurs in the alveolar region only and not in the other parts of respiratory system.

4. A graph was plotted to show the energy output of two types of respiration.

$$\underset{\substack{\text{glucose}\\(\text{6-carbon molecule})}}{C_6H_{12}O_6} \xrightarrow[\text{no } O_2 \text{ required}]{\text{glycolysis in cytoplasm}} \underset{(\text{3-carbon molecule})}{\text{Pyruvate}} \xrightarrow[\text{no } O_2 \text{ required}]{\text{in cytoplasm}} \underset{\substack{\text{ethyl alcohol}\\(\text{2-carbon molecule})}}{2C_2H_5OH} + \underset{\text{carbon dioxide}}{2CO_2} + \underset{(\text{2 ATP})}{\text{Energy}}$$



(a) Identify the types of respiration denoted by curves A and B.

(b) Name one organism in which type A respiration occur.

(c) Name one organism in which type B respiration occur.

(d) Write the equation for both type A and type B respiration.

(e) Mention the number of ATP molecules generated in
(i) Type A (ii) Type B respiration.

Ans. (a) A denotes anaerobic respiration while B denotes aerobic respiration.

(b) Yeast

(c) All mammals

(d) Type B respiration

$$\underset{\text{glucose}}{C_6H_{12}O_6} + \underset{\text{oxygen}}{6O_2} \rightarrow \underset{\text{carbon dioxide}}{6CO_2} + \underset{\text{water}}{6H_2O} + \text{Energy (ATP)},$$

Type A respiration (given below at the bottom of the page)

(e) (i) 2 ATPs (ii) 38 ATPs

Self-Assessment

(Page 35)

Multiple-Choice Questions

1. Which of the following is not a 3-carbon molecule?

(a) Pyruvate (b) Ethanol

(c) Lactic acid (d) None of these

Ans. (b) Ethanol

2. Which of the following respiratory structure has cartilaginous rings to prevent it from collapsing?

(a) Nasal cavity (b) Pharynx

(c) Larynx (d) Trachea

Ans. (d) Trachea

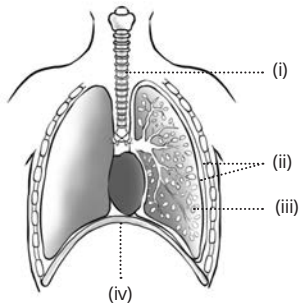
3. Which of the following structures increase the total surface area for the exchange of gases in the lungs?

(a) Bronchi (b) Alveoli

(c) Bronchioles (d) Trachea

Ans. (b) Alveoli

4. Carefully study the diagram of the human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and /or characteristic.



(a) (i) Trachea: It is supported by bony rings for conducting inspired air.

(b) (ii) Ribs: When we breathe out, ribs are lifted.

(c) (iii) Alveoli: Thin-walled sac like structures for exchange of gases.

(d) (iv) Diaphragm: It is pulled up when we breathe in.

Ans. (C) Alveoli: Thin-walled sac like structures for exchange of gases

5. Gaseous exchange in fish takes place through the

(a) trachea. (b) lungs.

(c) gills. (d) alveoli.

Ans. (c) Gills

6. A sportsman, after a long break of his routine exercise, suffered muscular cramps during a heavy exercise session. This happened due to

(a) lack of carbon dioxide and formation of pyruvate.

(b) presence of oxygen and formation of ethanol.

(c) lack of oxygen and formation of lactic acid.

(d) lack of oxygen and formation of carbon dioxide. **(CBSE SP 2024)**

Ans. (c) lack of oxygen and formation of lactic acid.

Assertion–Reason Type Questions

For question numbers 7 to 13, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.

(b) Both A and R are true but R is not the correct explanation of the assertion.

(c) A is true but R is false.

(d) A is false but R is true.

7. **Assertion:** Alveoli are known as functional unit of lungs.
Reason: Alveoli are the site of gaseous exchange.

Ans. (a)

8. **Assertion:** Aerobic respiration is a two-step process.
Reason: The first step of aerobic respiration occurs in the mitochondria and the second step occurs in the cytoplasm.

Ans. (c)

9. **Assertion:** Break down of glucose in the absence of O_2 leads to the production of ethanol, CO_2 and energy.
Reason: Break down of glucose during lack of O_2 leads to the formation of lactic acid and energy.

Ans. (b)

10. **Assertion:** Plants release O_2 during photosynthesis.
Reason: Plants release CO_2 only at night.

Ans. (c)

11. **Assertion:** Haemoglobin is a respiratory pigment.
Reason: Haemoglobin contains iron and imparts red colour to the blood.

Ans. (b)

12. **Assertion:** The anaerobic respiration which takes place in yeast, has one of the end products as an acid.
Reason: During anaerobic respiration, there is incomplete breakdown of glucose. **(CBSE 2023)**

Ans. (d)

13. **Assertion:** The rate of breathing in aquatic organisms is much faster than in terrestrial organisms.
Reason: The amount of oxygen dissolved in water is very high as compared to the amount of oxygen in the air. **(CBSE 2024)**

Ans. (c)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

14. Air quality of our planet is degrading day by day. The reasons are vehicular emission, burning of fossil fuels, increased number of factories, burning of farm stubble, bursting of crackers etc. The pollutants released gets inside and accumulate in our body through the respiratory tract, affecting various tissues and organs. This leads to adverse effect on everyone's health specially children and cause several diseases including asthma and Chronic Obstructive Pulmonary Disease. The problem becomes severe in big cities where large scale cutting of trees is undertaken to make space for houses and offices.

I. (a) Name any two harmful gases which are a part of vehicular emission.

(b) Expand the term CNG.

(c) (i) Explain the role of trees in controlling air pollution and improving air quality.

OR

(ii) Name one disease caused due to air pollution.

Ans. (a) Carbon monoxide and nitrogen oxide.

(b) Compressed Natural Gas

(c) (i) Plants absorb toxic chemicals through stomata and also minimizes the greenhouse effect by trapping heat.

OR

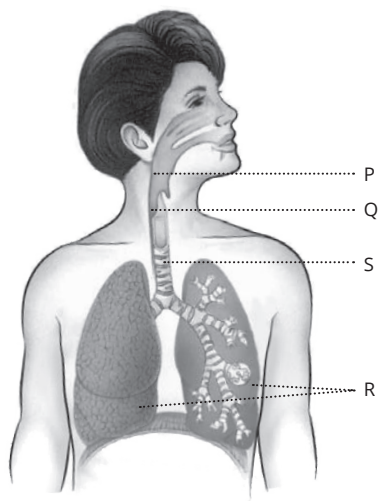
(ii) Asthma

II. (a) Which of the following is/are respiratory disease/s?

(i) Chronic bronchitis (ii) Emphysema
(iii) Cystic fibrosis (iv) All of these

Ans. (iv) All of these

(b) In which of the following parts of the given figure does gaseous exchange take place?



(i) P (ii) Q
(iii) R (iv) S

Ans. (iii) R

(c) Meteorological departments measure air quality index in cities. Air quality index

(i) indicates the oxygen content of the air.
(i) predicts ozone level of the area.
(iii) determines intensity of the sound pollution.
(iv) determines the amount of air pollutants.

Ans. (iv) determines the amount of air pollutants.

(d) An asthma patient shows the symptoms of
(i) shortness of breathing.
(ii) wheezing.
(iii) chest tightness.
(iv) all of these.

Ans. (iv) all of these.

(e) Which of the following can cause chronic obstructive pulmonary disease (COPD)?
(i) Particulate matter
(ii) Airborne chemicals
(iii) Burning coal
(iv) All of these

Ans. (iv) All of these

15. Raghav's mother who was in good health condition about a month ago, has started feeling tired all the time with some breathing issues. Her stamina has gone down considerably and she is finding it difficult to carry out her daily routine tasks. Her doctor prescribed a blood test which revealed that her haemoglobin level was 7.2 gm/dL.

I. (a) What is the normal range of haemoglobin for a healthy adult female?

(b) What is the term given to low level of iron in the blood?

(c) (i) Explain why she was feeling tired all the time.

OR

(ii) Name any green leafy vegetable which is a rich source of iron.

Ans. (a) Normal range of haemoglobin for a healthy adult female is 12.0 to 15.5 grams per decilitre.

(b) Iron deficiency anaemia is the term given for low level of iron in the blood.

(c) (i) She was feeling tired because of low haemoglobin level.

OR

(ii) Spinach is a rich source of iron.

II. (a) The normal range of haemoglobin for a healthy adult female is
(i) 15–17.5 grams per decilitre.
(ii) 12–15.5 grams per decilitre.
(iii) 13.5–17.5 grams per decilitre.
(iv) 9–10 grams per decilitre.

Ans. (ii) 12–15.5 grams per decilitre.

(b) Low level of iron in blood, is termed as
(i) hypoglycemia. (ii) anaemia.
(iii) ketonuria. (iv) hyperglycemia.

Ans. (ii) anaemia.

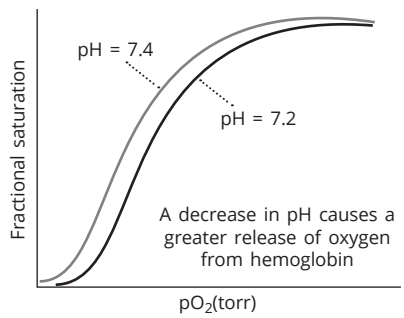
(c) Raghav's mother was feeling tired all the day because
(i) she cannot breath enough oxygen.
(ii) of decreased level of oxygen in blood due to low haemoglobin.
(iii) of decreased level of CO_2 in blood due to low haemoglobin.
(iv) all of these.

Ans. (ii) of decreased level of oxygen in blood due to low haemoglobin.

(d) Which of the following foods is a rich source of iron?
(i) Tea (ii) Spinach
(iii) Carrot (iv) Ginger

Ans. (ii) Spinach

(e) The given graph is showing the effect of pH on haemoglobin.



Which of the following is incorrect related to the low pH of blood?
(i) The blood is alkaline when the pH decreases.
(ii) Blood pH is decreased when body cannot remove enough CO_2.
(iii) This condition occurs if one has severe respiratory problem.
(iv) Clinical consequences of decreasing blood pH are drowsiness, stupor and coma.

Ans. (i) The blood is alkaline when the pH decreases.

Very Short Answer Type Questions

16. Name the reaction common to both aerobic and anaerobic respiration. What are the end products of aerobic respiration?

Ans. Glycolysis.

Carbon dioxide, water vapour and ATP.

17. Why are the alveoli in lungs covered with blood capillaries?

Ans. Alveoli are covered with capillaries for exchange of gases like oxygen and carbon dioxide between the alveoli and the capillaries by diffusion.

18. What is the location and function of larynx?

Ans. Larynx is present between the pharynx and the trachea. It is used for breathing, talking and swallowing.

19. Why do higher animals have special respiratory organs with large surface area?

Ans. In case of large, multicellular organisms, simple diffusion of gases does not satisfy the body's demand for oxygen. In order to cope with this increased need, certain specialised structures are present in the bodies of higher organisms that act as respiratory organs.

20. What type of respiration takes place in human muscles during vigorous physical exercise? Give reasons for your answer.

Ans. Lactic acid fermentation, a type of anaerobic respiration takes place.

Sometimes, when we are doing vigorous physical exercises or hard physical work, the oxygen is used up very fast in our muscle cells than it is received from blood. In the absence of oxygen, anaerobic respiration takes places in our muscle cells to release energy. This process is called lactic acid fermentation. During this process, the pyruvate is converted into lactic acid (another 3 carbon molecule) in the absence of oxygen and a small amount of energy is also released. There is a sudden built-up of lactic acid in our muscles during this process which causes muscle cramps.

21. Why have lungs replaced skin for gaseous exchange?

Ans. Lungs provide large surface area for exchange of gases as compared to skin. Presence of alveoli in lungs increases the surface area for gaseous exchange. Lungs have thin and delicate lining for easy diffusion of gases and richly supplied with blood capillaries so that gases can be transported through blood to each and every cell of the body. In contrast, gaseous exchange would be slow and would take place only at the surface through skin. Therefore, skin have been replaced by lungs to increase the efficiency of exchange of gases.

22. Explain why, when air is taken in or let out during breathing, the lungs always contain a residual volume of air.

Ans. When air is taken in or let out during breathing, the lungs always contain some air, called the residual volume so that there is sufficient time for the oxygen to be absorbed and for the carbon dioxide to be released.

Short Answer Type Questions

23. List three characteristics of lungs which make it an efficient respiratory surface.

Ans. All respiratory organs have three common features:

Large surface area to get enough oxygen

Thin walls for easy diffusion and exchange of respiratory gases

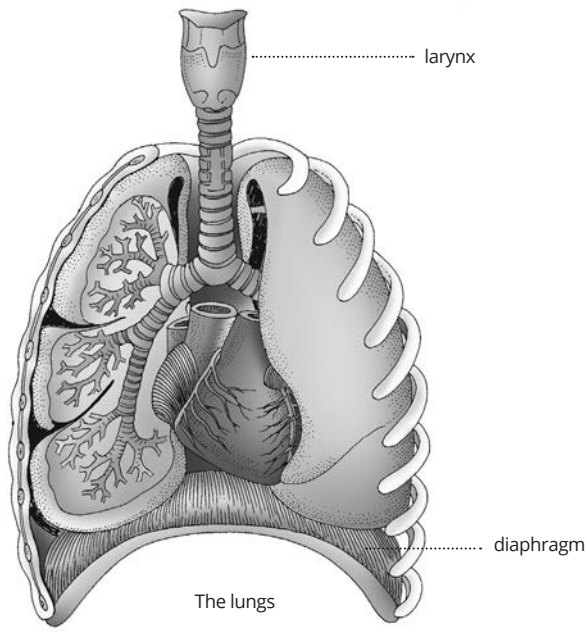
Rich blood supply for transporting respiratory gases

24. Draw a diagram of human respiratory system and label the following.

(a) Diaphragm

(b) Larynx

Ans.



The lungs

25. Which physical process is mainly responsible for respiratory gases in leaves? Explain the phenomenon.

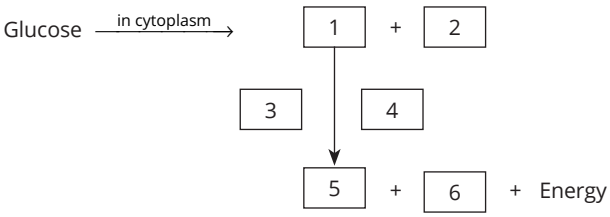
Ans. The physical process responsible for exchange of respiratory gases in leaves is diffusion.

The exchange of gases in leaves occur through the stomata. The gases in the sub-stomatal air chambers diffuse through the intercellular spaces between the mesophyll cells in the leaf. The direction of diffusion of these gases depends upon the requirement of the plant and the environmental conditions. Plants respire throughout the day while photosynthesis occurs only in presence of sunlight. During daytime, carbon dioxide produced by plants is used by them in photosynthesis. Some of the oxygen produced during photosynthesis, is utilised by the plants in respiration and the rest is released in air. Thus, there is a net diffusion of carbon dioxide into the leaves and oxygen out of the leaves,

during day time. At night, when no photosynthesis occurs, no oxygen is released. Thus, oxygen from air diffuses into the leaves to carry out respiration and carbon dioxide thus produced diffuses out of the leaves into the air. So, there is a net diffusion of oxygen into the leaves and carbon dioxide out of the leaves during night.

Long Answer Type Questions

26. (a) Complete the glucose breakdown pathway in case of aerobic respiration by filling the blanks.



(b) Name the molecule in the cell which stores the energy produced at the end of the pathway.

Ans. (a) 1. Pyruvate
2. Energy
3. Oxygen
4. Mitochondria
5. Carbon dioxide
6. Water vapour

(b) ATP (Adenosine triphosphate)

27. Describe how exchange of gases takes place in the lungs.

Ans. During breathing in, the air containing oxygen fills up alveoli of lungs. The alveoli are surrounded by very thin blood capillaries carrying rich supply of blood. The concentration of oxygen in alveoli is higher than that in the deoxygenated blood in capillaries. This difference causes oxygen to diffuse from the alveoli into the lung capillaries. This diffusion continues as long as the concerned molecules are unequally distributed.

The blood present in the capillaries has high concentration of carbon dioxide which it has absorbed from body tissues. Therefore, carbon dioxide diffuses out from blood capillaries into the alveoli.

The oxygen is carried by a red pigment in our blood called haemoglobin. The haemoglobin binds the oxygen (as it has great affinity for oxygen) and takes it to all parts of the body. Each molecule of haemoglobin carries 4 molecules of oxygen. Deficiency of haemoglobin lowers the oxygen-carrying capacity of blood leading to breathing problems, lack of energy and tiredness.

Let's Compete

(Page 37)

Multiple-Choice Questions

1. The common phase between aerobic and anaerobic respiration is called
(a) glycolysis. (b) Kreb's cycle.
(c) oxygen cycle.
(d) tricarboxylic acid cycle.

Ans. (a) glycolysis.

2. The exchange of gases in the alveoli of lungs takes place by
(a) osmosis. (b) simple diffusion.
(c) active transport. (d) none of these.

Ans. (b) simple diffusion.

3. The fermentation of glucose by yeast normally yields
(a) lactic acid, CO_2 and 2 ATP.
(b) CO_2, H_2O and 36 ATP.
(c) alcohol, CO_2 and 36 ATP.
(d) alcohol, CO_2 and 2 ATP.

Ans. (d) alcohol, CO_2 and 2 ATP.

4. During inspiration, the diaphragm
(a) relaxes. (b) contracts.
(c) expands. (d) gets folded.

Ans. (b) contracts.

5. The ultimate end parts of the respiratory system in humans are known as
(a) alveoli. (b) bronchioles.
(c) tracheoles. (d) bronchi.

Ans. (a) alveoli.

6. The end product of glycolysis is
(a) lactic acid. (b) glucose.
(c) ethanol. (d) pyruvate.

Ans. (d) pyruvate.

7. Gaseous exchange in fish takes place through
(a) skin. (b) gills.
(c) lungs. (d) trachea.

Ans. (b) gills.

8. One of the following organisms does not depend on simple diffusion of gases for breathing and respiration. The organism is
(a) *Amoeba*.
(b) prawn.
(c) *Planaria*.
(d) *Bryophyllum*.

Ans. (b) prawn.

9. Which of the following is most likely to have a much higher breathing rate?

(a) Sparrow

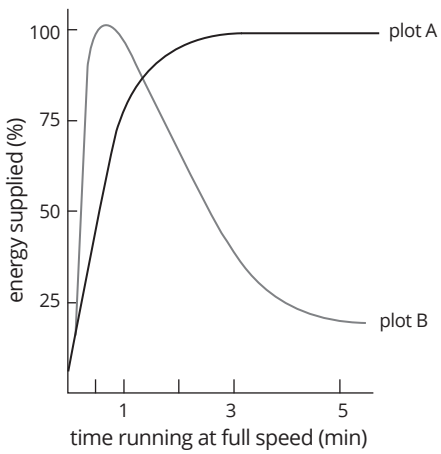
(b) Fish

(c) Cat

(d) Man

Ans. (b) Fish

10. Study the graph below that represents the amount of energy supplied with respect to the time while an athlete is running at full speed.



Choose the correct combination of plots and justification provided in the following table.

	Plot A	Plot B	Justification
(a)	Aerobic	Anaerobic	Amount of energy is low and inconsistent in aerobic and high in anaerobic
(b)	Anaerobic	Aerobic	Amount of energy is high and consistent in aerobic and low in anaerobic
(c)	Aerobic	Anaerobic	Amount of energy is high and consistent in aerobic and low in anaerobic
(d)	Anaerobic	Aerobic	Amount of energy is high and inconsistent in anaerobic and low in aerobic

Ans. (c)

Life Skills
(Page 38)

1. A school organized a summer camp for students. On the next day after trekking, Rakesh had a severe pain in the calf muscle of his left leg. His friend Abdul massaged his leg and advised him to take a hot water bath. Rakesh felt better after taking a hot water bath.

(a) What do you think is the possible reason behind the pain in the calf muscle?

(b) Does it have any correlation with the availability of oxygen?

(c) What values are shown by Abdul?

Ans. (a) Due to trekking, the oxygen is used up very fast in muscle cells than it is received from blood. Thus, in the absence of oxygen, anaerobic respiration takes places in muscle cells to release energy. This process is called lactate fermentation. During this process, there is a built-up of lactic acid in muscles. This sudden build-up of lactic acid in our muscles causes muscle cramps.

(b) During this process, the pyruvate is converted into lactic acid in the absence of oxygen and a small amount of energy is also released. This process is called lactate fermentation.

(c) Values showed by Abdul are scientific attitude and caring nature.

2. After being taught about respiration in living organisms, Ayushi got confused as to how organisms like earthworm respire. As these organisms lack any special organ for respiration and breathing. Now, answer the following questions.

(a) How does earthworm respire when no specialised system is present in them?

(b) Mention the major function of respiratory pigment.

(c) What values do you observe in Ayushi?

Ans. (a) Earthworm respires through their skin.

(b) Respiratory pigments have high affinity to oxygen and are present in blood of an organism. They bind to oxygen and transport it to all the parts of the body.

(c) Ayushi is kind, curious and aware.

3. Anshu observed her mother preparing batter for a dish. She noted that her mother added yeast powder to the dough and left it overnight. She got curious and asked her teacher questions about the same, next day.

Based on the above text, answer the following questions.

(a) Why was yeast powder added to the dough?

(b) What type of reaction do you observe in this case? What are the end products?

(c) Suggest the value shown by Anshu.

Ans. (a) Yeast powder was added so that fermentation occur in the dough due to which it will rise and become lighter.

(b) fermentation, a type of anaerobic respiration is occurring in yeast. Ethanol and carbon dioxide are the end products.

(c) Anshu is aware, curious, intelligent and observant.

4. Raman kept a plant in his room. Adequate light was provided and the plant was extensively watered. Instead of flourishing, the plant died. Raman asked his teacher for an explanation for the same. Now answer the following questions.

(a) Even though the plant was watered, it soon died. Give reasons.

(b) How do plants respire? Name the organelle responsible for gaseous exchange in

(i) herbaceous plants (ii) woody plants.

(c) What values does Raman have in your opinion?

Ans. (a) The root of a plant respire by absorbing oxygen from the air present in between the soil particles through root hairs by the process of diffusion. Due to extensive watering, the space between the soil particle got filled with water and plant died due to lack of oxygen in soil.

(b) Plants respire by taking in oxygen and giving out carbon dioxide. In plants, there is no special means for transport of gases. The gases move entirely by the process of diffusion. Thus, tissues have intercellular spaces through which these gases diffuse freely. All the parts of plant, such as, root, stem and leaf respire individually.

(i) Stomata (ii) lenticels

(c) The value shown by Raman is unawareness and non-observant.

(III) Transportation

Check Your Progress 1

(Page 42)

Multiple-Choice Questions

1. Which of the following carries substances upwards as well as downwards in a plant?

(a) Xylem (b) Companion cells

(c) Phloem (d) Tracheids

Ans. (c) Phloem.

2. Water will be absorbed by root hair when

(a) concentration of solute in the cell sap is high.

(b) plant is rapidly respiring.

(c) they are separated from soil by permeable membrane.

(d) concentration of salts in the soil is high.

Ans. (a) concentration of solute in the cell sap is high.

3. The carbohydrate synthesized in the leaves are transported through sieve tube most commonly in the form of

(a) glucose. (b) triose.

(c) sucrose. (d) soluble starch.

Ans. (c) sucrose.

4. Water movement against gravity is due to

(a) osmosis. (b) respiration.

(c) photosynthesis. (d) transpiration.

Ans. (d) transpiration.

Very Short Answer Type Questions

5. Name the plant tissue concerned with transport of water and food materials. Name the term for transport of food from leaves to other parts of plants.

Ans. Vascular tissues are responsible for transport of water and food materials in plants. Xylem transports water and phloem transports food materials.

Translocation.

6. What are the components of xylem?

Ans. Xylem vessel, tracheids, xylem fibres and xylem parenchyma.

7. What is the role of stomata in transpiration?

Ans. Water is lost through stomata during transpiration.

8. Name the living component of phloem which carries out transportation of food. Which part of root system is concerned with absorption of water?

Ans. Sieve tube and companion cell.

Root hair.

9. Explain why multicellular organisms need a transportation system for carrying food and oxygen.

Ans. In multicellular organisms, all the cells of the body are not in direct contact with environment. Food and oxygen are taken up at one place in the body of the organism, while all parts of the body need them. So a transportation system is needed.

10. What are the two kinds of transport systems in plants? What would happen if one of them fails in plant A and other in plant B?

Ans. The two types of transport systems in plants are xylem and phloem. Failure of any of them will adversely affect the plant. Failure of xylem in plant A prevents transport of water and minerals from the roots to other parts of the plant. Hence the plant will die. The failure of phloem in plant B will inhibit transport of food from leaves to other parts of the plant and the plant will eventually die.

11. A potted plant showed signs of wilting of leaves. A gardener poured water in the pot to save the plant from wilting. How does water poured in the pot help the leaves to recover?

Ans. Water and minerals are essential for survival of plants. Plants absorb water and soluble mineral salts from the soil by their root system to survive. When the gardener pours water in the pot, the plant absorbs water and minerals through the root. Water poured in the pot reaches the leaf through xylem helping it to recover wilting. The plant thus survives.

12. Which plant parts need the sugar stored in root and stem tissue in spring season? Why?

Ans. During spring season, new buds are formed. These buds require more energy to grow. Hence, the sugar stored in the stem or root tissue is transported through the phloem tissues to the buds.

Short Answer Type Questions

13. (a) What is the difference between transpiration pull and root pressure?

(b) "Transpiration is a necessary evil." Justify.

Ans. (a)

Root Pressure	Transpiration pull
(i) Root pressure is caused by active transport of mineral ions in the root xylem.	(i) Transpiration pull is caused by loss of water vapour from leaves.
(ii) Helps in transport of water in small herbs during day as well as night.	(ii) Responsible for upward movement of water in tall plants only during day time.
(iii) It is a positive pressure.	(iii) It is a negative or suction pressure.

(b) Transpiration is a necessary evil as it leads to water deficiency in plants resulting in wilting and reduced growth. However, it has great significance in plants too. Water is conducted in tall plants due to transpiration pull. Transpiration also helps to regulate the temperature of plants by keeping it cool.

14. (a) What is transpiration?

(b) What is the role of transpiration in transportation?

(c) Which plant part helps in unidirectional flow of water?

Ans. (a) The loss of water in the form of vapour from the aerial parts of the plant is known as transpiration.

(b) The loss of water through stomata during transpiration is replaced by xylem vessels in the leaf. This creates a suction which pulls water from the xylem cells of the roots. Thus, water reaches the upper parts of the plant by transpiration pull.

(c) Xylem helps in upward unidirectional flow of water.

Long Answer Type Questions

15. What do you understand by ascent of sap? Give an experiment to demonstrate that xylem is the path of ascent of sap in plants.

Ans. Plants absorb water from the soil through the roots. Thus, water has to be transported upwards to the other parts of the plant. This upward movement of water is called ascent of sap. It is called the sap as it contains many dissolved minerals. Ascent of sap involves root pressure and transpiration pull.

A young, medium sized, balsam plant is placed in the beaker containing water mixed with eosine stain solution. The roots are completely submerged in the solution. After 3–4 hours, the plant is removed from beaker and washed in running tap water. When the transverse section passing through roots, stem and leaves is taken, it is observed that in the centre xylem vessels appear red due to conduction of eosine stain dye. This shows that water is conducted through xylem and hence xylem is the path of ascent of sap in plants.

16. (a) How is food prepared by leaves utilised by roots? Explain.

(b) Water is absorbed by roots and lost through leaves. How does this happen?

Ans. (a) Food prepared by leaves is translocated to roots through phloem. Translocation of food takes place through sieve tube and companion cell of the phloem in both upward and downward direction. It is an energy dependent process. Sugars (mainly sucrose) are pumped by active transport into the phloem tissues. Accumulation of sugars in the phloem increases the osmotic pressure of these tissues and leads to entry of water into the tissues by osmosis. This pressure difference moves different substances in the phloem to tissues like root which have less pressure. Thus, it is the pressure gradient that drives the mechanism of food transport through phloem.

(b) Water absorbed by roots are lost through leaves by transport through xylem.

In tall plants, the main force responsible for upward movement of water is transpiration pull generated in the leaves which pulls the water column in the xylem vessels and tracheids upward. It happens as follows:

(i) Water and minerals are absorbed from the soil by roots, move upward to leaf and diffuse out through the stomata leading to cell transpiration.

(ii) This leads to generation of suction pressure in the leaf. The thin film of water vapour present in the mesophyll cells replaces the water vapour lost from the leaf by transpiration. During this process, water is pulled on by the adhesive and cohesive forces.

(iii) This suction pressure draws water from the leaf xylem towards stomata through the mesophyll cells. The water lost via transpiration is replaced by the water that is pulled out of the leaf xylem.

Check Your Progress 2

(Page 50)

Multiple-Choice Questions

1. Which of the following cells are formed in the bone marrow?

(a) RBCs (b) Leucocytes

(c) Leucocytes and RBCs (d) Lymphocytes

Ans. (c) Leucocytes and RBCs

2. Muscular wall is absent in

(a) vein. (b) venule.

(c) arteriole. (d) capillary.

Ans. (d) capillary.

3. The heart chamber having the thickest muscular wall is

(a) left atrium. (b) left ventricle.

(c) right atrium. (d) right ventricle.

Ans. (b) left ventricle.

4. The main function of lymph is to

(a) transport O_2 to the brain.

(b) transport CO_2 to lungs.

(c) return interstitial fluid to blood.

(d) return RBCs and WBCs to lymph vessels.

Ans. (c) return interstitial fluid to blood.

Very Short Answer Type Questions

5. In the absence of haemoglobin, which function of blood gets affected? Explain.

Ans. Transport of oxygen through red blood cells gets affected.

6. Name the vessel that carries oxygenated blood from lungs to the heart. What is the significance of pulmonary circulation?

Ans. Pulmonary vein.

Pulmonary circulation is vital for oxygenating blood. It carries deoxygenated blood from the heart's right ventricle to the lungs, where it releases carbon dioxide and absorbs oxygen. The oxygen-rich blood then returns to the heart's left atrium, ensuring oxygen supply to tissues throughout the body for proper function.

7. What do you understand by blood pressure? Name the instrument used to measure blood pressure.

Ans. Blood pressure is the force exerted by circulating blood on the walls of blood vessels, primarily arteries. It is measured in two values - systolic pressure (when the ventricles contract) and diastolic pressure (when the ventricles relax). Sphygmomanometer.

8. Name a circulatory fluid other than blood in our body.

Ans. Lymph.

9. What is the liquid part of the blood called? What is the function of platelets in the blood?

Ans. Plasma.

Platelets help in clotting of blood.

10. Why is it essential to separate oxygenated and deoxygenated blood in mammals and birds?

(CBSE 2016)

Ans. Mammals and birds are warm blooded animals. Separating oxygenated and deoxygenated blood helps to provide them more energy required to maintain their body temperature.

11. What are capillaries? State the function performed by them.

Ans. Capillaries are microscopic vessels that connect arteries to veins or venules. Their walls are thin to facilitate the exchange of food material, gases (oxygen and carbon dioxide) and waste between the blood and the tissues.

12. Why is the force of blood greater in arteries than in veins?

Ans. Arteries carry blood from heart to different parts of the body while veins carry blood from different parts of the body back to the heart. The pressure of the blood that emerges from the heart is very high which helps in carrying blood to all parts of the body whereas, the pressure of the blood that emerges from different body parts is not high. So the force of blood is greater in arteries than in veins.

13. State the difference between systemic circulation and pulmonary circulation.

Ans. Systemic circulation is composed of vena cava, aorta, arteries veins and other blood vessels and involves the circulation of blood between heart and entire body (except lungs) while pulmonary circulation is composed of pulmonary artery and pulmonary veins and involves circulation of blood only between the heart and the lungs.

14. Name the type of blood (oxygenated/ deoxygenated) transported by each of the following mentioning the path (i.e. from one organ (which place) to another (which place)).

(a) Vena cava (b) Pulmonary artery

(CBSE 2023)

Ans. (i) Vena cava: Transports deoxygenated blood from the body (various organs and tissues) to the heart's right atrium.

(ii) Pulmonary artery: Transports deoxygenated blood from the right ventricle to the lungs for oxygenation. This follows the path where blood flows from the right atrium to the right

ventricle, and then the right ventricle pumps it through the pulmonary artery to the lungs for oxygenation.

Short Answer Type Questions

15. What is lymph? State two major functions of lymph.

Ans. Lymph is a colourless fluid. It is a part of the tissue fluid. Lymph consists of a fluid matrix in which the white blood corpuscles or leucocytes are present. The lymph in the lymph capillaries lacks leucocytes, but receives them as it passes through the lymph nodes. Functions of lymph are:

(i) It carries carbon dioxide and nitrogenous waste materials that diffuse into the blood through the tissue fluid.

(ii) It carries lymphocytes and antibodies from the lymph nodes to the blood.

(iii) It transports fats (fatty acids and glycerol) from the intestine to the blood.

(iv) It destroys microorganisms and foreign particles in the lymph nodes.

(v) It drains excess tissue fluid from the intercellular spaces back into the blood.

16. State one function of the cellular elements of blood.

Ans. Three types of cellular elements are found suspended in the plasma:

Red blood corpuscles (RBCs) or erythrocytes

White blood corpuscles (WBCs) or leucocytes

Platelets

Red blood corpuscles or erythrocytes are biconcave and enucleated cells which are red in colour due to iron containing pigment called haemoglobin. It carries oxygen from one part of the body to another. Haemoglobin also carries some of the carbon dioxide from body tissues to the lungs.

White blood corpuscles or leucocytes are round or irregular-shaped cells and are capable of amoeboid movement. WBCs help in destroying foreign substances, specially bacteria, by engulfing them. By doing so they defend the body from diseases, i.e. they are responsible for immunity.

Platelets are colourless, oval or round, cytoplasmic fragments formed in the bone marrow. They play a major role in blood clotting. They release a chemical, thromboplastin, which initiates the process of clotting of blood.

17. (a) Ram's blood pressure is 120/80 mm Hg. How do you explain it?

(b) What will happen if human beings have single circulation of blood?

Ans. (a) The pressure of blood inside the artery during ventricular systole (contraction) is called systolic pressure and pressure in artery during ventricular diastole (relaxation) is called diastolic pressure. Ram's blood pressure is 120/80 mm Hg means that the systolic pressure is 120 mm Hg and diastolic pressure is 80 mm Hg.

(b) If human being have single blood circulation, there will be mixing of oxygenated and deoxygenated blood. Therefore, less energy will be produced in body which will be insufficient to maintain the body temperature.

18. (a) Name the blood vessel that brings deoxygenated blood to the human heart.

(b) Which chamber of the heart receives deoxygenated blood?

(c) Describe how deoxygenated blood from this chamber is sent to lungs for oxygenation.

Ans. (a) Vena cava

(b) Right atrium

(c) The impure blood coming from various parts of the body is collected in the right atrium from where it is sent to the lungs through the pulmonary artery. Blood is purified in the lungs. It is then sent through the pulmonary vein to the left auricle or atrium from where it comes into ventricle and then to various parts of the body through aorta.

Long Answer Type Questions

19. Describe the flow of blood through the heart of human beings.

Ans. Since blood flows twice through the heart in each circuit, this circulation of blood in the human heart is called double circulation. Circulation of blood between the heart and body organs (except lungs) is called systemic circulation. Circulation of blood between the heart and the lungs is called pulmonary circulation.

When all the four chambers of heart are relaxed, the oxygenated blood from lungs enters the left atrium through pulmonary vein. The left atrium is relaxed while collecting the blood.

Now, the left atrium contracts and the oxygenated blood is pushed into the expanded left ventricle.

Now, the left ventricle contracts and the oxygenated blood is pumped into the aorta. The oxygenated blood is then transferred to all parts of the body except lungs. This is how blood rich in oxygen is supplied to all parts of the body. The deoxygenated blood from body is carried to right atrium as it expands. When the right atrium

contracts, the right ventricle dilates transferring the blood to the right ventricle. The right ventricle pumps deoxygenated blood to the lungs for oxygenation.

20. Draw the sectional view of human heart and label the following parts given below:

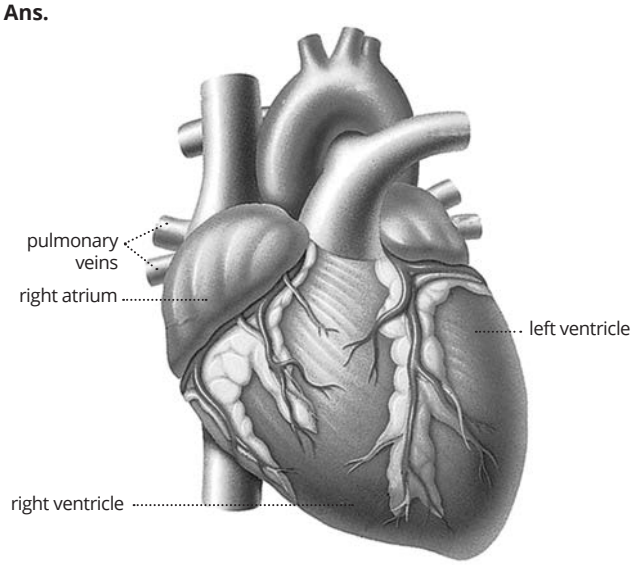
(a) Part which receives deoxygenated blood from vena cava.

(b) Part which sends deoxygenated blood to lungs through pulmonary artery.

(c) Part which sends oxygenated blood from lungs.

(d) Part which sends oxygenated blood to all parts of the body through aorta.

Ans.



Higher Order Thinking Skills (HOTS) Questions

(Page 52)

1. Why do doctors give injection in the vein and not in the artery?

Ans. Veins are superficial and easy to access while arteries are deep seated. Blood pressure in arteries is high so puncturing an artery will result in huge blood loss. So doctors give injection in the vein and not in the artery.

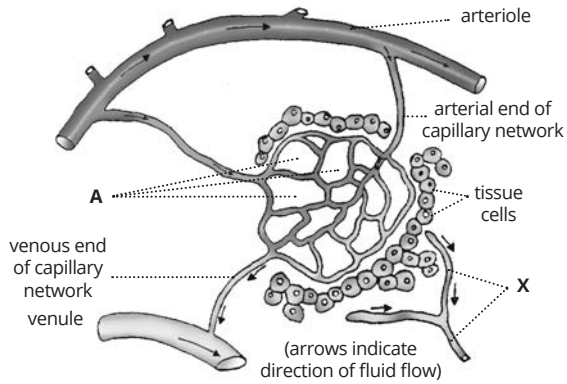
2. Why does lymphatic circulation take place very slowly?

Ans. Lymphatic system is a one way open circulatory system which transports lymph from interstitial spaces of the tissues to the blood vessel. It lacks a central pumping organ like heart. Its transportation takes place due to contraction of lymph vessels. So lymphatic circulation takes place slowly.

3. A certain tissue in a green plant get blocked and the leaves wilted. What was the tissue that was blocked? Give reason.

Ans. The tissue blocked is xylem. Water and mineral absorbed by the roots from the soil is transported to leaves and other parts of the plants through xylem. If xylem is blocked, leaves will wilt due to lack of water.

4. The given diagram shows part of the capillary bed in an organ of the mammalian body. Some of the blood arriving at the capillaries at points labelled A moves out into the spaces between the tissue cells. Study the diagram and answer the questions that follow.



(a) When the liquid from the blood is surrounding the cells, what is it called?

(b) Name any one important component of the blood which remains inside the capillaries and fails to move out into the spaces.

(c) Some of the liquid surrounding the cells does not pass directly back into the blood but eventually reaches it by another route through vessel X. Name the fluid present in vessel X.

(d) State two important functions performed in our body by the fluid present in vessel X.

Ans. (a) Tissue fluid

(b) Erythrocytes

(c) X: Lymphatic vessels. The fluid present in vessel X is lymph

(d) (i) It carries carbon dioxide and nitrogenous waste materials that diffuse into the blood through the tissue fluid.

(ii) It carries lymphocytes and antibodies from the lymph nodes to the blood.

5. Give reasons for the following:

(a) A higher rate of transpiration is recorded on a windy day rather than on a calm day.

(b) Some plants show wilting of their leaves during noon even when the soil is well watered.

Ans. (a) Moving air sweeps away the water vapour in the air outside the stomata. This speeds up diffusion of water vapour from stomata. Thus,

a higher rate of transpiration is recorded on a windy day rather than on a calm day.

(b) This is because of the high rate of vaporization of water during midday, the rate of transpiration is higher than the rate of absorption of water. Thus, the stomata becomes flaccid and close and leaves wilt. But during evening this rate of vaporization of water becomes very less and the stomata becomes turgid and the leaves again stand out erect.

Self-Assessment

(Page 52)

Multiple-Choice Questions

1. The largest artery in the human body is

(a) systemic artery. (b) renal artery.

(c) pulmonary artery. (d) aorta.

Ans. (d) aorta.

2. Blood bank of the body is

(a) spleen. (b) heart.

(c) liver. (d) bone marrow.

Ans. (a) spleen.

3. In which of the following, heart does not pump oxygenated blood to different parts of the body?

(a) Pisces and amphibians.

(b) Amphibians and reptiles.

(c) Amphibians only.

(d) Pisces only.

Ans. (d) Pisces only.

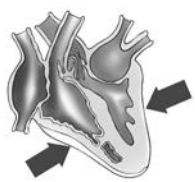
4. The process of carrying food from the leaves to other parts of a plant is called

(a) transpiration. (b) transportation.

(c) translocation. (d) transformation.

Ans. (c) translocation.

5. Identify the phase of circulation which is represented in the diagram of heart given below. Arrows indicate contraction of the chambers shown.



(a) Blood transferred to the right ventricle and left ventricle simultaneously.

(b) Blood is transferred to lungs for oxygenation and is pumped into various organs simultaneously.

(c) Blood transferred to the right auricle and left auricle simultaneously.

(d) Blood is received from lungs after oxygenation and is received from various organs of the body.

Ans. (b) Blood is transferred to lungs for oxygenation and is pumped into various organs simultaneously.

Assertion–Reason Type Questions

For question numbers 6 to 14, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.

(b) Both A and R are true but R is not the correct explanation of the assertion.

(c) A is true but R is false.

(d) A is false but R is true.

6. Assertion: Ventricles of human heart have thicker walls and inter-ventricular septum.
Reason: Ventricles need to pump blood with great force.

Ans. (a)

7. Assertion: Arteries have thicker walls as compared to that of the veins.
Reason: Veins have valves in it to prevent backflow of blood.

Ans. (b)

8. Assertion: Lymph transports fat throughout the body and returns excess interstitial fluids to the blood.
Reason: Lymph is similar to blood plasma but has more protein.

Ans. (c)

9. Assertion: Capillaries are the only blood vessels through which exchange of material takes place.
Reason: White blood cells play a role in the clotting of blood.

Ans. (c)

10. Assertion: Transpiration is called a necessary evil for plants.
Reason: Transpiration leads to loss of water but helps in the upward movement of water against the force of gravity.

Ans. (a)

11. Assertion: Movement of materials in xylem is unidirectional.
Reason: Movement of materials in phloem is bidirectional/multidirectional.

Ans. (b)

12. Assertion: Humans show double circulation of blood.
Reason: Double circulation has two parts pulmonary circulation and systemic circulation.

Ans. (b)

13. **Assertion:** Left atrium receives oxygenated blood from pulmonary vein.
Reason: Right atrium transfers deoxygenated blood to the right ventricle, which pumps it to the lungs for oxygenation. **(CBSE 2023)**

Ans. (b)

14. **Assertion:** Blood clotting prevents excessive loss of blood.
Reason: Blood clotting is due to blood plasma and white blood cells present in the blood. **(CBSE 2023)**

Ans. (c)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

15. Rahul is fourteen years old and is very fond of eating junk food. He does not like playing outdoor games and spend most of his time with mobile and television. He is gaining weight and feel breathless even after short walks. His ECG has revealed that his arteries are getting blocked. His parents are worried about his health. The doctor has advised him to lose weight and change his lifestyle.

I. (a) Mention the things which are wrong with the lifestyle of Rahul.

(b) List few changes that you would recommend for Rahul.

(c) (i) Expand the term ECG.

OR

(ii) Differentiate between arteries and veins.

Ans. (a) Eating junk food and spending time with mobile and TV are the things which are wrong with Rahul's lifestyle.

(b) Rahul can replace his fast food with healthy food and should exercise everyday.

(c) (i) Electrocardiogram

OR

(ii) Arteries carry blood from the heart to various body parts while veins carry blood from different body parts to the heart.

II. (a) Which of the following habits is/are wrong in lifestyle of Rahul?

(i) Eating junk food (ii) No outdoor games
(iii) No workout (iv) All of these

Ans. (iv) All of these

(b) Which of the changes would you recommend to Rahul for betterment of his health?

(i) He should take healthy diet with vegetables, grains, dairy products, fruits.
(ii) He should completely avoid junk food.
(iii) He should start exercise, jogging or some outdoor games.
(iv) All of these

Ans. (iv) All of these

(c) The full form of ECG is

(i) Electrocardiogram. (ii) Echocardiogram.
(iii) Echocardiography. (iv) None of these.

Ans. (i) Electrocardiogram.

(d) Select the correct statement about artery and vein from the following.

(i) Arteries always carry oxygenated blood.
(ii) Veins always carry deoxygenated blood.
(iii) Arteries have wide lumens while veins have narrow lumens.
(iv) Arteries carry blood away from the heart while veins carry blood towards the heart.

Ans. (iv) Arteries carry blood away from the heart while veins carry blood towards the heart.

(e) A cross section of artery is shown in the given figure. Arteries can be blocked and impaired difficulty in blood flow.

This may occur due to the deposition of

(i) collagen fibres. (ii) low density lipids.
(iii) mucus layer. (iv) proteins.

Ans. (ii) low density lipids.

16. The force exerted by blood against blood vessels is known as blood pressure. The blood pressure in our arteries is much higher than that of the veins. Ramesh's father is suffering from hypertension from past six months which is usually caused by constriction of arterioles and may lead to ruptured artery and internal bleeding. The doctor has prescribed medicines and have put him on a low salt diet.

I. (a) What is hypertension?

(b) Name the instrument with which blood pressure is measured.

(c) (i) Why was he put on low salt diet?

OR

(ii) Mention the normal range of blood pressure.

Ans. (a) Hypertension or high blood pressure, is a medical condition in which the blood pressure in the arteries is elevated.

(b) Blood pressure is measured with sphygmomanometer.

(c) (i) Reduction in dietary salt is an effective way to reduce blood pressure.

OR

(ii) An optimal blood pressure level is 120/80 mmHg.

II. (a) Ramesh's father is suffering from hypertension which means

(i) high blood pressure on vein walls.

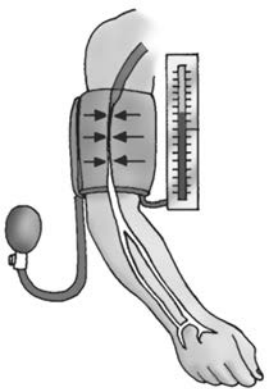
(ii) low blood pressure on artery walls.

(iii) high blood pressure on artery walls.

(iv) low blood pressure on vein walls.

Ans. (iii) high blood pressure on artery walls.

(b) The given figure shows the method of measuring blood pressure. Name of the instrument is



(i) stethoscope.

(ii) electrocardiogram.

(iii) sphygmomanometer.

(iv) echocardiogram.

Ans. (iii) sphygmomanometer.

(c) Why is he prescribed for low salt diet?

(i) Low salt diet decreases blood calcium level.

(ii) Low salt diet reduces high blood pressure.

(iii) Low salt diet increases blood cholesterol level.

(iv) All of these.

Ans. (ii) Low salt diet reduces high blood pressure.

(d) The normal range of blood pressure is

(i) 140/80 mmHg (ii) 70/130 mmHg

(iii) 120/80 mmHg (iv) 100/70 mmHg

Ans. (iii) 120/80 mmHg

(e) Select the incorrect statement about arteries.

(i) Blood flows with high speed within the arteries.

(ii) The walls are thick.

(iii) Valves are present to control the blood flow.

(iv) Blood flows under high pressure.

Ans. (iii) Valves are present to control the blood flow.

Very Short Answer Type Questions

17. Name the extracellular fluid which flows from body tissues to the heart.

Ans. Lymph

18. Name the living component of xylem tissues.

Ans. Xylem parenchyma

19. Name the component of transport system in plants that carries materials in

(a) upward as well as downward direction

(b) only upward direction.

Ans. (a) Phloem (b) Xylem

20. What would be the consequences of deficiency of haemoglobin in your body?

Ans. Deficiency of haemoglobin lowers the oxygen carrying capacity of blood thus decreasing the oxygen supply to the cell. This may lead to release of less energy in our body leading to a condition known as anaemia.

21. What would happen to a plant if its xylem is removed?

Ans. If xylem is removed, upward movement of water from roots to leaves and different parts of the plant will not take place. This will lead to wilting of leaves and the plant will die.

22. What would happen if conducting tubes of circulatory system develops a leak?

Ans. If conducting tube of circulatory system develops a leak, blood loss will take place and there will be a reduction in blood pressure. This will reduce the efficiency of the pumping system.

23. Explain how water and minerals are transported in plants. **(CBSE 2015)**

Ans. Water and minerals are transported through xylem in plants. Tracheids and vessels of xylem form a continuous system of water conducting channel from roots to the upper parts of the plant. The root cells in contact with soil take up ions, which create a difference in the concentration of these mineral ions between roots and the soil. Hence, water from soil diffuses into the root hair. The pressure, with which water is pushed into the xylem tubes of the root, is called root pressure. Root pressure plays a major role in transporting water in small herbs. In tall plants, the main force responsible for upward movement of water is transpiration pull which creates a suction pressure in leaves which pulls the water column in the xylem vessels and tracheids upward.

24. Only deoxygenated blood is pumped through fish's heart. Is it true? Justify your answer.

Ans. Yes, only deoxygenated blood is transported through fish heart. Fish show single blood circulation in which the blood passes through

the heart only once. It has two chambered heart which pumps deoxygenated blood to the gills where it gets oxygenated and transported to rest of the body.

25. Explain how the body temperature of some organisms depend on the temperature of the surrounding.

Ans. The body temperature of cold blooded animals like amphibians and reptiles depends on the temperature of the environment. Such animals have two or three chambered heart and can tolerate little mixing of oxygenated and deoxygenated blood. These animals cannot satisfy the high energy requirement to maintain constant body temperature and changes their body temperature according to the environment.

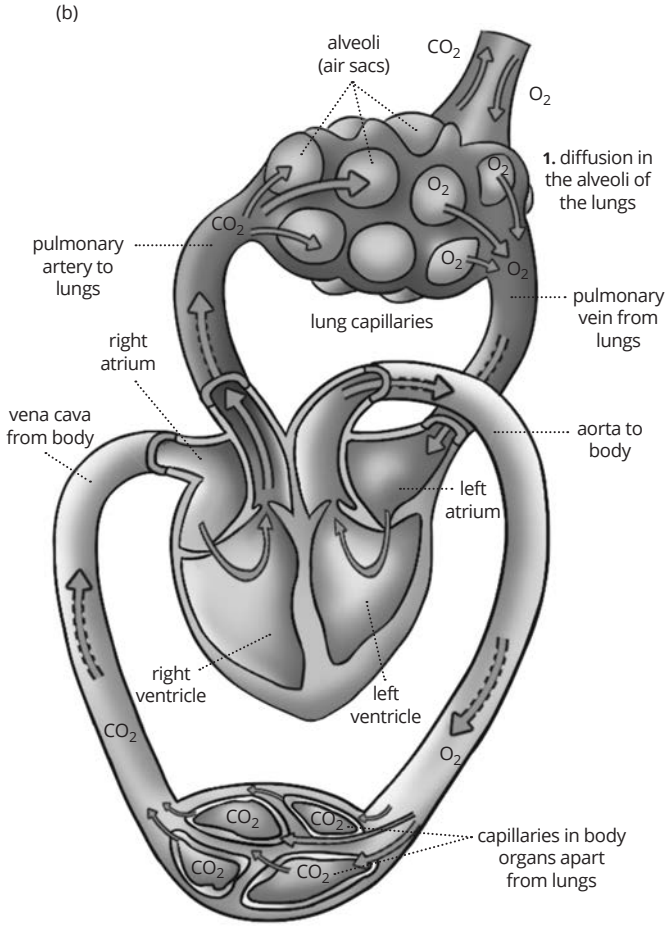
Short Answer Type Questions

26. (a) Name the site of exchange of material between the blood and the surrounding cells.

(b) Draw a schematic representation of transport and exchange of oxygen and carbon dioxide in human body.

Ans. (a) Capillaries.

(b)



Double circulation in human heart

27. The figures given are the cross sections of blood vessels.

(A) **(B)** **(C)**

(a) Identify the blood vessels **A**, **B** and **C**.

(b) Mention two structural differences between **A** and **B**.

(c) Name the type of blood that flows

(i) through **A**. (ii) through **B**.

Ans. (a) A. artery, B. vein, C. capillary

(b) In arteries, valves are absent whereas valves are present in veins. In arteries, lumen is narrow and the wall is thick and more elastic whereas in veins the lumen is wider and the wall is thin and less elastic.

(c) Through A oxygenated blood flows whereas through B deoxygenated blood flows.

28. (a) Which organisms have a three-chambered heart? Why do they have three-chambered hearts?

(b) List two functions of lymph. **(CBSE 2024)**

Ans. (a) All reptiles except crocodiles (four-chambered hearts) have three-chambered hearts.

The three-chambered heart in reptiles represents an evolutionary adaptation from early vertebrates. As reptiles evolved from amphibians, they developed a heart with partial separation of oxygenated and deoxygenated blood, improving circulatory efficiency for their more active, land-based lifestyle. This heart structure reflects an intermediate step in the evolution of more complex hearts, eventually leading to the four-chambered hearts in birds and mammals, which offer complete separation and greater efficiency for higher metabolic demands in more active environments.

(b) Two functions of lymph: Lymph transports fats from the intestine to the blood. It destroys microorganisms in the lymph nodes.

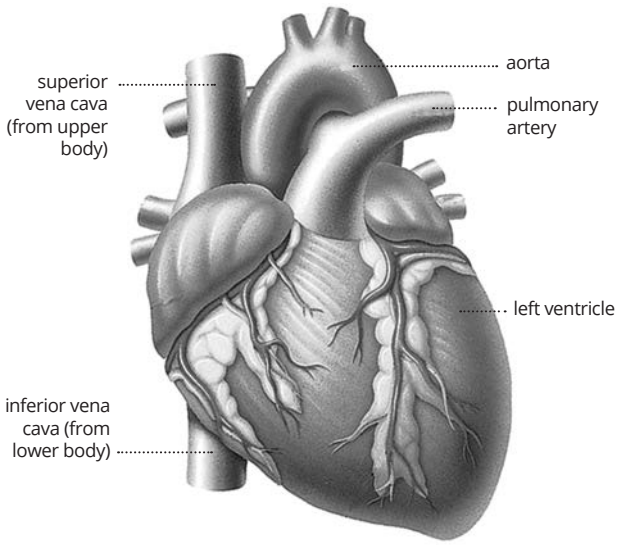
Long Answer Type Questions

29. (a) Draw a sectional view of the human heart and label on it: aorta, pulmonary arteries, vena cava, left ventricle.

(b) State the functions of the following components of a transport system.

(i) Blood (ii) Lymph

Ans. (a)



(b) (i) Functions of blood

Transport of Nutrients: The digested food is absorbed by blood at the site of absorption (intestine) and transported to different organs of the body.

Transport of Respiratory Gases: Blood transports oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs.

Transport of Waste Products: The metabolic waste substances produced in the body are transported by blood to the organs meant for their removal from the body.

Transport of Body Secretions: Blood transports chemical secretions like hormones from the site of their secretion to the target organ.

Defense against Infection: Blood contains white blood corpuscles that are phagocytic in nature. WBCs also produce antibodies which combat the bacteria after neutralising their toxins and thus play a protective role.

Prevention of Blood Loss: At the site of injury, clotting factors present in the plasma (prothrombin and fibrinogen) prevent blood loss by forming a blood clot.

(ii) Functions of the Lymph

The lymph performs many functions:

It transports fats (fatty acids and glycerol) from the intestine to the blood.

It drains excess tissue fluid from the intercellular spaces back into the blood.

It carries lymphocytes and antibodies from the lymph nodes to the blood.

It destroys microorganisms and foreign particles in the lymph nodes.

It carries carbon dioxide and nitrogenous waste materials that diffuse into the blood through the tissue fluid.

30. (a) Plants absorb water from the soil. How does this water reach to the top of the tree? Explain in detail.

(b) How does translocation take place in plants?

Ans. (a) In tall plants, the main force responsible for upward movement of water is transpiration pull generated in the leaves which pulls the water column in the xylem vessels and tracheids upward. It happens as follows:

(i) Water and minerals are absorbed from the soil by roots, move upward to leaf and diffuse out through the stomata leading to cell transpiration.

(ii) This leads to generation of suction pressure in the leaf. The thin film of water vapour present in the mesophyll cells replaces the water vapour lost from the leaf by transpiration. During this process, water is pulled on by the adhesive and cohesive forces.

(iii) This suction pressure draws water from the leaf xylem towards stomata through the mesophyll cells. The water lost via transpiration is replaced by the water that is pulled out of the leaf xylem.

(b) Translocation of food and other substances takes place through sieve tube and companion cell of the phloem in both upward and downward direction. It is an energy dependent process. Sugars (mainly sucrose) are pumped by active transport into the phloem tissues. Accumulation of sugars in the phloem increases the osmotic pressure of these tissues and leads to entry of water into the tissues by osmosis. This pressure difference moves different substances in the phloem to tissues which have less pressure. Thus, it is the pressure gradient that drives the mechanism of food transport through phloem.

Let's Compete

(Page 55)

Multiple-Choice Questions

1. Which blood vessel does not carry any carbon dioxide?

(a) Pulmonary artery.

(b) Vena cava.

(c) Hepatic vein.

(d) Pulmonary vein.

Ans. (d) Pulmonary vein.

2. Which of the following carries substances upwards as well as downwards in a plant?

(a) Xylem. (b) Companion cells.

(c) Phloem. (d) Tracheids.

Ans. (c) Phloem.

3. Which of the following does not have a valve?

(a) Heart. (b) Arteries.

(c) Veins. (d) Both heart and vein.

Ans. (b) Arteries.

4. Single blood circulation can be seen in which of the following group?

(a) Sharks, whale

(b) Flying fish, bats

(c) Tree frogs, climbing perch

(d) Gold fish, carps

Ans. (d) Gold fish, carps

5. What is correct about pulmonary vein?

(a) It supplies blood to the valves.

(b) It is the longest vein.

(c) It has pure blood that comes from the liver.

(d) It brings oxygenated blood to the left atrium.

Ans. (d) It brings oxygenated blood to the left atrium.

6. In a closed circulatory system, blood is completely enclosed within

(a) vessels. (b) heart.

(c) skeleton. (d) sinuses.

Ans. (a) vessels.

7. Blood pressure is measured by an instrument called

(a) manometer. (b) barometer.

(c) sphygmomanometer. (d) potometer.

Ans. (c) sphygmomanometer.

8. Which of the following is the only conducting tissue in non-flowering plants?

(a) Xylem vessels (b) Sieve tubes

(c) Companion cells (d) Tracheids

Ans. (d) Tracheids

9. The chief function of lymph nodes in mammalian body is to

(a) produce RBCs.

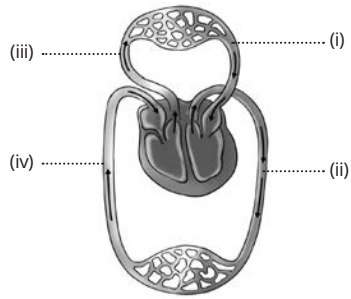
(b) collect and destroy pathogens.

(c) produce hormones.

(d) destroy the old and worn out red blood cells.

Ans. (b) collect and destroy pathogens.

10. The figure given below shows a schematic plan of blood circulation in humans with labels (i) to (iv). Identify the correct label with its functions?



(a) (i) Pulmonary vein - takes impure blood from body part.

(b) (ii) Pulmonary artery - takes blood from lung to heart.

(c) (iii) Aorta - takes blood from heart to body parts.

(d) (iv) Vena cava takes - blood from body parts to right auricle.

Ans. (d) (iv) Vena cava takes - blood from body parts to right auricle.

Life Skills

(Page 55)

1. One of your class fellows Amrit is very weak physically. He gets tired very soon and even his skin appears pale. On medical check-up it has been found that his haemoglobin content in the blood is low.

(a) Which disease is he suffering from?

(b) How does haemoglobin content in our blood affect our health?

(c) What kind of diet should he eat to overcome this problem?

Ans. (a) Amrit must be suffering from anemia.

(b) Haemoglobin is the respiratory pigment which transports oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. If the haemoglobin content in our blood decreases it will affect the exchange of gases and affect may lead to pale skin, fatigue, shortness of breath and dizziness, etc.

(c) Amrit should take iron-rich foods, vitamin C rich foods, beet roots and apples, etc.

2. Sunaina was travelling with her family by car. While moving on the way, they saw a biker on the road who was bleeding profusely. Her mother asked Sunaina's father to stop the car and help the person. Her father however, did not stop as

he feared that they would have to deal with the police enquiry, if they would stop.

Read the above passage and answer the following questions.

(a) What happens, if a person bleeds profusely?

(b) What will you do, if the hospital refuses to provide treatment unless the accident case is registered by police?

(c) What values are shown by the Sunaina's mother?

Ans. (a) A person may die if he/she bleeds profusely. Blood is the fluid which transports oxygen and nutrients to all parts of the body. Loss of blood may lead to the death of the person.

(b) I will try to convince the hospital authorities to provide immediate treatment to the patient as the patient might die if not attended immediately.

(c) The values shown by her mother are humanity, kindness and concern for others.

3. Water plays an important role in plants life processes like photosynthesis and transpiration. Most of the water absorbed is lost through transpiration and it is still not consider as wastage but necessary.

Now, answer the following questions.

(a) How can water be saved while growing plants on land available in the house?

(b) How would reduction of water wastage help?

(c) Though most of the water absorbed by plant is lost through transpiration. Still it is not considered as wastage. Comment.

Ans. (a) We should not waste water while watering plants rather water plant with right amount of water with the help of sprinkler or hose pipe. We should grow plant which needs less water. We can also collect rainwater or reuse old water for watering plants.

(b) Reducing water wastage helps to conserve water which is a very important natural resource and it also saves energy used in supplying water to our homes.

(c) Transpiration is not considered a wastage rather it has many advantages. Water is conducted in tall plants due to transpiration pull. Transpiration also helps to regulate the temperature of plants by keeping it cool.

4. Amit studied transportation in plants. He wanted to observe the process of transpiration and placed a plant in bright sunlight and noted his observations. Next day he asked his teacher some questions about his observations. Read the above passage and answer the questions.

(a) What is the role of transpiration in plants?

(b) Explain how the transpiration rate is affected by

(i) decreasing the humidity of the surrounding air.

(ii) increasing the temperature of the surrounding air.

(c) What values do you observe in Amit?

Ans. (a) Role of transpiration in plants are:

(i) Water is conducted in tall plants due to transpiration pull.

(ii) Transpiration also helps to regulate the temperature of plants by keeping it cool.

(b) (i) Rate of transpiration increases by decreasing the humidity of the surrounding air as rate of evaporation increases on decreasing humidity. Therefore more water will be lost by plants by transpiration.

(ii) Rate of transpiration increases on increasing the temperature of the surrounding air. With increase in temperature the water holding capacity of the surrounding air decreases and water evaporates more rapidly. Therefore plant will lose more water by transpiration.

(c) Amit is curious, observant, intelligent and aware.

(IV) Excretion

Check Your Progress

(Page 62)

Multiple-Choice Questions

1. The substance which is not reabsorbed into the blood capillaries surrounding the tubule of a nephron is mainly

(a) glucose. (b) amino acid.
(c) urea. (d) water.

Ans. (c) urea.

2. In *Amoeba*, ammonia is excreted through

(a) plasma membrane. (b) food vacuole.
(c) contractile vacuole. (d) both (b) and (c).

Ans. (c) contractile vacuole.

3. Which blood vessel takes blood away from the kidney?

(a) Renal portal vein (b) Renal vein
(c) Afferent arteriole (d) Efferent arteriole

Ans. (b) Renal vein

4. The correct path in urine formation is

(a) kidney → ureter → bladder → urethra.
(b) bladder → kidney → ureter → urethra.
(c) kidney → ureter → urethra → bladder.
(d) kidney → bladder → urethra → ureter.

Ans. (a) kidney → ureter → bladder → urethra.

Very Short Answer Type Questions

5. What is a nephron? Where do nephrons discharge their contents?

Ans. The nephron is the basic structural and functional unit of a kidney. Nephrons discharge their contents in the collecting duct.

6. Why is the right kidney positioned slightly lower than the left kidney?

Ans. The right kidney is positioned slightly lower than the left kidney as the right side of the abdominal cavity is occupied by the liver.

7. What happens to useful substances present in filtrate in nephron?

Ans. The useful substances present in the filtrate are reabsorbed through the walls of nephric tubules and returned to the blood flowing in capillaries.

8. Name the two parts of a plant through which its gaseous waste products are released into the air.

Ans. Stomata and lenticels.

9. What is the role of glomerulus in the kidney?

Ans. The function of glomerulus is to filter the blood passing through it.

10. (a) What are the main toxic wastes that the kidney filters from the blood?

(b) Name any two substances, which are selectively reabsorbed from the tubules of a nephron.

Ans. (a) Urea and uric acid are the main toxic wastes that the kidney filters from blood.

(b) Water, glucose, amino acid and salts are selectively reabsorbed from the tubules of nephrons.

11. Tabulate differences between renal artery and renal vein.

Ans. The renal artery carries oxygenated blood to the kidney. The renal vein carries deoxygenated blood away from the kidney. The amount of urea in high in the blood flowing through renal artery and low in the blood flowing through renal vein.

12. Name the factors on which amount of water reabsorbed along the tubular part of nephron depends.

Ans. The amount of water reabsorbed depends on how much excess water is there in the body and how much of dissolved waste is there to be excreted.

13. What is osmoregulation? Name the organs of osmoregulation in

(a) human beings. (b) *Amoeba*.

Ans. Osmoregulation is the process of maintaining salt and water balance within the body.

Organs of osmoregulation in
(a) Human beings are kidneys
(b) *Amoeba* is contractile vacuole.

14. Name the part of the human excretory system where nephrons are found. Write the structure and function of nephrons. **(CBSE 2023)**

Ans. Nephrons are found in the kidneys, the main organs of the human excretory system. Each nephron has a Bowman's capsule, which filters blood to form filtrate and tubules (Proximal Convoluted Tubule, Loop of Henle and Distal Convoluted Tubule) for reabsorbing useful substances like glucose, salts and water, and secretion of some waste. The collecting duct transports urine to the ureter. Nephrons perform filtration, reabsorption and urine formation to remove waste products like urea.

Short Answer Type Questions

15. (a) Write the functions of structural and functional unit of kidney.

(b) Write any two functions of an artificial kidney.

Ans. (a) Nephron is the structural and functional unit of kidney. The main functions of nephrons are

filtration of blood, reabsorption of water and other useful metabolites and urine formation.

(b) Artificial kidney is used to purify the blood of a person when the kidney is not functioning normally. Functions of artificial kidney are:

(i) Helps to remove harmful wastes, extra salts and water.

(ii) Maintains the balance of sodium and potassium salts in a patient whose kidneys have damaged.

16. How do plants get rid of their excretory products?

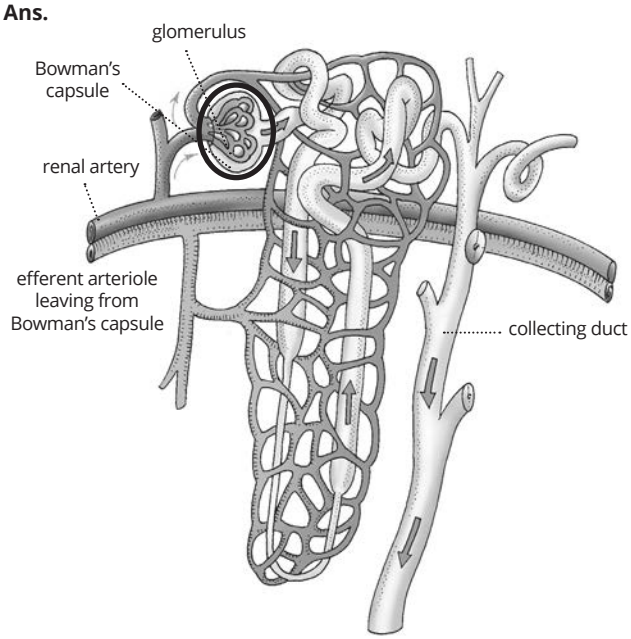
Ans. In plants, there are no special organs for excretion. Plants excrete waste products by various methods. The different waste products released by a plant are carbon dioxide (during respiration), oxygen (during photosynthesis), excess water, resins, gums and some other waste products stored in cellular vacuoles.
The gaseous waste product like carbon dioxide produced during respiration is the raw material for photosynthesis and hence utilised by plants itself. Oxygen produced during photosynthesis is released as waste through stomata on leaves and lenticels found on stems. Excess water produced by plants during respiration escapes by the process of transpiration. Many organic wastes like resins and gums are stored in cellular vacuoles and dead permanent tissues like old xylems. Plants get rid of these wastes by shedding off bark and old leaves. Plants also excrete some waste material into the soil around them.

17. Draw a neat diagram of an excretory unit of human kidney and label the following on it.

(a) Bowman's capsule (b) Renal artery

(c) Glomerulus (d) Collecting duct

Ans.



Long Answer Type Questions

18. Describe in brief the functions of kidney, ureter, urinary bladder and urethra.

Ans. Kidney: It removes nitrogenous wastes like urea and excess water from the blood.

Ureter: It is a tube which carries urine from the kidney to the urinary bladder.

Urinary bladder: The urinary bladder acts as a muscular reservoir for urine before it is discharged from the body.

Urethra: It is a tube through which urine is passed out from the body.

19. (a) Differentiate between excretion and egestion.

(b) Explain the process of excretion in humans.

(c) What are the major constituents of urine?

Ans. (a) Excretion is the process in which metabolic waste is removed from the body. It is associated with the kidneys. In contrast, egestion is the removal of undigested food from the body. It is associated with the alimentary canal.

(b) Elimination of toxic and waste products from the body is called excretion.

In complex organisms such as humans, there is a specialized system for excretion called the excretory system. Excretory system in human beings consists of a pair of kidneys, a pair of ureters, a urinary bladder, and a urethra. Kidney has a structural filtration unit called nephron where the blood is filtered. Each kidney contains a million of nephrons. Capillaries of kidneys filter the blood and the essential substances like glucose, amino acids, salts, and required amount of water are reabsorbed. The pure blood circulates back to other parts through renal vein. Excess water and nitrogenous waste in humans are converted to urine. Urine thus produced is passed to the urinary bladder via the ureters. The urine is stored in the urinary bladder until the pressure of the expanded bladder leads to the urge to pass it out through the urinary opening called urethra.

(c) Major constituents of urine are water and urea.

Higher Order Thinking Skills (HOTS) Questions

(Page 62)

1. Why are glomeruli considered as dialysis bags?

Ans. Glomeruli are considered as dialysis bags as just like the membranous tubes of dialysis

machine, glomeruli filter blood by allowing certain molecules to pass through it and restrict other molecules to move across it. It does not reabsorb any component, just like dialysing tubes.

2. What will happen if there is a sudden shortage of water in the body?

Ans. If there is sudden shortage of water in the body, the tubular part of nephron will absorb more water from the primary filtrate passing through it to maintain a water balance in the body. It will result in concentrated urine and decreased urine output.

3. (a) Urine is acidic while blood is alkaline. Justify.

(b) Why is the urine slightly thicker in summer than in winter?

(c) State the reason for high hydrostatic pressure in glomerulus.

Ans. (a) Urine becomes acidic due to secretion of H^+ ion from blood plasma into urine by renal tubules.

(b) During summer, there is more loss of water from our body due to perspiration. As a result, the tubular part of nephron will absorb more water from the primary filtrate passing through it to maintain a water balance in the body resulting in slightly thicker urine in summer than in winter.

(c) This is because the efferent arteriole, which takes blood away from glomerulus has a smaller diameter than the afferent arteriole, which brings blood to the glomerulus.

4. Why is ammonia directly converted to uric acid in uricotelic organisms?

Ans. Uric acid can be excreted in very little water. Therefore, uricotelic organism synthesize crystals of uric acid from ammonia to conserve water in their bodies.

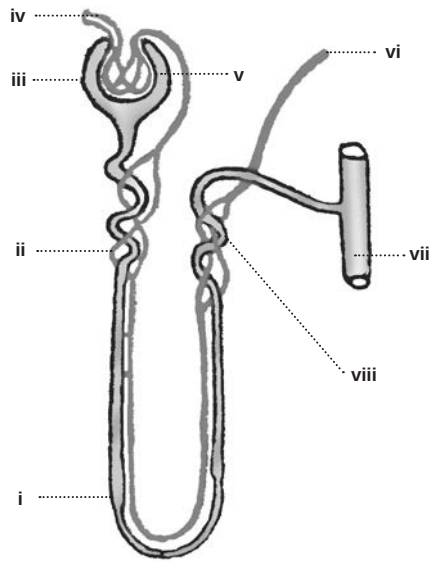
5. Why do we feel an urge to urinate?

Ans. Urine produced in the kidney is stored in the urinary bladder. The urinary bladder is a muscular bag which is under nervous control. When the bladder is filled up the brain signals the urinary bladder to contract and excrete the urine through urethra.

6. The chances of kidney failure are high in patients with high blood pressure. Why?

Ans. High blood pressure can cause damage to the arteries around the kidney due to which the nephrons do not receive oxygen and nutrients and hence the kidney loses its ability to filter blood leading to kidney failure.

7. The given diagram represents a mammalian kidney tubule (nephron) and its blood supply. Parts indicated by the numbers **i.** to **viii.** are as follows.



(i) U-shaped loop of Henle,

(ii) Proximal convoluted tubule with blood capillaries,

(iii) Bowman's capsule,

(iv) Afferent arteriole from renal artery,

(v) Glomerulus,

(vi) Venule to renal vein,

(vii) Collecting tubule, and

(viii) Distal convoluted tubule with blood capillaries.

Study the diagram and answer the following questions.

(a) Where does ultrafiltration take place?

(b) Which structure contains the lowest concentration of urea?

(c) Which structure contains the highest concentration of urea?

(d) What is the difference between tubular reabsorption and tubular secretion?

Ans. (a) Bowman's capsule

(b) Collecting duct

(c) Glomerulus

(d) Difference between tubular reabsorption and tubular secretion.

Tubular reabsorption	Tubular secretion
Water and many solutes are reabsorbed through the walls of nephric tubule and return to the blood in capillaries.	Cells of renal tubule remove wastes from blood and pass them into filtrate.

Self-Assessment

(Page 63)

Multiple-Choice Questions

1. The network of capillaries in a nephron is
(a) Malpighian capsule. (b) Bowman's capsule.
(c) glomerulus. (d) none of these.

Ans. (c) glomerulus.

2. Which of the following is not a part of a nephron?
(a) Henle's loop
(b) Proximal convoluted tubule
(c) Distal convoluted tubule
(d) Cortex

Ans. (d) Cortex

3. Mammalian kidney is
(a) oval. (b) cylindrical.
(c) bean-shaped. (d) trilobed.

Ans. (c) bean-shaped.

4. What will happen if one of the kidneys of a person is removed?
(a) The person will die.
(b) Urea will go on accumulating in blood.
(c) The person will survive and remain normal.
(d) Urination will stop.

Ans. (c) The person will survive and remain normal.

5. Uriniferous tubules are mainly concerned with
(a) concentration of urine.
(b) passage of urine.
(c) reabsorption of useful substances from glomerular filtrate.
(d) removal of urea from blood.

Ans. (c) reabsorption of useful substances from glomerular filtrate.

Assertion–Reason Type Questions

For question numbers 6 to 10, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.
(b) Both A and R are true but R is not the correct explanation of the assertion.
(c) A is true but R is false.
(d) A is false but R is true.

6. **Assertion:** The urinary system only removes ammonia from the human body.
Reason: Skin, lungs, and nose also removes waste from the human body.

Ans. (d)

7. **Assertion:** Nephron is the basic unit of the urinary system.
Reason: Neuron is the basic unit of the nervous system.

Ans. (b)

8. **Assertion:** Filtration in the glomerulus happens under high pressure.
Reason: The diameter of the artery entering the Bowman's capsule is broader than that of the artery leaving it.

Ans. (a)

9. **Assertion:** Dialysis purifies blood outside the body.
Reason: Dialysis should be done with everyone on regular basis.

Ans. (c)

10. **Assertion:** Resins and gums are stored in plants.
Reason: Plants do not have an excretory system like animals.

Ans. (a)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

11. Kidneys are vital organs of human body. Several factors including excessive uric acid formation and salts like calcium oxalate leads to kidney stones and often affect the functioning of the kidneys. Infections or restricted blood flow also reduce the activity of kidneys. Rohit's father has been suffering from kidney failure from past one year. The doctors has prescribed medicines and regular dialysis. They have also advised him to get his kidney function test done on a regular basis.

I. (a) What is the need to monitor his kidney health?
(b) What is haemodialysis?
(c) (i) What is the normal range of kidney filtrate in human adult per day?
OR
(ii) Name the basic filtration unit present in the kidneys.

Ans. (a) Rohit's father has been suffering from kidney problem and therefore it is necessary to monitor toxins in his blood regularly.
(b) The process of purifying blood by an artificial kidney is called haemodialysis.
(c) (i) The normal range of kidney filtrate in human per day is around 180 L per day and average urine output is about 1.5 L daily.

OR

(ii) Nephron

II. (a) Which of the following waste products is eliminated through human kidneys?

(i) Excess salts

(ii) Urea

(iii) Uric acid

(iv) All of these

Ans. (iv) All of these

(b) Which of the following is incorrect in relation to the parts of human excretory system?

(i) A pair of kidneys

(ii) One ureter

(iii) One urinary bladder

(iv) Urethra

Ans. (ii) One ureter

(c) The functional unit of kidney is

(i) renal tubule.

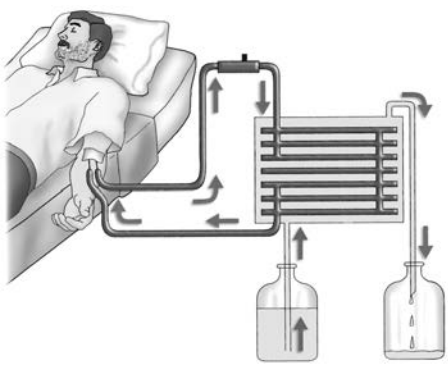
(ii) nephron.

(iii) collecting tubule.

(iv) ureter.

Ans. (ii) nephron.

(d) Haemodialysis is the process of purifying blood artificially as shown in the figure.



During the process of haemodialysis, blood of the patient is taken out from main artery and heparin is mixed with it. Heparin is a/an

(i) antibiotic.

(ii) anticoagulant.

(iii) blood pressure controlling agent.

(iv) blood filtering agent.

Ans. (ii) anticoagulant.

(e) In distal convoluted tubule, ADH promotes

(i) secretion of urea.

(ii) reabsorption of salt.

(iii) reabsorption of water.

(iv) secretion of salts.

Ans. (iii) reabsorption of water.

12. Excretion is the process of removing harmful and toxic substance from the body of an organism. Animals have a well developed excretory system but unlike them, plants have no special organ or organ system for excreting waste products. Plants need to excrete various by-products like carbon dioxide, oxygen, resins, gums and excess water using various methods. But there are many metabolic by-product of plants which are of great commercial importance. Some of them are rubber, essential oils, gums and resins.

I. (a) How do plants get rid of excess water?

(b) Name any two waste products secreted by plants.

(c) (i) Mention one economic importance of metabolic by-product of plants.

OR

(ii) Name two parts of a plant through which its gaseous waste products are released into the air.

Ans. (a) Plants get rid of excess water through transpiration.

(b) Resins and CO_2

(c) (i) Resins are used as adhesives.

OR

(ii) Stomata and lenticels

II. (a) Plants get rid of excess water through the process of

(i) respiration. (ii) transportation.

(iii) transpiration. (iv) translocation.

Ans. (iii) transpiration.

(b) The waste product/products released by plants is/are

(i) CO_2. (ii) O_2.

(iii) resins. (iv) all of these.

Ans. (iv) all of these.

(c) In plants, gaseous waste products are released through

(i) stomata. (ii) lenticels.

(iii) hydathodes. (iv) both (i) and (ii).

Ans. (iv) both (i) and (ii).

(d) Quinine is a useful plant waste product with medicinal properties. It is found in

(i) Poppy flower. (ii) *Cinchona* bark.

(iii) Babool. (iv) Ashoka.

Ans. (ii) *Cinchona* bark.

(e) Which of the following is correct in relation to waste products in plants?

(i) Oxygen is released through stomata during day and night.

(ii) Carbon dioxide is released through stomata during daytime.

(iii) Oxygen is released through stomata during night.

(iv) Carbon dioxide is released through stomata at night.

Ans. (iv) Carbon dioxide is released through stomata at night.

Very Short Answer Type Questions

13. Which contains less nitrogenous waste - renal artery or renal vein? Explain.

Ans. Renal vein

Renal artery contains more nitrogenous waste because from the artery blood is entered into glomerulus for purification.

14. In which part of the nephron does filtrate become hypertonic to blood plasma?

Ans. Collecting duct.

15. Name the different parts of a nephron.

Ans. Each nephron consists of – a Malpighian capsule, a nephric or renal tubule and a collecting tubule.

16. What would happen if there is no reabsorption of water from filtrate in the nephron?

Ans. If there is no reabsorption of water from filtrate in the nephron, excess of water would be lost from the body resulting in death of the person.

17. How is excess water removed by the plants?

Ans. Through transpiration.

18. "About 180 litre of filtrate is produced each day but only 1.5 litre of urine is excreted out." Justify this statement.

Ans. Normally in a healthy adult, the initial filtrate of the kidneys is about 180 litres daily. However, the volume actually excreted is 1.5 litres because the remaining filtrate is reabsorbed in the kidney tubules.

19. Differentiate between urea and urine.

Ans. Urea is produced in the liver by the metabolism of amino acid and nucleic acid. While, urine is a mixture of metabolic wastes produced in the kidney.

20. What happens to glucose that enters the nephron along with the filtrate?

Ans. Glucose that enters the nephron along with the filtrate are selectively reabsorbed by the nephric tubules.

21. What are the components of urine in a healthy person?

Ans. Components of urine in a healthy person are water, urea, uric acid and salts.

22. Mention the pathway of urine in our body starting from the organ of its formation to its excretion. What will happen if the tubular part of the nephron does not work properly? **(CBSE 2024)**

Ans. Urine forms in the kidneys, where blood is filtered in the nephrons. It then passes through the renal pelvis, enters the ureters, and is stored in the bladder. Finally, urine is excreted via the urethra. If the nephron's tubular part fails, reabsorption of water and essential substances is impaired, causing dehydration and imbalanced waste elimination.

Short Answer Type Questions

23. What is the role of following in excretion by various organisms?

(a) Leaves

(b) Ureter

(c) Glomerulus

Ans. (a) Leaves: Some plants store some of their waste products in their leaves in a way as they do not harm the plant as a whole. The plants get rid of these wastes by the shedding of leaves.

(b) Ureter: The pair of ureter transports urine from the kidneys to the urinary bladder.

(c) Glomerules: The function of glomerulus is to filter the blood passing through it.

24. Why do some people need dialysis? What does the dialysis apparatus do?

Ans. Dialysis is needed to filter the blood of the patients whose kidneys are damaged.

Dialysing machine contain a number of tubes with a semipermeable lining suspended in a tank filled with a dialysing fluid. This fluid has the same osmotic pressure as blood, except that it is devoid of nitrogenous waste such as urea. During the procedure of dialysis, the patients blood is passed through these tubes. As the blood flows through these tubes, molecules of compounds like urea, uric acid and creatinine diffuse out in the dialysing fluid. The purified blood is then pumped into the body of the patient through a vein.

25. Define excretion. Write two vital functions of kidneys. **(CBSE 2016)**

Ans. The process of removal of harmful metabolic waste products and salts from the body of an organism is called excretion. Two functions of kidneys are:

(i) Removal of nitrogenous waste

(ii) Osmoregulation

Long Answer Type Questions

26. How does nephron help in urine formation?

Ans. The nephron forms urine in three main steps: ultrafiltration, tubular reabsorption and tubular secretion

(i) Ultrafiltration

Walls of glomerular capillaries and Bowman's capsule are very thin and semipermeable. Hence, they act as ultrafilters. The liquid part of the blood containing nitrogenous wastes, glucose, amino acids, mineral ions, etc., is filtered out in the Bowman's capsule. This forms the glomerular filtrate. Since filtration is under high pressure, it is called ultrafiltration.

After ultrafiltration, the rest of the blood that is left behind in the glomerulus is very thick (because of the liquid part been taken out) and is carried forward by the efferent arteriole. The filtered liquid is also known as nephric filtrate.

(ii) Tubular or selective reabsorption

As this filtrate flows through the nephric tubule also known as renal tubule, several useful substances are reabsorbed through its walls and returned to the blood flowing in capillaries. Water is reabsorbed by osmosis. Selective reabsorption of glucose, amino acids and salts from nephric filtrate into the blood of peritubular capillaries in PCT also takes place.

(iii) Tubular secretion

The cells of the renal tubule also remove wastes from blood and pass into the filtrate by the process of secretion. Tubular secretion removes ammonia, urea, uric acid, creatinine, etc.

27. Give a brief account of various means by which plants get rid of waste produced in their body.

Ans. In plants, there are no special organs for excretion. Plants excrete waste products by various methods. The different waste products released by a plant are carbon dioxide (during respiration), oxygen (during photosynthesis), excess water, resins, gums and some other waste products stored in cellular vacuoles.
The gaseous waste product like carbon dioxide produced during respiration is the raw material for photosynthesis and hence utilised by plants itself. Oxygen produced during photosynthesis is released as waste through stomata on leaves and lenticels found on stems. Excess water produced by plants during respiration escapes by the process of transpiration. Many organic wastes like resins and gums are stored in cellular vacuoles and dead permanent tissues like old xylems. Plants get rid of these wastes by shedding off bark and old leaves. Plants also excrete some waste material into the soil around them.

Let's Compete

(Page 65)

Multiple-Choice Questions

1. Which one of the following is not an excretory activity?

(a) Giving out carbon dioxide

(b) Passing out faecal matter

(c) Sweating

(d) Removal of urea

Ans. (b) Passing out faecal matter.

2. In a cockroach, excretion is performed by

(a) Renette cells. (b) flame cells.

(c) nephridia. (d) Malpighian tubule.

Ans. (d) Malpighian tubule.

3. The basic functional unit of human kidney is

(a) Henle's loop. (b) nephron.

(c) nephridia. (d) collecting duct.

Ans. (b) nephron.

4. The procedure of cleaning the blood of a person by using a kidney machine is known as

(a) ketolysis. (b) hydrolysis.

(c) dialysis. (d) photolysis.

Ans. (c) dialysis.

5. Under normal conditions, which one is completely reabsorbed in the renal tubule?

(a) Urea (b) Uric acid

(c) Salts (d) Glucose

Ans. (d) Glucose

6. The kidneys resemble the contractile vacuole of *Amoeba* in

(a) expelling out excess of water.

(b) expelling out glucose.

(c) expelling out urea and uric acid.

(d) expelling out salts.

Ans. (a) expelling out excess of water.

7. The concentration of urea is highest in

(a) renal vein. (b) hepatic portal vein.

(c) dorsal aorta. (d) hepatic vein.

Ans. (d) hepatic vein.

8. Plants eliminate its gaseous wastes through

(a) stomata. (b) lenticels.

(c) hydathodes. (d) both (a) and (b)

Ans. (d) both (a) and (b)

9. Urine produced in the human kidneys is temporarily stored in

(a) ureters. (b) urethra.

(c) urinary bladder. (d) glomerulus.

Ans. (c) urinary bladder.

10. The cup shaped upper end of nephron is called

(a) Bowman's capsule. (b) glomerulus.

(c) nephrostone. (d) pyramid.

Ans. (a) Bowman's capsule.

Life Skills

(Page 66)

1. Sanjay owns a factory which produces varnishes and glazing agents. One day he decided to visit a forest with his friends to collect fresh resin and gums from the trees of the forest to produce some substances for his factory. On the basis of above text, answer the following questions.

(a) What are gums and resins?

(b) What are the uses of these substances?

(c) What values are shown by Sanjay?

Ans. (a) Gums and resins are the excretory products produced by the plants.

(b) These substances are used in the production of medicine, cosmetics and essential oil for therapeutic uses.

(c) The values shown by Sanjay are awareness and creativity.

2. Rohan has a habit of drinking very less water. His parents and teachers explained him the ill effects of this habit but he did not care. One day while studying in the classroom, he suffered from severe pain in the abdominal area. Teacher immediately called the doctor and his parents. The doctor recommended him to undergo ultrasound by which a kidney stone was diagnosed. Answer the following questions.

(a) What is a kidney stone?

(b) How did Rohan develop stones in his kidney? What are its symptoms?

(c) What values were shown by Rohan's teacher?

Ans. (a) Kidney stones are formed by excessive uric acid and some salts like calcium oxalate. These salts and uric acid take the form of soft stones which affect the functioning of the kidneys.

(b) Rohan developed stones in the kidney due to lack of water as water is needed in our body to dilute uric acid. Symptoms are severe pain in the abdomen.

(c) Rohan's teacher is responsible, caring and concerned.

3. Sunita studied excretion in plants. She observed that oxygen we breathe is actually a waste product of photosynthesis in plants. She wondered about other waste products and their uses. She was also bothered about the increased deforestation which disturbs oxygen-carbon dioxide balance of the environment.

Answer the following questions.

(a) How do plants release gaseous waste from their body?

(b) Apart from oxygen, what other waste products are released by plants? Give two examples along with their uses.

(c) What values are shown by Sunita?

Ans. (a) Plants remove gaseous waste from their body through stomata and lenticels.

(b) Tannins, a waste product of plants are stored in leaves and bark. It is an essential component of tea leaves used all over the world.

Quinine and morphine are medicines derived from alkaloids stored in *Cinchona* bark and poppy flowers, respectively.

(c) Sunita is aware, inquisitive and concerned for environment.

6

Control and Coordination

Checkpoint (Page 69)

1. State two processes in the body that are controlled by the nervous system and two that are controlled by the endocrine system.

Ans. Nervous system controls all the voluntary action like running, speaking and several involuntary actions like breathing and heart beat. It also controls memory, thinking and reasoning skills.

Endocrine system controls the growth, metabolism and reproduction of an organism.

2. Name four endocrine glands and the hormones they secrete.

Ans. Four endocrine gland and the hormones secreted by them are:

Pituitary gland – Growth hormone

Adrenal gland – Adrenaline

Testes – Testosterone

Ovaries – Oestrogen

3. How does the endocrine system control body processes?

Ans. Endocrine system controls body processes by secreting hormones which are carried by blood to the target site to regulate physiological and biochemical processes in our body.

4. Define puberty.

Ans. Puberty is a period of transition from childhood to adulthood in human development during which the body changes under the influence of hormones.

5. Name the hormones that cause changes in the human body during adolescence.

Ans. Testosterone in males and Oestrogen in females.

Check Your Progress 1

(Page 76)

Multiple-Choice Questions

1. Part of the brain which brings about muscular coordination is

(a) cerebrum. (b) cerebellum.

(c) hypothalamus. (d) medulla oblongata.

Ans. (b) cerebellum.

2. Reflex actions are the actions mostly controlled by

(a) brain.

(b) spinal cord.

(c) both brain and spinal cord.

(d) neither brain nor spinal cord.

Ans. (b) spinal cord.

3. In a neuron, conversion of electrical signal to a chemical signal occurs at

(a) cell body. (b) axonal end.

(c) dendritic end. (d) axon.

Ans. (b) axonal end.

4. Which one is not a reflex action?

(a) Knee jerk

(b) Coughing

(c) Closing of eyes on flashing light

(d) Swallowing

Ans. (d) Swallowing

5. Receptors are usually located in sense organs. Gustatory receptors are present in

(a) tongue. (b) nose.

(c) eye. (d) ear. **(CBSE SP 2024)**

Ans. (a) tongue.

Very Short Answer Type Questions

6. What is effector? Give two examples of effectors.

Ans. Effector organ responds by producing movement or secretions. Examples, muscles and glands.

7. Differentiate between afferent nerves and efferent nerves.

Ans. Afferent nerves carry message from receptor to the spinal cord, while efferent nerves carry message from spinal cord to the effector organs.

8. How is spinal cord protected in the human body?

Ans. Spinal cord is protected in human body by vertebral column and three layers of meninges.

9. Why is the flow of signals in a synapse unidirectional?

Ans. Flow of signals in a synapse is always unidirectional as neurotransmitters are always released at the nerve endings. So electrical impulse always travels from dendrites to nerve endings.

10. Which parts of human brain are responsible for auditory reception and sensation of smell?

Ans. Forebrain

11. How are involuntary actions and reflex actions different from each other?

Ans. Involuntary action is the set of muscle movements which do not require thinking. But it is controlled by brain for example beating of heart. While on the other hand, the reflex action is rapid and spontaneous action in response to any stimulus which doesn't involve brain. For example – shutting eyes immediately when bright light is focused on them.

12. What are meninges? State its function. Name the fluid that is filled between the meninges.

Ans. Brain and spinal cord are covered on the outside by three membranes called meninges which help to protect it. The cerebrospinal fluid fills the spaces between the meninges. The fluid protects the brain from shock.

13. What are the key differences between a reflex action and voluntary action?

Ans. Reflex action is an automatic, involuntary, quick and spontaneous response to stimulus which is not consciously controlled by the brain. On the other hand, voluntary actions are responses consciously controlled by the brain.

14. Trace the sequence of events when a bright light is focussed on your eyes. **(CBSE 2015)**

Ans. When a bright light is focussed on eyes, photoreceptors present in eye will generate electrical impulse and pass it on to the brain through sensory neuron. Brain will send message to the pupil of the eye to contact through motor neuron. This is an example of cerebral reflex. Pathway:-

Receptor → Sensory neuron → Brain → motor neuron → pupil of eye → pupil contracts.

15. Write the sequence of events that involve response of a person when a dust particle is inhaled through the nose by him. **(CBSE 2023)**

Ans. When a dust particle enters the nose, it acts as the stimulus and irritates the nasal mucosa triggering sensory nerves. These nerves send signals to the brainstem, which initiates a sneeze. The body forcefully expels air through the nose and mouth, removing the dust particle to protect the respiratory system.

Short Answer Type Questions

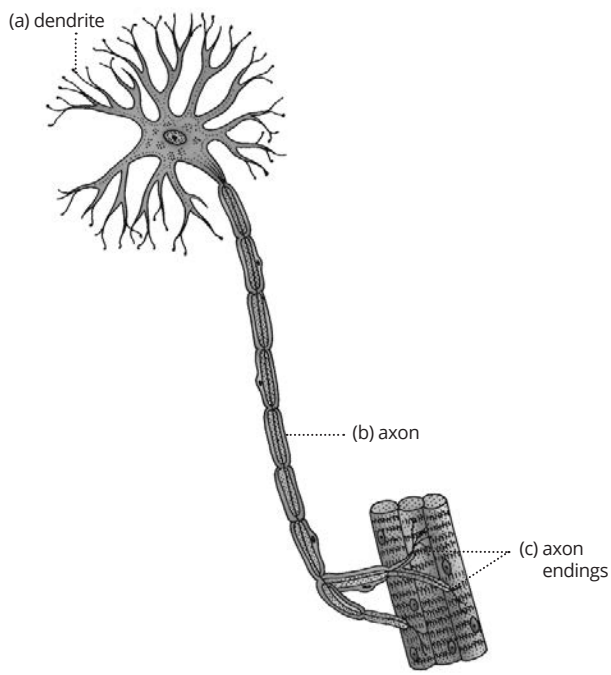
16. Draw a diagram of neuron and label the part

(a) where information is acquired.

(b) through which information travels as an electrical impulse.

(c) where impulse is converted into chemical signal for onward transmission.

Ans.



17. (a) How is brain protected from shock and injury?

(b) Name two main parts of hindbrain and state the function of each.

Ans. (a) Human brain is situated in a bony box, the cranium and it is covered on the outside by

three membranes called meninges which help to protect it. The cerebrospinal fluid fills the spaces between the meninges. The fluid protects the brain from shock.

(b) Two main parts of hind brain are cerebellum and medulla. Cerebellum maintains equilibrium and controls postures. It makes the body movements smooth, steady and coordinated. Medulla contains vital reflex centres, such as cardiac centre and centres for swallowing, sneezing, coughing and vomiting, involuntary actions such as peristalsis, breathing, swallowing, heart beat etc.

18. State the key differences between central nervous system (CNS) and peripheral nervous system (PNS).

Ans. Differences between central nervous system and peripheral nervous system

Central Nervous System	Peripheral Nervous System
Consists of brain and spinal cord.	Consists of nerves arising from brain and spinal cord.
Its function is to organize and analyze the information obtained from sense organ.	Its function is to transmit information from sense organ to the central nervous system and transmit motor impulses from central nervous system to the effector organs.
It coordinates all neural functions.	It transmits information regarding contraction of muscles or glands.
A damage in central nervous system affects the entire body.	A damage in peripheral nervous system causes a local effect on the body.

19. Define reflex action. With the help of a flow chart show the path of a reflex action such as sneezing.

(CBSE 2024)

Ans. A reflex action may be defined as a spontaneous, automatic and mechanical response to a stimulus controlled by the spinal cord without the involvement of brain.

The path of a reflex action is as follows.

Stimulus received by the sensory receptors

↓

Impulse is generated and carried along by sensory neurons towards the spinal cord along the dorsal root

↓

Impulse arrives at the nerve endings of sensory neurons in the grey matter of the spinal cord.

↓

The impulse passes across the relay neuron to the motor neuron via synapse

↓

Impulse travels along motor neurons away from the spinal cord along the ventral root

↓

The nerve endings of motor neuron connect effector organ or muscle

↓

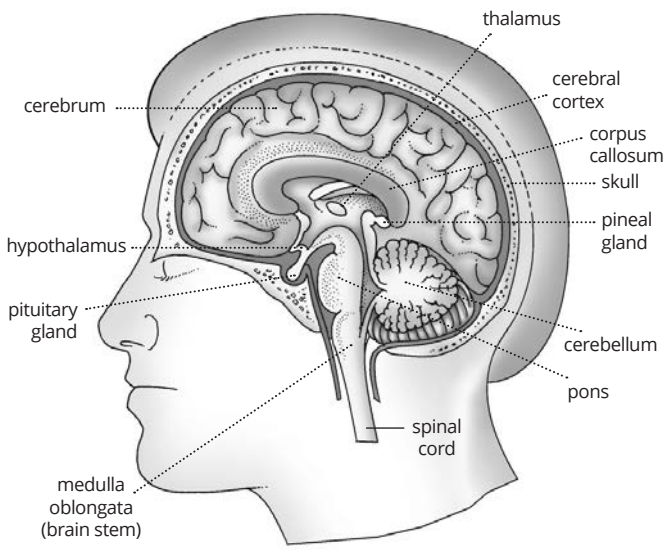
Response produced by effector organ or muscle

Long Answer Type Questions

20. Draw a labelled diagram of human brain and mention the functions of the following: cerebellum, medulla oblongata and forebrain

(CBSE 2015)

Ans.



Parts of the human brain

(i) Cerebellum: Cerebellum maintains equilibrium and controls postures. It makes the body movements smooth, steady and coordinated.

(ii) Medulla: Medulla contains vital reflex centres, such as cardiac centre and centres for swallowing, sneezing, coughing and vomiting, involuntary actions such as peristalsis, breathing, swallowing, heart beat etc.

(iii) Forebrain: All voluntary actions of the body are coordinated by the cerebrum. The cerebrum governs mental abilities like thinking, reasoning, learning, memorising and intelligence. It also controls will, emotions and speech. It is the main thinking part of the brain. Olfactory lobes acts as the centre of smell. Diencephalon possesses control units for body temperature, hunger, thirst, sleep, etc.

21. (a) "All voluntary actions of the body are coordinated by the cerebrum." Justify the statement.

(b) Classify the following as spinal reflex or cerebral reflex.

(i) Closing of eyes when exposed to bright light.

(ii) Taking away the hand on touching a hot pan.

(iii) Knee jerk reflex.

(iv) Salivating at the sight of food.

Ans. (a) Cerebrum is the largest, highly developed and most prominent part of the brain. There are specific sensory areas in the cerebrum which receive sensory impulse from various receptors in skin, eyes, ear, nose, etc. There are separate areas of association where sensory information is interpreted by combining the information from the receptors as well as with the information already stored in the brain. Depending on this, the information on how to respond is passed on to the motor areas from where impulses are sent to the effector organs. Therefore, all the voluntary actions of the body are coordinated by the cerebrum.

(b) (i) Cerebral reflex

(ii) Spinal reflex

(iii) Spinal reflex

(iv) Cerebral reflex

Check Your Progress 2

(Page 81)

Multiple-Choice Questions

1. Which of the following endocrine glands is unpaired?

(a) Adrenal (b) Testes

(c) Pituitary (d) Ovary

Ans. (c) Pituitary

2. Goitre results from

(a) gibberellin toxication. (b) iodine deficiency.

(c) calcium depletion. (d) thyroid dysfunction.

Ans. (b) iodine deficiency.

Very Short Answer Type Questions

3. Name the following.

(a) Endocrine gland present just below the hypothalamus.

(b) Hormone whose deficiency causes diabetes.

Ans. (a) Pituitary

(b) Insulin

4. Name the disorder which occurs due to under secretion of growth hormone from anterior lobe of pituitary in children.

Ans. Dwarfism

5. What is the function of adrenaline hormone in our body?

Ans. Adrenaline controls emotions, fear, anger, blood pressure, heartbeat, respiration and relaxation of smooth muscles.

6. Which type of glands in human body secrete hormones? State any one location of them.

Ans. Endocrine glands, e.g. pituitary gland in the brain, adrenal glands above kidney.

7. Why are endocrine glands called ductless glands?

Ans. Endocrine glands are also called ductless glands because they do not have their own ducts, and their secretions are directly released into the tissue space next to them. These secretions are carried by blood and/or lymph to the target organs.

8. What do you understand by the term 'target organ'? Give one example.

Ans. Target organs are the organs on which the hormones act by triggering a series of biochemical reactions. For example, the target organ for adrenaline hormone is heart which increases the heart beat to supply more oxygen to the muscles.

9. A doctor advised a patient to go on a diet without sugar and take insulin injections also. Name the disease he is suffering from. Why has he been given the two advices?

Ans. He is suffering from diabetes mellitus in which pancreas secretes less amount of insulin which leads to increase in blood glucose level. Therefore, the patient is advised a diet without sugar to prevent further increase in blood glucose level as glucose cannot be utilized by the cells in the absence of insulin. He has been advised to take insulin injection as it will decrease the blood glucose level by depositing extra glucose as glycogen in the liver.

10. Differentiate between nervous control and chemical control.

Ans. Differences between nervous control and chemical control

Nervous control	Chemical control
Rapid short lasting response	Slow long lasting response.
Transmitted electrochemically through nerve fibres.	Secreted directly in blood by endocrine glands.
Localised effect, i.e. reaches only those cells which are connected to nerve cell.	Widespread effect, i.e. reaches all the cell of the body through blood.
Less persistent as neurons need time to reset its mechanism.	More persistent.

Short Answer Type Questions

11. Why is pituitary gland called the master gland? Where is it located and what are its functions?

Ans. Pituitary gland is popularly known as master gland because it controls the functioning of all other endocrine glands.

It is located in the brain just below the hypothalamus of midbrain.

The pituitary releases growth hormone (GH). GH controls the overall development or growth of the body, muscles and bones. It increases the rate of protein synthesis and stimulates fat metabolism.

12. 'Pancreas is the overall controller of blood glucose level'. Give your views.

Ans. Pancreas secretes insulin hormone which overall controls the blood glucose level.

Whenever there is increase in blood glucose, insulin is secreted. Insulin promotes glucose utilization by the body cells.

It stimulates deposition of extra glucose as glycogen in liver and muscles.

13. Why is pancreas referred to as a 'heterocrine gland'?

Ans. Pancreas is referred to as heterocrine gland as it secretes both digestive juice as well as hormones. It has two parts namely an exocrine (duct) part, which produces digestive juices, and an endocrine (ductless) part, which secretes hormones. Its endocrine part contains hormone secreting cells called Islets of Langerhans.

Long Answer Type Question

14. (a) Suggest an explanation for the fact that the chemicals produced by endocrine glands are usually in the form of small molecules.

(b) Name the diseases caused by

(i) undersecretion of thyroxine.

(ii) undersecretion of insulin.

(iii) undersecretion of growth hormone.

(iv) over secretion of growth hormone in adults.

Ans. (a) Chemicals produced by endocrine glands are in the form of small molecules as they can diffuse easily into the blood stream and transported to target organs.

(b) (i) Goitre

(ii) Diabetes mellitus

(iii) Dwarfism

(iv) Gigantism.

15. (a) A doctor has advised Sameer to reduce sugar intake in his diet and do regular exercise after checking his blood test reports. Which disease do you think Sameer is suffering from? Name the hormone responsible for this disease and the organ producing the hormone.

(b) Which hormone is present in the areas of rapid cell division in a plant and which hormone inhibits growth? **(CBSE SP 2024)**

Ans. (a) Sameer is suffering from diabetes.

Under secretion of insulin hormone causes diabetes mellitus.

The endocrine part of pancreas, called Islets of Langerhans, secretes insulin hormone.

(b) Cytokinins are present in the areas of rapid cell division in plants.

Abscisic acid inhibits growth in plants.

Check Your Progress 3

(Page 85)

Multiple-Choice Questions

1. Artificial ripening of fruits is carried out by

(a) auxin. (b) kinetin.

(c) ethylene. (d) ABA.

Ans. (c) ethylene.

2. A big tree falls in a forest but its roots are still in contact with the soil. The branches of this fallen tree grow up vertically. This happens in response to

(a) water and light. (b) water and minerals.

(c) gravity and water. (d) light and gravity.

Ans. (d) light and gravity.

3. Select from the following the correct statement about tropic movement in plants

(a) It is due to stimulus of touch and temperature.

(b) It does not depend upon the direction of stimulus received.

(c) It is observed only in roots and not in stems.

(d) It is a growth-related movement. **(CBSE 2023)**

Ans. (d) It is a growth-related movement.

Very Short Answer Type Questions

4. Where is the auxin hormone made in the plant stem? Name a phytohormone that helps in breaking seed dormancy.

Ans. Shoot apex

Gibberellin

5. Give one example of the movement of a plant part which is caused by loss of water. Give an example of chemotropism in plants.

Ans. Folding of leaflets in *Mimosa* plants.

Growth of pollen tube towards the ovule through style.

6. How shoot and root of a plant respond to light?

Ans. Shoot of a plant moves towards light while roots of a plant moves away from light.

7. What does a plant do in response to water? What is this phenomenon known as?

Ans. Roots of the plants grow towards water. This phenomenon is called hydrotropism.

8. Give an example of occurrence of thigmonasty in nature. Explain how it works.

Ans. The leaflets of *Mimosa* plant fold and droop quickly in response to touch. This is an example of thigmonasty.

The touch triggers a sudden and rapid loss of water from the cells at the base of the leaflets. As a result the cell shrinks. Plants communicate that a touch has occurred through electrochemical means. Thus, in response to touch, plant cell changes shape by changing the amount of water in them, resulting in swelling or shrinking of cell. This results in folding or drooping movement.

9. State the main functions of abscisic acid in plants.

Ans. Functions of abscisic acid are:

(i) Abscisic acid is a growth inhibiting hormone.

(ii) It promotes wilting of leaves.

(iii) It helps in stomatal closure.

(iv) It promotes dormancy of seed.

10. Differentiate between movement of leaves of the sensitive plant and the movement of shoot towards light. **(CBSE 2015)**

Ans.

Leaf movement in sensitive plant	Shoot movement towards light
Nastic movement	Tropic movement
Non directional movement.	Directional movement.
Movement in response to touch.	Movement in response to light.
Movement due in change in turgor pressure of cell.	Growth related movement.

11. Name one directional growth movement each in response to chemicals and water in plants. Write an example for each of them. **(CBSE 2024)**

Ans. The directional growth in plants in response to chemicals is called chemotropism. Example- pollen tube growth on stigma of flower.

The directional growth in plants in response to water is called hydrotropism. Example- movement of root in the direction of water within the soil.

12. Name a hormone that promotes the growth of tendrils and explain how they help a pea plant to climb up other plants. **(CBSE 2024)**

Ans. Auxin is responsible for the growth of tendrils in plants.

In pea tendrils, uneven auxin distribution causes differential growth. The side with higher auxin concentration grows faster, leading to coiling. This growth pattern allows tendrils to wrap around supports, aiding in the plant's climbing and stabilization process.

Short Answer Type Questions

13. What is nastic movement? Explain with the help of an example.

Ans. The movement of a plant part in response to an external stimulus when the direction of response is not based on the direction of stimulus is called nastic movement.

When the non-directional movement of a plant part is in response to touch, it is called thigmonasty. For example, movement in touch-me-not plant (*Mimosa pudica*). In response to touch, the leaflets of *Mimosa* plant fold and droop quickly. The touch triggers a sudden and rapid loss of water from the cells at the base of the leaflets. As a result the cell shrinks. After sometime, the leaflets regain its original shape.

Plants communicate that a touch has occurred through electrochemical means. Thus, in response to touch, plant cell changes shape by changing the amount of water in them, resulting in swelling or shrinking of cell. This results in folding or drooping movement.

14. Name the property that causes tendril to circle around the object. Explain how it happens and how is plant benefitted by it.

Ans. Thigmotropism

The movement of a plant part in response to the touch of an object is called thigmotropism. The tendrils of a plant grow towards a support, touch it and wind around that support. When the tip of a tendril touches a support, the auxin present in it moves away from the support. Therefore, the side of tendril away from support grows longer and faster. It also curves or bends towards the support and as a result winds around the support.

This helps the plants having weak stem to climb along the support.

15. What are phytohormones? State two functions of cytokinin.

Ans. Plants produce certain chemical substances in their cells which regulate their growth. These chemicals are secreted in very minute quantity but have a marked effect on physiological processes in a plant. Some of these chemicals stimulate plant growth while others retard the rate of growth of plants. These chemicals are known as phytohormones.

Functions of cytokinin:

(i) Cytokinin promotes cell division.

(ii) It controls cell enlargement and cell differentiation.

16. What are the different types of tropism? Give an example of each kind.

Ans. There are five types of tropisms found in the plants – phototropism, geotropism, hydrotropism, chemotropism and thigmotropism.

The growth and movement of a plant part in response to light is called phototropism. Shoot moves towards the light then it shows positive phototropism. Root moves away from light then it shows negative phototropism.

The downward movement of roots in response to gravitational force of the earth is called geotropism. Roots show positive geotropism while shoots show negative geotropism.

The movement of plant parts towards water or moisture is called hydrotropism. The roots always grow towards water, therefore roots are positively hydrotropic.

The movement of a plant part due to chemical stimuli is called chemotropism. For example, pollen tube grows through the style towards ovules in response to certain chemical secretions from stigma.

The movement of a plant part in response to the touch of an object is called thigmotropism. For example, the tendrils of a plant grow towards a support, touch it and wind around that support.

Long Answer Type Questions

17. Name the various plant hormones. Also give their physiological effects on growth and development.

(CBSE 2016)

Ans. There are five main types of naturally occurring plant hormones.

(i) Auxin (ii) Gibberellin

(iii) Cytokinin (iv) Ethylene

(v) Abscisic acid (ABA)

Auxin: Auxin is a growth hormone and helps the cells to grow longer. It is synthesized at the shoot and root tip. It has opposite effect on the growth of the stem and roots. It increases cell growth in shoots and decreases cell growth in roots. Auxin controls the phototropic behaviour of a plant. It also controls the geotropic behaviour of a plant.

Gibberellin: Gibberellin promotes cell enlargement in the presence of auxins. It promotes cell division and stimulates stem elongation. It stimulates seed germination by breaking seed dormancy.

Cytokinin: Cytokinin promotes cell division. Therefore, it is present in high concentration in areas of rapid cell division like fruits and seeds. It controls cell enlargement and cell differentiation. Like gibberellin, it also helps in breaking seed dormancy.

Ethylene: Ethylene is a gaseous hormone that has inhibitory effect on growth. It induces ripening of fruits.

Abscisic Acid: Abscisic acid is a growth inhibiting hormone. It also promotes wilting of leaves and dormancy of seed. It also helps in stomatal closure.

18. (a) How do control and coordination take place in plants? How does it differ from that in animals?

(b) State the differences between thigmotropism and thigmonasty. Name one plant exhibiting each.

Ans. (a) Plants do not have nervous system but they still respond to internal and external changes in the environment around them. Plants can detect changes in light, water, touch, chemicals, gravity and respond to these changes by the action of hormones. Since plants do not

have nervous system, they use hormones for coordination and response. Therefore, the function of control and coordination in plants is performed by chemical substances called hormones.

The control and coordination in animals take place by both nervous as well as endocrine system.

(b) The directional movement of a plant part in response to the touch of an object is called thigmotropism. For example, the tendrils of a plant grow towards a support, touch it and wind around that support. It is a growth related movement.

Thigmonastic movement is the non directional movement of a plant part in response to touch.For example, movement in touch-me-not plant (*Mimosa pudica*).

The main difference between thigmotropism and thigmonasty is that thigmotropic movement is directional while a thigmonastic movement is non-directional, i.e. thigmonasty is independent of direction of stimulus.

Higher Order Thinking Skills (HOTS) Questions

(Page 86)

1. 'There is a close coordination between nerves and hormones.' Explain with an example.

Ans. In animals control and coordination is carried out by both nervous and endocrine system. Nervous system generates and transmits electrical impulse while endocrine system secretes hormones which diffuse in the blood to reach the target site. These two systems work in close coordination in animal's body to carry out a particular function effectively. For example, when an emergency stimulus is detected by the nervous system, it generates and sends electrical impulse to the CNS to analyze it which in turn sends message to the effector organ for proper response. At the same time the adrenal gland is also activated to secrete adrenaline hormone which prepares the body for the emergency situation by increasing the rate of breathing and rate of heart beat.

2. Due to some reasons the blood glucose level of an otherwise normal person has shot up above normal. How will this condition be returned to normal through hormone action?

Ans. The increase in concentration of blood glucose activates insulin production by beta cells of islets of langerhans in pancreas. This hormone stimulates the conversion of glucose to glycogen. That brings the blood sugar level to normal.

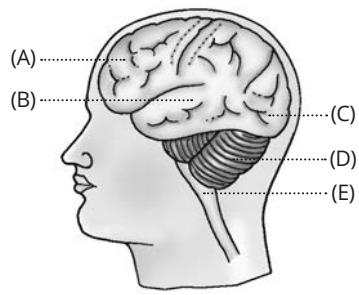
3. Adrenal glands are located on top of each kidney. What will happen if these glands do not secrete adrenaline?

Ans. If the adrenal glands do not secrete adrenaline, our body will not able to prepare itself for emergency situation. The rate of heart beat and breathing rate will not increase. So the body will not be able to produce more energy required to deal with emergency situation.

4. How do we detect the smell of an *agarbatti*?

Ans. The olfactoreceptor present in the nose detects the smell of the *agarbatti* and generates electrical impulse which will be sent to the olfactory lobe of the forebrain via sensory neuron to produce the sensation of smell.

5. The given diagram is that of a human brain. Labels (A) to (E) indicate different parts of the brain as shown. Study the diagram and answer the following questions.



(a) Name the parts labelled (A) to (E).

(b) What handicaps would result from

(i) damage to part labelled (C)?

(ii) damage to part labelled (D)?

Ans. (a) A: Frontal lobe of cerebrum, B: Auditory area of cerebrum, C: Occipital lobe of cerebrum, D: Cerebellum, E: Medulla oblongata.

(b) i. may affect the vision.

ii. will lead to loss of balance of the body and coordination of muscular activities.

Self-Assessment

(Page 86)

Multiple-Choice Questions

1. Abscisic acid controls

(a) cell wall formation.

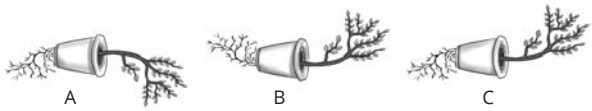
(b) cell elongation and shoot elongation.

(c) leaf fall and dormancy.

(d) cell division.

Ans. (c) leaf fall and dormancy.

2. Observe the three figures given below. Which of the following depicts tropic movements appropriately?



(a) B and C (b) A and C
(c) B only (d) C only
(CBSE SP 2022–23)

Ans. (d) C only

3. The space between meninges is filled with
(a) lymph. (b) blood plasma.
(c) cerebrospinal fluid. (d) hormone.

Ans. (c) cerebrospinal fluid.

4. The function of association area of forebrain is
(a) thinking. (b) memory.
(c) speaking. (d) all the above.

Ans. (d) all the above.

5. Which area of the brain is responsible for control of hunger?
(a) Pituitary (b) Thalamus
(c) Hypothalamus (d) Cerebellum

Ans. (c) Hypothalamus

6. In a nerve cell, the site where the electrical impulse is converted into a chemical signal is known as
(a) axon. (b) dendrites.
(c) neuromuscular junction. (d) cell body.
(CBSE 2024)

Ans. (c) neuromuscular junction.

7. Height of a plant is regulated by
(a) DNA which is directly influenced by growth hormone
(b) genes which regulate the proteins directly.
(c) growth hormones under the influence of the enzymes coded by a gene.
(d) growth hormones directly under the influence of a gene. **(CBSE SP 2024)**

Ans. (c) growth hormones under the influence of the enzymes coded by a gene.

Assertion–Reason Type Questions

For question numbers 8 to 17, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.
(b) Both A and R are true but R is not the correct explanation of the assertion.
(c) A is true but R is false.
(d) A is false but R is true.

8. **Assertion:** Plants show control and coordination due to the presence of nervous system.
Reason: Animals show both movement and locomotion.

Ans. (d)

9. **Assertion:** Neuromuscular junction is a connection between nervous system and the spinal cord.
Reason: Synapse is a connection within the nervous system.

Ans. (b)

10. **Assertion:** Auditory receptors detect sound.
Reason: Gustatory receptors detect sound.

Ans. (c)

11. **Assertion:** Reflexes are faster since they do not involve any thinking.
Reason: Reflexes are mediated through spinal cord without the involvement of the brain.

Ans. (a)

12. **Assertion:** Involuntary actions are controlled by midbrain and hindbrain.
Reason: Fore-brain is the main thinking area of the brain.

Ans. (b)

13. **Assertion:** Hormones are secreted by ductless glands.
Reason: Enzymes are secreted by ductless glands only.

Ans. (c)

14. **Assertion:** Pituitary gland is called the master gland.
Reason: Pituitary gland controls the functioning of rest of the endocrine glands.

Ans. (a)

15. **Assertion:** Plant responses are controlled by a set of phytohormones.
Reason: Plants show quick responses to environmental stimuli.

Ans. (b)

16. **Assertion:** Phototropism is a directional response.
Reason: Gibberellin is a plant hormone responsible for phototropism.

Ans. (c)

17. **Assertion:** Roots are positively phototropic and negatively geotropic.
Reason: Pollen germination and movement towards ovule is an example of chemotropism.

Ans. (d)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

18. Rohan's dad leads a high stress sedentary lifestyle. He has no time to exercise. His food timings are erratic. His food mainly consists of junk food like pizza, burger, soft drinks etc. Of late, he is losing weight and has started feeling fatigued. His appetite has increased, and he feels thirsty all the time. The doctor has advised him to get his blood sugar tested.

I. (a) What do you think his blood sugar test will reveal?

(b) Name the disease and the hormone responsible for it.

(c) (i) What are lifestyle diseases?

OR

(ii) Suggest two lifestyle changes which will help him manage his condition.

Ans. (a) His blood test will reveal high blood sugar level.

(b) The disease caused due to high blood sugar is diabetes and the hormone responsible for this is insulin.

(c) (i) Lifestyle diseases are the diseases which are based on our daily habits including food habits, physical inactivity, wrong body posture, and disturbed biological clock.

OR

(ii) Eating wholegrain food and increasing exercise will help him to manage his condition.

II. (a) What do you think will his blood test reveal?

(i) Hypoglycemia
(ii) Hyperglycemia
(iii) Normal blood sugar level
(iv) None of these

Ans. (ii) Hyperglycemia

(b) What is the normal range of blood sugar level in fasting condition?

(i) >100 mg/dL
(ii) 120–140 mg/dL
(iii) 150 mg/dL
(iv) 200 mg/dL

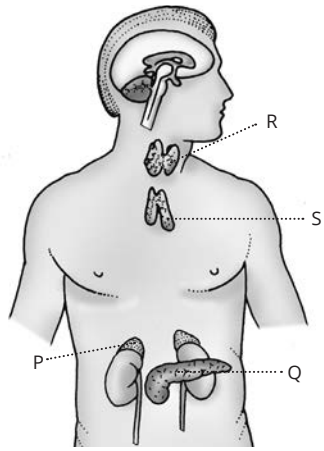
Ans. (i) >100 mg/dL

(c) Which hormone is responsible for diabetes, if secreted in low amount?

(i) Thyroxin (ii) Insulin
(iii) Glucagon (iv) Parathormone

Ans. (ii) Insulin

(d) Some endocrine glands are marked in the given figure. Identify the gland from where the hormone, related with diabetes, is secreted.



(i) P (ii) Q
(iii) R (iv) S

Ans. (ii) Q

(e) What type of lifestyle modification will help him to control his health problem?

(i) To eat healthy food including vegetables, whole grains, etc.
(ii) To start physical exercise
(iii) Manage stress
(iv) All of these

Ans. (iv) All of these

19. We all have seen salt packets labelled as 'iodized salt' or enriched with iodine. It is necessary to take sufficient amount of iodine in our diet because its deficiency leads to swelling in the neck. People with the deficiency of iodine usually suffer from slow metabolism, weight gain and general lethargy.

I. (a) Why is it necessary to have iodine in our diet?

(b) Name the endocrine gland located in our neck.

(c) (i) Which hormone is secreted by the gland present in the neck?

OR

(ii) Mention the functions of the above mentioned hormone.

Ans. (a) Iodine is necessary for the production of thyroxine hormone. A deficiency of iodine in diet can cause a deficiency in thyroxine production in the body.

(b) Thyroid gland is located in our neck.

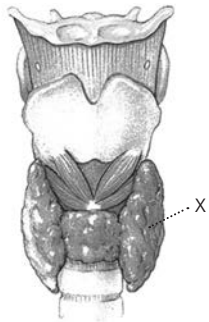
(c) (i) Thyroid gland secretes thyroxine and calcitonin hormones.

OR

(ii) Thyroxine regulates body temperature by energy production, growth and

development of the body, ossification of bones, mental development, activities of the nervous system and metabolism of carbohydrate, protein and fat.

II. (a) Identify the endocrine gland 'X' from the given figure, present in our neck region.



(i) Adrenal gland
(ii) Thyroid gland
(iii) Pituitary gland
(iv) None of these

Ans. (ii) Thyroid gland

(b) Which of the following hormones is secreted by the endocrine gland discussed in the paragraph?

(i) Adrenalin (ii) Thyroxine
(iii) Calcitonin (iv) Both (ii) and (iii)

Ans. (iv) Both (ii) and (iii)

(c) Iodine is essential in our diet as because it is necessary for the production of

(i) adrenalin hormone.
(ii) thyroxine hormone.
(iii) insulin hormone.
(iv) parathyroid hormone.

Ans. (ii) thyroxine hormone.

(d) People with deficiency of iodine usually suffer from the disease

(i) diabetes mellitus.
(ii) hypothyroidism.
(iii) diabetes insipidus.
(iv) hyperthyroidism.

Ans. (ii) hypothyroidism.

(e) Which of the following is/are rich iodine source/s?

(i) Seafood
(ii) Dairy products
(iii) Prunes
(iv) All of these

Ans. (iv) All of these

Very Short Answer Type Questions

20. Mention the sensory receptors present in tongue and nose.

Ans. Tongue: Gustatoreceptor; Nose: Olfactoreceptor

21. Which one of the following actions on touch is an example of chemical control?

(a) Movement on the touch-sensitive plant
(b) Movement in human leg

Ans. (a) Movement on the touch-sensitive plant

22. How does a nerve impulse transmit across the synapse?

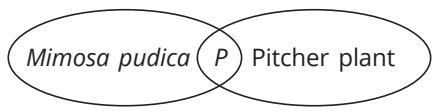
Ans. In response to this electrical impulse, neurotransmitters are released in the synaptic cleft. These chemicals cross the synapse and start a similar electrical impulse in the dendrite of the next neuron.

23. Name the source organ and target organ of adrenaline.

Ans. Source organ: Adrenal gland

Target organs: Heart, diaphragm and rib muscles.

24. According to the given diagram, both plants respond to a particular stimulus, i.e. (a) *Mimosa pudica* (b) Pitcher plant. What process does *P* represent in the diagram?



Ans. P represents thigmonasty.

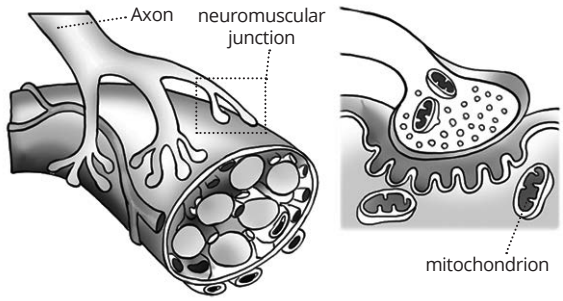
25. State differences between tropic movement and nastic movement.

Ans. Differences between tropic movement and nastic movement:

Tropic movement	Nastic movement
Growth dependent movement.	Growth independent movement.
Slow response to stimulus.	Immediate response to stimulus.
Directional movement towards or away from stimulus.	Non directional movement not based on the direction of stimulus.
Example: Movement of shoot towards sunlight.	Example: Folding of *Mimosa* leaves on touching.

26. Draw a neat and labelled diagram of neuromuscular junction. **(CBSE 2015)**

Ans.



27. Write the functions of the following:

(a) Sensory neuron (b) Cranium

(c) Vertebral column (d) Motor neuron.

Ans. (a) Sensory neuron transmits nerve impulse from sense organs to central nervous system.

(b) Cranium protects the brain.

(c) Vertebral column protects the spinal cord.

(d) Motor neuron transmits electrical impulse from central nervous system to the effector.

28. If you keep a potted plant horizontally for 2-3 days, what type of movements would be shown by the shoot and root after 2-3 days? Why?

Ans. We will observe that shoot will grow towards the sun and root will grow towards the soil. This is because shoot is positively phototropic and negatively geotropic while root is positively geotropic and negatively phototropic.

29. (a) Write the role of insulin in regulating blood sugar levels in human body. Mention the disease caused due to it.

(b) How is the timing and the amount of release of insulin in the blood regulated? **(CBSE 2023)**

Ans. (a) Insulin is a blood sugar level-controlling hormone produced by the pancreas. It helps lower blood sugar by allowing cells to take in glucose and convert it to glycogen for storage. Improper secretion of insulin or its deficiency can lead to diabetes, causing harmful effects by increasing blood sugar levels.

(b) A feedback mechanism regulates the timing and amount of insulin release. The pancreas detects the change caused by increased blood sugar level and secretes more insulin. As blood sugar level decreases, insulin secretion is reduced, maintaining balance.

30. There is a hormone which regulates carbohydrate, protein and fat metabolism in our body. Name the hormone and the gland which secretes it. Why is it important for us to have iodised salt in our diet? **(CBSE 2024)**

Ans. The hormone thyroxine regulates carbohydrates, protein and fat metabolism in our body. Thyroxine hormone is secreted by the thyroid gland. We are advised to include iodised salt in our diet because iodine is essential for the synthesis of thyroxine hormone. If iodine is deficient in our diet, there is a possibility of suffering from goitre.

31. (a) Write the significance of peripheral nervous system in human beings.

(b) How is human brain protected from mechanical injuries and shocks? **(CBSE 2024)**

Ans. (a) The peripheral nervous system (PNS) connects the brain and spinal cord to the rest of the body. It transmits sensory information, controls voluntary and involuntary actions, and enables communication between the central nervous system and various organs, muscles, and tissues.

(b) Human brain is protected in the cranium or bony box of the skull. Under the skull there are three protective layers of meninges. The cerebrospinal fluid fills the spaces between the meninges and protects the brain from shock.

Short Answer Type Questions

32. (a) Name the system which facilitates communication between central nervous system and other parts of the body. Mention two types of nerves it consists of along with organs of origin.

(b) Where does cerebrospinal fluid occur in our body? Mention any two of its functions.

Ans. (a) The peripheral nervous system facilitates communication between central nervous system and other parts of the body. Two types of nerves of this system are cranial nerves arising from the brain and spinal nerves originating from spinal cord.

(b) Cerebrospinal fluid fills the spaces between the meninges. It protects the brain from shock. It supplies food and oxygen to the brain and removes carbon dioxide and other wastes from the brain.

33. Define phytohormones. How do plants respond to external stimuli? **(CBSE 2015)**

Ans. Plants produce certain chemical substances in their cells which regulate their growth. These chemicals are secreted in very minute quantity but have a marked effect on physiological processes in a plant. Some of these chemicals stimulate plant growth while others retard the rate of growth of plants. Therefore, these chemicals are known as phytohormones.

Plants respond to external stimuli by two types of movements:

1. Tropic movements
2. Nastic movements

The movement of a plant in the direction of stimulus is known as tropism. When the growth movement of the plant part is towards the stimulus, it is called positive tropism. When the growth movement of the plant part is against or away from the stimulus, it is called negative tropism.

The movement of a plant part in response to an external stimulus when the direction of response is not based on the direction of stimulus is called nastic movement.

Long Answer Type Questions

34. (a) Define nerve impulse. Name the structure that helps to conduct a nerve impulse

(i) towards cell body.

(ii) away from cell body.

(b) Why have organisms adapted to use electrical impulse to transmit messages?

(c) State two limitations of the use of electrical impulses. **(CBSE 2016)**

Ans. (a) Nerve impulse is a self-propagated electrical current that travels from one end to another of a neuron for the passage of message.

(i) Dendrite

(ii) Axon.

(b) Electrical impulse is a quick method for response to stimulus. Therefore, it has been adapted by organisms to provide survival advantage.

(c) Limitations of electrical impulse:

(i) Electrical impulse will not reach each and every cell in the animal body. It will reach only those cells that are connected by nervous tissue.

(ii) Once an electrical impulse is generated in a cell and transmitted, the cell will take some time to reset its mechanism before it can generate and transmit a fresh impulse.

35. (a) Differentiate between thigmonasty and photonasty.

(b) "Both overproduction and underproduction of growth hormone leads to disorder in the body." Explain.

Ans. (a) When the non-directional movement of a plant part is in response to touch, it is called thigmonasty. For example, movement in touch-me-not plant (*Mimosa pudica*).

When the non-directional movement of a plant part (usually petals) is in response to light, it is called photonasty. For example, opening and closing of dandelion flower in response to light intensity.

(b) Growth hormone controls the overall development or growth of the body, muscles and bones. It increases the rate of protein synthesis and stimulates fat metabolism. Underproduction of GH in the childhood causes dwarfism while over secretion in the childhood causes gigantism. Moreover, the over secretion of GH in an adult causes acromegaly.

Let's Compete

(Page 89)

Multiple-Choice Questions

1. Hormone which controls cellular metabolism is

(a) adrenaline. (b) insulin.

(c) thyroxine. (d) testosterone.

Ans. (c) thyroxine.

2. Plants bend towards a source of light as a result of

(a) increase in amount of food synthesized by leaves.

(b) change in turgor pressure of cell.

(c) unequal distribution of auxin in the stem.

(d) increased uptake of water by the roots.

Ans. (c) unequal distribution of auxin in the stem.

3. A group of cells in a sense organ which is sensitive to a particular stimulus is called

(a) effector. (b) receptor.

(c) neurotransmitter. (d) impulse.

Ans. (b) receptor.

4. Which of the following is not an involuntary action?

(a) Vomiting (b) Salvation

(c) Heart beat (d) Chewing

Ans. (d) Chewing

5. The growth of tendril in pea plants is due to

(a) effect of gravity.

(b) effect of light.

(c) rapid cell division in tendrillar cells that are away from the support.

(d) rapid cell divisions in tendrillar cells in contact with the support.

Ans. (c) rapid cell division in tendrillar cells that are away from the support.

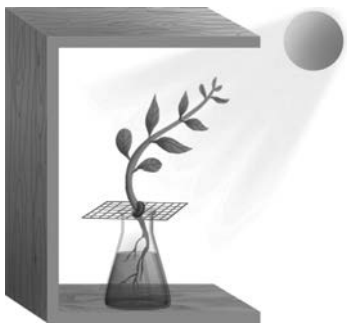
6. Chemicals released at the synaptic cleft are called

(a) hormones. (b) lymph.

(c) cerebrospinal fluid. (d) neurotransmitters.

Ans. (d) neurotransmitters.

7. A student grew a plant in a conical flask. He placed the conical flask in a cardboard box that was open from one side. The box was kept in a way that its open side faces sunlight near the window. After 2–3 days it was observed that the shoot is bent towards the light as shown in the figure alongside. Which type of tropism is being observed in the given figure?



(a) Geotropism (b) Phototropism

(c) Chemotropism (d) Hydrotropism

Ans. (b) Phototropism

8. The hormone which is associated with male puberty is

(a) progesterone. (b) testosterone.

(c) oestrogen. (d) insulin.

Ans. (b) testosterone.

9. All the voluntary actions of our body are controlled by

(a) cerebrum. (b) cerebellum.

(c) pons. (d) medulla.

Ans. (a) cerebrum.

10. The endocrine gland associated with brain is

(a) adrenal. (b) thyroid.

(c) pituitary. (d) pancreas.

Ans. (c) pituitary.

Life Skills

(Page 90)

1. Aakash was walking barefoot on grass in a park. Suddenly he stepped on a nail and withdrew his foot spontaneously.

(a) Name the phenomenon involved in this process.

(b) Which organ in our body controls such stimulus?

(c) What can be done to stop recurrence of such situations in parks?

Ans. (a) Reflex action.

(b) Spinal cord.

(c) We should wear footwear while walking in the park. At the same time we should be careful enough and take precautionary measures to avoid recurrence of such situations. In addition, general public should be more responsible and they should actively participate in keeping the park clean.

2. Ramesh is coming down from 20th floor of a building through a lift. There is nobody else in the lift. Suddenly in the midway, the electricity goes off and the lift stops moving. There is no light inside the lift. His heartbeat increases, mouth becomes dry and pupils of his eyes get dilated.

(a) Name the hormone causing these changes.

(b) Which gland is responsible for releasing this hormone?

(c) What steps should be taken to rescue Ramesh?

Ans. (a) These changes are caused by adrenaline hormone.

(b) This hormone is secreted by adrenal gland.

(c) Ramesh should be first asked to calm down and breathe, and follow the instructions given by the rescue personal properly and also a generator can be switched on to provide electricity to the lift.

3. Smita's father was complaining about frequent urination, pain in legs and a frequent weight loss to Smita's mother and she discussed the things with Smita when she retuned from her school. Listening this, Smita said to her mother that her father should visit a doctor, who told her mother that her husband is having an elevated level of blood glucose. He should take care of his diet and should exercise regularly to maintain his normal glucose level. On the basis of given text answer the following questions.

(a) Name the disease he is suffering from and name the hormone, whose deficiency cause it.

(b) Identify the gland that secretes it and mention the function of the hormone.

(c) Explain, how the time and amount of secretion of this hormone is regulated in human system.

(d) What values were shown by Smita and her father? **(CBSE 2015)**

Ans. (a) He is suffering from diabetes which is caused by deficiency of insulin hormone in the body.

(b) Pancreas secretes insulin which helps in regulating blood glucose level.

(c) When the sugar level in blood rises excessively, it is detected by the cells of pancreas. Pancreas in turn responds by releasing more insulin into blood. The high concentration of insulin lowers the sugar level in blood and when the level reaches a certain limit, the secretion of insulin is reduced automatically. The two opposing systems work in coordination in a method described as feedback mechanism to adjust the output accordingly. This ensures the secretion of the accurate amount of hormone.

(d) Smita is aware, responsible and caring. Smita's father is careless towards his health.

7

How do Organisms Reproduce?

Checkpoint (Page 93)

1. Why is reproduction important?

Ans. Reproduction is important for continuity of species.

2. Name the different methods of asexual reproduction.

Ans. Different methods of asexual reproduction are binary fission, budding, spore formation and vegetative propagation.

3. Explain the difference between viviparous and oviparous animals.

Ans. Oviparous are egg laying organisms while viviparous organisms give birth to young ones.

4. Describe the process of *in vitro* fertilization.

Ans. The fertilization that takes outside the body of the mother is known as *in vitro* fertilization. In this method, the freshly released egg and sperm are kept together for a few hours for fertilization to take place. In case fertilization occurs, the zygote is allowed to develop for about a week and then placed in mother's uterus. Complete development takes place in the uterus and the baby is born like any other baby. Babies born through this technique is known as test tube babies.

5. What is puberty? What changes occur in boys and girls during puberty?

Ans. Puberty is a period of transition from childhood to adulthood in human development during which the body changes under the influence of hormones.

Changes during puberty in males include deepening of voice, widening of shoulders, appearance of beard and moustache, growth of hair under arm and in pubic area, enlargement of external genital organs and formation of sperms.

Changes during puberty in females include growth of hair under arm and in pubic area, widening of pelvis and hip, enlargement of breasts and initiation of the menstrual cycle.

6. What is menstruation?

Ans. Every month, the uterus lining prepares itself to receive a fertilized egg. It becomes thick with a lining of soft and spongy tissue rich in blood vessels. If fertilization does not take place, the ovum along with the uterus lining and blood vessel shed off. This results in bleeding in women which continues for 2-8 days. This is called menstruation.

7. Differentiate between zygote and foetus.

Ans. Zygote is a single celled structure formed by the fusion of male and female gametes. Foetus is a multicellular structure formed by the repeated division of embryo and its differentiation.

8. Describe the process of fertilization in human beings.

Ans. Fertilization in human beings takes place by fusion of sperm and ovum. This happens by transfer of millions of sperms produced by males into the body of females. The sperms swim with the help of their tail to reach the oviduct egg where they come in contact with the egg. One of the sperm fuse with the egg by the process of fertilization to form a single celled structure known as zygote.

9. Define metamorphosis.

Ans. Metamorphosis is the biological transformation of larva into adult.

Check Your Progress 1

(Page 100)

Multiple-Choice Questions

1. Fragmentation is the common method of asexual reproduction in

(a) yeast. (b) *Spirogyra*.

(c) *Amoeba*. (d) *Plasmodium*.

Ans. (b) *Spirogyra*.

2. In *Rhizopus*, tubular thread-like structures bearing sporangia at their tips are called

(a) filaments. (b) hyphae.

(c) rhizoids. (d) roots.

Ans. (b) hyphae.

3. The method commonly used to produce new rose plants is

(a) layering. (b) tissue culture.

(c) cutting. (d) grafting.

Ans. (c) cutting.

4. The process of sporulation is observed in

(a) *Hydra*. (b) *Mucor.*

(c) *Spirogyra.* (d) *Plasmodium.*

Ans. (b) *Mucor.*

5. Select the incorrect match (between the plant and its vegetative part) from the following

(a) *Bryophyllum*, leaf (b) Potato, stem

(c) Money-plant, stem (d) Rose, root **(CBSE 2023)**

Ans. (d) Rose, root

6. In which of the following organisms, multiple fission is a means of asexual reproduction?

(a) Yeast (b) *Leishmania*

(c) *Paramoecium* (d) *Plasmodium*

(CBSE 2024)

Ans. (d) *Plasmodium*

Very Short Answer Type Questions

7. Why do certain animals produce cysts?

Ans. Cyst is a protective covering developed by some organisms to protect themselves from unfavourable condition.

8. How does variation occur during reproduction?

Ans. Variation occurs during reproduction due to errors during copying of DNA.

9. Malarial parasites divide into many daughter individuals simultaneously through multiple fission. State an advantage the parasite gets because of this type of reproduction.

Ans. Large number of offsprings are produced which provides survival advantage to the organism.

10. Why do more complex organisms not give rise to new individuals through regeneration?

Ans. Since multicellular organisms have complex body design having many types of cells, they cannot reproduce by regeneration. Regeneration can be used to produce only those organisms which have simple body design. It is carried by specialized cells which have the ability to proliferate and make large number of cells. The cell mass then undergoes changes to develop the lost part of the body. The cells change shape or become specialized to form different types of tissues which develop into lost organs. These changes take place in an organised manner.

11. State two advantages of grafting.

Ans. The technique of grafting is used to develop plants of superior quality which have a better root system and fruit quality.

12. Name two organisms that reproduce through spore formation. How will an organism be benefitted if it reproduces through spores?

Ans. *Rhizopus* and *Mucor*

Spores are protected by a hard protective covering which enables them to survive the unfavourable condition.

13. List four advantages of vegetative propagation.

Ans. Advantages of vegetative propagation are:

(i) The plants which do not produce viable seeds or produce very few seeds can be propagated by this method, for example banana, potato, sugar cane, grape, orange, rose and jasmine plants.

(ii) The plants raised by vegetative propagation bear flowers and fruits earlier than those produced from seeds. The quality of flowers and fruits is also better.

(iii) It is a cheaper and more rapid method of plant propagation than growing plants from seeds.

(iv) Plants raised through vegetative propagation from a single plant are genetically identical and exact copies of the parent plant. Thus desirable traits can be preserved.

14. Write any two differences between binary fission and multiple fission in a tabular form as observed in cells of organisms.

Ans. Differences between binary fission and multiple fission:

Binary fission	Multiple fission
The parent organism splits to produce two new organisms.	The parent organism divides to produce many new organisms at the same time.

Occurs during favourable environmental condition.	Occurs during unfavourable environmental condition.
Example: *Amoeba, Leishmania*	Example: *Plasmodium*

Short Answer Type Questions

15. (a) Identify whether budding as seen in *Hydra* is a type of sexual or asexual reproduction. Give reasons for your answer.

(b) How is this process different from fission?

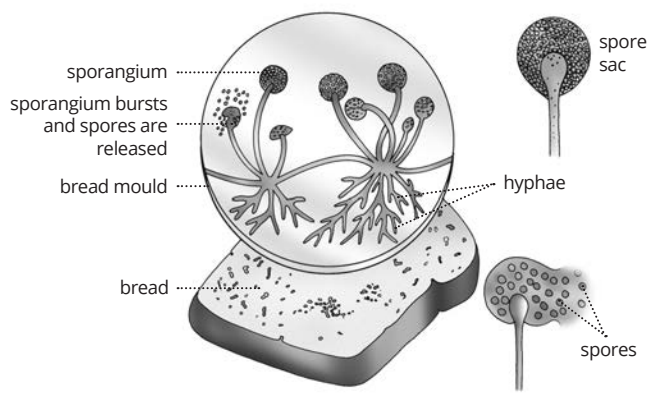
(CBSE 2015)

Ans. (a) Budding is a type of asexual reproduction as a single parent is involved in this type of reproduction and it does not involve the fusion of gametes. In this type of asexual reproduction, a bulb-like projection or outgrowth arises from the parent body, known as bud, which detaches and grows to form a new organism.

(b) In budding, the new individuals develop from the parent as an extra outgrowth whereas in fission, parent's body divides into identical daughter cells.

16. Explain with diagram the process of spore formation.

Ans. Spore formation is a common method of asexual reproduction in lower organisms. In fungi, like *Rhizopus* and *Mucor*, the spores are produced inside the sporangia. Upon ripening, the sporangia burst open to release spores. A spore is a resting state in which the cell is protected by a thick wall during unfavourable conditions. The wall breaks open and releases the spores as the conditions get favourable. Each spore, upon germination, gives rise to a new individual. Fungus like *Penicillium* and non-flowering plants like mosses and ferns also reproduce through spore formation.



Spore formation in bread mould (*Rhizopus)*

17. What is the importance of DNA copying during reproduction? Why are offsprings formed by asexual reproduction genetically similar to their parents?

Ans. Importance of DNA copying during reproduction are:

(i) It helps in transmission of characters from parents to offsprings.

(ii) Errors during copying of DNA leads to variation which is important for evolution of species over time.

Offsprings produced by asexual reproduction are genetically similar to their parents as only a single parent is involved and there is no fusion of gamete. Therefore they lack variation and they are genetically and morphologically identical to their parents.

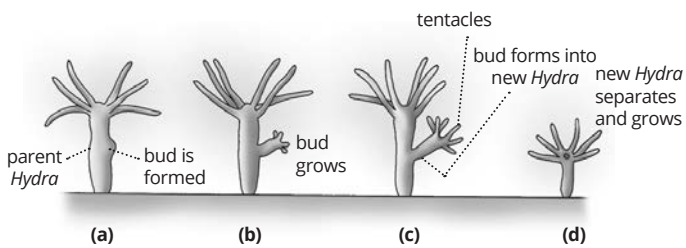
Long Answer Type Questions

18. List in tabular form two differences between asexual and sexual modes of reproduction. Name and explain with the help of a labelled diagram the process by which *Hydra* reproduces asexually.

Ans.

Asexual reproduction	Sexual reproduction
(i) Only one parent is involved.	Two parents are involved.
(ii) Formation of gametes and fertilization are not involved.	Formation of gametes and fertilization are involved.

Hydra reproduces by budding. In *Hydra*, the bud arises from one side of the body in the form of a protuberance. The protuberance grows, and develops a mouth and tentacles at its free end. Finally, it gets detached from the parent and grows independently.



Budding in *Hydra*

19. (a) How is fragmentation different from regeneration?

(b) How is fission different from fragmentation?

(c) Name three plants which can be propagated by cutting. **(CBSE 2015)**

Ans. (a)

Fragmentation	Regeneration
The breaking up of the body of simple multicellular organisms into fragments or pieces such that each of the piece grows to form a new organism is called fragmentation.	The ability of an organism to replace its lost body part(s) by regrowth is known as regeneration.
Fragmentation does not require any specialised cell.	Regeneration is carried by specialized cells which have the ability to proliferate and make large number of cells.
Example: *Spirogyra*	Example: *Planaria*

(b)

Fission	Fragmentation
In this type of reproduction, parent cell splits into two or more daughter cells.	In this type of reproduction, the parent organism breaks into two or more fragments, each capable of growing into a new organism.
Occurs in unicellular organisms.	Occurs in multicellular organisms.
Example: *Amoeba*, *Plasmodium*	Example: *Spirogyra*

(c) Rose, sugar cane, *Bougainvillia*

Check Your Progress 2

(Page 106)

Multiple-Choice Questions

1. At the time of entering into an ovule, the pollen tube has
(a) one gamete nucleus.
(b) two male nuclei.
(c) three male nuclei.
(d) four male nuclei.

Ans. (b) two male nuclei.

2. Pollen grains are produced by
(a) ovary. (b) ovule.
(c) anther. (d) corolla.

Ans. (c) anther.

3. Name the part of a seed which grows and develops into root on germination.
(a) Cotyledon (b) Plumule
(c) Follicle (d) Radicle

Ans. (d) Radicle

4. In tobacco plant, the male gametes have 24 chromosomes. What is the number of chromosomes in the female gamete and in the zygote respectively?
(a) 24, 24 (b) 12, 24
(c) 24, 48 (d) 24, 12

Ans. (c) 24, 48

Very Short Answer Type Questions

5. How is a zygote formed? Name the parts where germ cells of a flower are located.

Ans. A zygote is formed by the fusion of male and female gametes.
Male germ cell of a flower is located in the anther while female germ cell is located in the ovary.

6. Some flowers of papaya develop into fruits whereas others fail to develop into fruits. What may be the possible reason?

Ans. Papaya is a unicellular plant. After fertilization, only female flowers bearing the pistil develop into fruit while male flowers bearing the stamen do not develop into fruits.

7. Define triple fusion.

Ans. Triple fusion is the fusion of two polar nuclei of the embryo sac with one male gamete.

8. Why is fertilization not possible without pollination? **(CBSE foreign 2016)**

Ans. Fertilization is the fusion of male and female gametes while pollination refers to the transfer of pollen grains from anther to stigma of same plant or another plant. Pollen grains contain the male gamete. Therefore, fertilization is not possible without pollination.

9. What is the fate of the non-essential whorls of a flower after fertilization?

Ans. The non essential whorls of a flower are calyx and corolla which generally degenerate and fall off after fertilization.

10. How is a unisexual flower different from a bisexual flower?

Ans. The flowers containing only one sex organ, i.e. either stamen or carpel are called unisexual flowers, for example, flowers of papaya and watermelon. The flowers containing both the sex organs, i.e. both stamen as well as carpel are called bisexual flowers, for example, flowers of mustard and *Hibiscus*.

11. (a) What happens to a pollen grain when it is transferred on the stigma?
(b) Define cross-pollination. Name the agents involved with it.

Ans. (a) When pollen grain is transferred to the stigma, the cytoplasm of the pollen grain absorbs sugar and water from the stigma and bulges out to produce a tube known as pollen tube. The nucleus of the pollen grain divides by mitosis and forms two male gametes. This tube with two male gametes grows down through the stigma and the style towards the ovary.

(b) The transfer of pollen grains from the anther of a flower of one plant to the stigma of a flower of another plant of the same species is called cross-pollination.

It is carried with the help of agents like insects, birds, wind and water.

12. State two major differences between self-pollination and cross-pollination.

Ans.

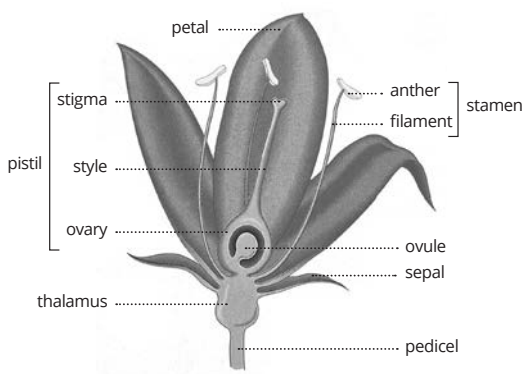
Self-pollination	Cross-pollination
Occurs within a flower or between two flowers on the same plant	Occurs between the flowers of two different plants of the same species
No external agent of pollination required.	External agents such as wind, water, insects and birds are required.
Offspring produced have genetic make-up identical to the parent plant, purity of race maintained, no variation occurs.	Offspring produced may differ in genetic make-up, and variations occur.
Flowers are usually not attractive.	Flowers are attractive with coloured petals.

(any two)

Short Answer Type Questions

13. With the help of a diagram describe the structure of a flower.

Ans.



Structure of a flower

A typical flower has four whorls – calyx (sepals), corolla (petals), androecium (stamens) and gynoecium (carpels).

Sepals are the outermost part of the flower which are usually green and protect the flower in the bud stage.

Petals are coloured and showy. In addition to protecting the reproductive parts, they also attract insects for the purpose of pollination.

Androecium (stamens) and gynoecium (carpels) are the reproductive parts of the flower. Androecium constitutes the male part of the flower called stamens. Each stamen has an upper part called anther and a slender stalk called filament. The anther possesses four pollen sacs and each pollen sac contains many pollen grains. Gynoecium or carpel is the innermost whorl of a flower which lies in its centre. It is the female reproductive part of a flower. Carpel is also known as a pistil. Each pistil consists of three parts – an upper, sticky flat part stigma, a medial, long, cylindrical part style and a lower, swollen part ovary.

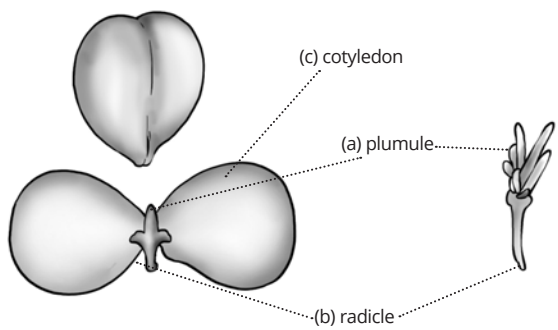
14. Draw a diagram of a germinating seed and label the following parts on it.

(a) Part that gives rise to shoot system.

(b) Part that gives rise to root system.

(c) Part that contains stored food. **(CBSE 2016)**

Ans.



15. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.

(CBSE 2015)

Ans. Chromosome is a thread like structure found in the nucleus at the time of cell division. It is made of DNA and protein.

In sexually reproducing organisms, the germ cells in male or female have only half the number of chromosomes and half the amount of DNA in comparison to the non-reproductive body cells. This is achieved by a process of cell division called meiosis. During sexual reproduction, each parent contributes half of the chromosomes which combine to form a new zygote. This re-establishes

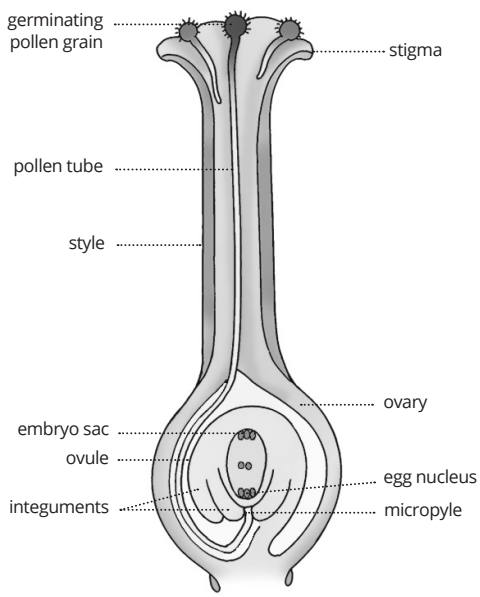
the number of chromosomes and DNA content in the next generation.

Long Answer Type Question

16. (a) Explain with the help of a diagram how pollen after landing on the stigma of a flower helps male germ cell to reach the female germ cell. Label the following: ovary, female germ cell, male germ cell and pollen grain.

(b) Discuss the significance of fertilization in detail.

Ans. (a) For the egg to be fertilized, the male and the female gametophytes must meet and unite their gametes. This is done by pollination, in which pollen grains are deposited on the stigma of the carpel. Under suitable conditions, the cytoplasm of the pollen grain absorbs sugar and water from the stigma and bulges out to produce a tube known as pollen tube. This tube grows down through the stigma and the style towards the ovary. The tip of the pollen tube enters the ovary through the micropyle end. The nucleus of the pollen grain divides by mitosis and forms two male gametes. The pollen grain, with a tube containing two male gametes, forms the mature male gametophyte. The ovule contains the egg cell inside the embryo sac. The tip of the pollen tube after entering ovary ruptures and discharges the two male gametes into the embryo sac. The fusion of male and female gametes is called fertilization. Of the two male gametes, one fuses with the egg to form the diploid zygote. This fusion is called syngamy. The zygote divides several times and forms an embryo. Another male gamete fuses with secondary nucleus and forms the endosperm, a food storing tissue. Since there are two acts of fertilization in the embryo sac, the mechanism is known as double fertilization.



(b) Significance of fertilization:

(i) Original number (diploid) of chromosomes is restored after fertilization.

(ii) It ensures new genetic combination and hence variation in offsprings.

17. (a) Name the parts of a bisexual flower that are not directly involved in reproduction.

(b) Differentiate between self-pollination and cross-pollination. List any two significances of pollination.

(c) What is the fate of ovules and ovary after fertilization in a flower? **(CBSE 2023)**

Ans. (a) The parts of a bisexual flower that are not directly involved in reproduction are:

Sepals: The outermost whorl of modified leaves that protect the developing flower bud.

Petals: The petals are usually brightly coloured and attract pollinators like insects and birds.

While sepals and petals are essential for the flower's overall function, they do not directly participate in the formation of seeds.

(b) In self-pollination, the pollen grains from the anther of a flower are transferred to the stigma of the same flower or another flower on the same plant. In cross-pollination, the pollen grains from the anther of one flower are transferred to the stigma of another flower on a different plant of the same species.

Two significances of pollination:

(i) Formation of seeds: Pollination is essential for formation of seeds, which are necessary for the continuation of the plant species.

(ii) Genetic variation: Cross-pollination leads to the mixing of genetic material from different plants, resulting in genetic variation among offspring. The plant species' adaptation and survival are improved by this genetic variety.

(c) After fertilization, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is gradually converted into a seed. The ovary, which contains the ovules, undergoes significant growth and development and ripens into a fruit.

Check Your Progress 3

(Page 115)

Multiple-Choice Questions

1. The sperm storage organ in human males is

(a) testes. (b) vas deferens.

(c) epididymis. (d) penis.

Ans. (c) epididymis.

2. In human females, an event that marks the start of reproductive phase is

(a) growth of body.

(b) changes in hair pattern.

(c) change in voice.

(d) menstruation.

Ans. (d) menstruation.

3. Which of the following is not a sexually transmitted disease?

(a) Syphilis (b) Warts

(c) HIV-AIDS (d) Diphtheria

Ans. (d) Diphtheria

4. Nutrients are provided to the growing foetus inside the uterus through

(a) placenta. (b) amniotic sac.

(c) oviduct. (d) uterus.

Ans. (a) placenta.

5. Which one of the following organs is NOT a part of human female reproductive system?

(a) Ovary (b) Uterus

(c) Vas deferens (d) Fallopian tube

(CBSE 2024)

Ans. (c) Vas deferens

Very Short Answer Type Questions

6. What is implantation? Expand the following: IUD, AIDS.

Ans. The fixing of embryo in the wall of the uterus is called implantation.

Intra uterine device

Acquired immune deficiency syndrome

7. If a woman is using copper-T, will it help in protecting her from sexually transmitted diseases?

Ans. If a woman is using Copper-T, it will not help in protecting her from sexually transmitted diseases because Copper-T prevents the implantation of embryo in the uterus, but it does not prevent the entry of semen in the vagina. Hence sexually transmitted disease which occurs by contact cannot be prevented by copper T.

8. Fertilization in humans can occur only once in a month. Why?

Ans. Fertilization in humans can occur only once in a month because only one ovum is released by human female every month.

9. What is meant by menopause?

Ans. The permanent stoppage of menstruation at the age of 45–50 years in a woman is known as menopause.

10. What changes are observed in uterus subsequent to implantation of young embryo?

Ans. Subsequent to implantation of young embryo, the uterine wall thickens and gets richly supplied by blood capillaries. The developing embryo is attached to the uterus by a tissue called placenta. Placenta serves as a tissue through which oxygen and food are supplied from the maternal blood to the foetus. It also transports carbon dioxide and excretory waste from the foetal blood to the maternal blood.

11. Name the organ where sperms are produced and name the hormone produced by it. Why do sperms have a tail but ovum does not have it?

Ans. Organ: Testis; Hormone: testosterone.

Sperms are smaller in size and have a tail. Tail allows the sperm to be motile so that it can swim through the female reproductive tract to reach the ovum. Ovum is larger in size and non-motile and hence lack a tail. The ovum is carried from ovary towards the uterus by the ciliary movement of cilia lining the fallopian tube.

12. How do blocking of fallopian tubes prevent pregnancy?

Ans. Blocking of fallopian tube prevents the passage of ova down the fallopian tubes. The eggs continue to be released but do not reach the uterus and hence, no fertilization or implantation takes place.

13. (a) Name the structure in the human male reproductive system that delivers the sperm from the testes to the urethra.

(b) Name the structure in human female reproductive system which delivers the egg from the ovary to the uterus.

Ans. (i) Vas deferens

(ii) Fallopian tube

Short Answer Type Questions

14. Why is the number of sperms produced always more than the number of eggs produced?

Ans. The number of sperms produced is always more than the number of eggs produced because sperms are motile and they have to compete with one another for their existence. They are quite sensitive to environmental factors such as pH and temperature. Sperms have to travel outside the body of males to reach the female reproductive system in which many sperms can be lost, damaged or destroyed. Therefore, to increase the chances of sperm reaching the ovum in the fallopian tube to fertilize it, sperms are produced in large numbers. In the end, only one sperm fuses with ovum.

15. What is the significance of fertilization?

Ans. Significance of fertilization are:

(i) Male and female gametes have half the number of chromosomes. During fertilization, the gametes fuse to restore the original number of chromosomes.

(ii) It combines the character of two parents and introduces variation in the offspring which leads to evolution.

(iii) It makes the egg more active metabolically.

(iv) It initiates the process of embryogenesis by repeated mitotic division.

(v) Fertilization keeps the number of chromosomes constant in a species.

(vi) It brings two different lines of heredity together.

16. Draw a diagram of human female reproductive system and label the following on it.

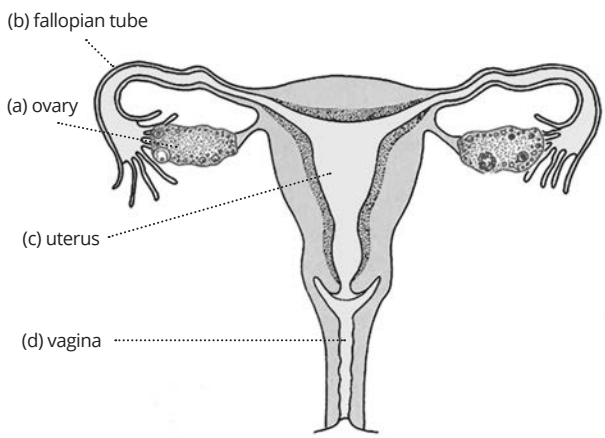
(a) Site of production of egg

(b) Site of fertilization

(c) Site of implantation

(d) Site of entry of sperm

Ans.



Female reproductive organs in human beings

17. Explain the following methods of contraception giving one example of each.

(a) Barrier method

(b) Chemical method

(c) Surgical method

Ans. (a) Barrier method: This approach mainly aims at preventing the passage of semen to the fallopian tube or to prevent implantation. An important advantage of this approach is that it protects the person from sexually transmitted diseases. Condoms, Diaphragm and Intra uterine device are commonly used barrier methods. IUD, like copper-T, is inserted in the uterus which prevents the implantation of embryo in the uterine wall.

(b) Chemical method: In this approach, different methods using chemicals are adopted to prevent fertilization. For example- *Spermicides and Oral contraceptives.* Oral contraceptives prevent ovulation in females.

(c) Surgical methods: Surgical methods are irreversible and provide permanent form of birth control by blocking the vas deferens (in males) or fallopian tube (in females). In vasectomy, each vas deferens is cut and tied at both cut ends by a thread in males. This prevents release of sperms in the semen during sexual intercourse. In tubectomy, the fallopian tubes or oviducts are cut and tied at their ends to prevent the passage of ova down the fallopian tubes in females. The eggs continue to be released but do not reach the uterus and hence, no fertilization takes place.

Long Answer Type Questions

18. (a) Describe in brief the role of

(i) testis. (ii) seminal vesicles.

(iii) vas deferens. (iv) ureter.

(v) prostate gland in human male reproductive system.

(b) What would happen if the mother's blood were to circulate through the embryo?

Ans. (a) (i) Testis: Testis is the male gonad. They produce the male hormone-testosterone and are involved in the formation of spermatozoa.

(ii) Seminal vesicles: The function of seminal vesicles is to store sperms and to secrete seminal fluid that make the sperm active.

(iii) Vas deferens: The vas deferens transports mature sperm from testis to the urethra.

(iv) Ureter: Transports urine from kidney to urethra.

(v) Prostate gland: Prostate gland secretes alkaline fluid which is discharged into the urethra and carries out nourishment and protection of the sperm.

(b) Mother's blood does not circulate through embryo rather the developing embryo is attached to the uterus by a tissue called placenta. It is the physiological connection between the developing embryo and the mother's uterine wall. Placenta serves as a tissue through which oxygen and food are supplied from the maternal blood to the foetus. It also transports carbon dioxide and excretory waste from the foetal blood to the maternal blood. Oxygen and nutrients (glucose, amino acids and salts) from the mother's blood vessels diffuse across into the embryonic blood vessels. On the other hand, carbon dioxide and

nitrogenous waste from the embryo pass to the mother's blood vessels.

19. Describe the menstrual cycle in brief.

Ans. During each menstrual cycle, an ovum is matured and released once every 28 days. The menstrual cycle starts with the menstrual flow, during which the cellular lining of the uterus, with blood flow, is shed off. This process continues for 2–8 days. From the 5th up to the 13th day of the onset of menstrual cycle, growth and maturation of the Graafian follicle takes place. It consists of an ovum and a mass of cells called follicular cells surrounding it. The Graafian follicle produces a hormone, oestrogen. This hormone stimulates the uterus to prepare itself to receive the ovum. The cells lining the uterus grow rapidly and develop a dense network of blood vessels. Ovulation takes place 12–13 days after the onset of menstruation. The Graafian follicle ruptures to release the ovum. These ruptured follicular cells form the *corpus luteum* which secretes the hormone, progesterone. This hormone along with oestrogen stimulate the uterus to maintain its thickening. The release of the ovum from the ovary is called ovulation. The ovum reaches the uterus through the fallopian tube on the 13th or 14th day and stays there up to the 16th day (for 48–72 hours). During this period, if no sperm reaches the ovum the latter starts degenerating. At the end of the 28th day, this ovum is ejected along with the uterine lining. This is the start of a slow disintegration of the thickened lining of the uterus and the next menstrual cycle. Menstruation usually commences 14 days after ovulation and lasts for 2–8 days.

20. (a) What happens when the egg is not fertilized?

(b) How is sperm genetically different from a human egg/ova?

(c) List any three contraceptive methods practised for family planning. Mention how these methods work. **(CBSE 2023)**

Ans. (a) If the egg is not fertilized, it lives for about one day. Since the ovary releases one egg every month, the uterus prepares itself every month to receive a fertilized egg. If the egg is not fertilized, the lining of the uterus, which has thickened to prepare for a potential pregnancy, is no longer needed. At the end of the 28th day, the unfertilized egg is ejected along with the uterine lining. This cycle takes place every month and is known as menstruation. It usually lasts for about two to eight days.

(b) Sperm can carry either an X chromosome or a Y chromosome whereas an egg always carries an X chromosome. This difference in sex chromosomes plays a crucial role in determining the sex of the offspring. If a sperm carrying a Y chromosome fertilizes an egg, a male child (XY) is produced. If a sperm carrying an X chromosome fertilizes an egg, a female child (XX) is produced.

(c) Contraceptive methods fall into a number of categories:

- Barrier (e.g., condoms): It creates a mechanical barrier so that sperm does not reach the egg.
- Hormonal (e.g., pills): It acts by changing the hormonal balance of the body so that eggs are not released, and fertilization cannot occur. These drugs commonly need to be taken orally as pills. However, since they change hormonal balances, they can cause side effects too.
- Intrauterine devices (IUDs): These devices such as the loop or the copper-T are placed in the uterus to prevent pregnancy. They can cause side effects due to irritation of the uterus.

21. Given below are certain situations. Analyze and describe its possible impact on a person.

(a) Testes of a male boy are not able to descend into scrotum during his embryonic development.

(b) Vas deferens of a man is plugged.

(c) Prostate and seminal vesicles are not functional.

(d) Egg is not fertilized in a human female.

(e) Placenta does not attach to the uterus optimally. **(CBSE SP 2024)**

Ans. (a) If testes fail to descend into the scrotum during embryonic development, it can lead to a condition called cryptorchidism. This will increase the risk of infertility, testicular cancer, and hormone imbalances.

(b) When the vas deferens is blocked, it prevents sperm from reaching the urethra, leading to infertility. This condition can result from infections, injuries, or surgical procedures like vasectomy.

(c) If the prostate and seminal vesicles are not functional, it can impair semen production and ejaculation, leading to infertility. This condition also affects the composition and quality of semen.

(d) If the egg is not fertilized in a human female, menstruation will occur to expel the unfertilized egg from the body.

(e) If the placenta fails to attach optimally to the uterus, it can cause complications like preterm birth or restricted fetal growth, risking both maternal and fetal health.

Higher Order Thinking Skills (HOTS) Questions

(Page 116)

1. 'Offspring and parents of organisms reproducing sexually have the same number of chromosomes.' Justify.

Ans. The parents have two sets of chromosomes, i.e. they are diploid. At the time of gamete formation, meiotic division takes place in the gonads resulting in half the number of chromosomes, i.e. haploid number of chromosomes in the gametes. The haploid gametes having single set of chromosomes fuses at the time of fertilization to restore the original number of chromosomes in the offsprings.

2. An interesting modification of flower shape for insect pollination occurs in some orchids, in which the male insect mistakes the pattern on the orchid flower for the female species and tries to copulate with it, thereby pollinating the flower. What type of pollination is observed? What are the advantages of such type of pollination?

Ans. Cross pollination by insect pollinator is observed here. Advantages of cross-pollination are:

i. Seeds produced contain two sources of genetic material which may contain genes which are advantageous for survival of the seedling.

ii. The seeds produced are viable and healthier and have better germinating capacity.

iii. Seeds produce healthier offspring.

iv. Cross-pollination is a source of variation in offspring because of intermixing of genetic make-up of two plants.

3. Why is female reproductive system more complex than the male reproductive system?

Ans. Female reproductive system is more complex than the male reproductive system as female reproductive system provides appropriate healthy and nourishing environment for the growth and development of the foetus. While the male reproductive system only produce and delivers the gametes.

4. Fertilization is possible if mating takes place during the middle of the menstrual cycle. Give reasons.

Ans. Ovulation takes place 12–13 days after the onset of menstruation. The ovum reaches the uterus through the fallopian tube on the 13th or 14th day and stays there up to the 16th day (for 48–72 hours). During this period, if mating takes place, fertilization is possible.

5. 'Surgical methods are permanent method of contraception'. Comment.

Ans. Surgical methods are irreversible and provide permanent form of birth control by blocking the vas deferens (in males) or fallopian tube (in females). In vasectomy, each vas deferens is cut and tied at both cut ends by a thread in males. This prevents release of sperms in the semen during sexual intercourse. In tubectomy, the fallopian tubes or oviducts are cut and tied at their ends to prevent the passage of ova down the fallopian tubes in females. The eggs continue to be released but do not reach the uterus and hence, no fertilization takes place.

6. '*Amoeba* is considered as immortal due to its clever reproduction strategy.' Justify the statement.

Ans. *Amoeba* is called an immortal organism because it reproduces by binary fission in which natural death of preexisting *Amoeba* does not occur rather it loses its existence and its cytoplasm divides equally to produce two new daughter cells and each daughter cell grows into an adult.

Self-Assessment

(Page 116)

Multiple-Choice Questions

1. The embedding of embryo in the wall of the uterus is known as

(a) fertilization. (b) differentiation.
(c) parturition. (d) implantation.

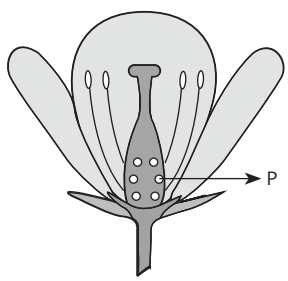
Ans. (d) implantation.

2. Which among the following is not sexually transmitted?

(a) Syphilis (b) Gonorrhea
(c) AIDS (d) None of the above

Ans. (d) None of the above

3. The diagram, given below, displays the structure of a flower. Which process is likely to be disturbed or will not occur if the labelled part P of the flower is removed?



(a) Formation of fruit
(b) Transport of pollen
(c) Formation of pollen
(d) Expansion of pollen tube

Ans. (a) Formation of fruit

4. Which one of the following processes does not lead to the formation of clones?
(a) Fragmentation (b) Fission
(c) Fertilization (d) Vegetative propagation

Ans. (c) Fertilization

5. In a flower, the part that produce male and female gametes respectively are
(a) filament and anther. (b) sepal and stigma.
(c) stamen and style. (d) anther and ovary.

Ans. (d) anther and ovary.

6. A farmer wants to grow banana plants genetically similar enough to the plants already available in his field. Which one of the following methods would you suggest for this purpose?
(a) Regeneration
(b) Budding
(c) Vegetative propagation
(d) Sexual reproduction **(CBSE SP 2024)**

Ans. (c) Vegetative propagation

Assertion–Reason Type Questions

For question numbers 7 to 16, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.
(b) Both A and R are true but R is not the correct explanation of the assertion.
(c) A is true but R is false.
(d) A is false but R is true.

7. **Assertion:** Asexual reproduction leads to more variation in a population.
Reason: Reproduction is a means of self-perpetuation.

Ans. (d)

8. **Assertion:** *Bryophyllum* reproduce through vegetative propagation.
Reason: During vegetative propagation, new plants are formed from adventitious buds.

Ans. (b)

9. **Assertion:** Sexual reproduction is shown by all complex organisms.
Reason: More variations in a population are desirable for survival of a species.

Ans. (a)

10. **Assertion:** *Rhizopus* shows spore formation.
Reason: *Spirogyra* shows fragmentation.

Ans. (b)

11. **Assertion:** Germ cells show half the chromosome number due to meiosis.
Reason: Meiotic division ensures that the number of chromosomes remain constant generation after generation.

Ans. (a)

12. **Assertion:** Budding can be shown by both unicellular and multicellular organisms.
Reason: Binary fission is a method of reproduction in higher organisms.

Ans. (c)

13. **Assertion:** Pollination refers to the fusion of gametes and fertilization is the transfer of pollen grains to the stigma.
Reason: Pollination is the transfer of pollen to the stigma and fertilization is the fusion of gametes.

Ans. (d)

14. **Assertion:** Sperm production starts at puberty and happens continuously.
Reason: Eggs are present since birth and one egg matures every month after reaching puberty.

Ans. (b)

15. **Assertion:** Menstruation occurs if the egg does not get fertilized.
Reason: Menstruation does not happen if fertilization has taken place and embryo is implanted in the uterus.

Ans. (b)

16. **Assertion:** Surgical methods are reversible methods of contraception.
Reason: Pills and condoms are examples of reversible methods of contraception.

Ans. (d)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

17. Having girl child is still not considered good in many parts of India, due to which, the child sex ratio is declining. Rakhee, a young school girl lives in a remote village. A girl child was born in her neighbouring house for which the mother of the new born was blamed. Rakhee tried to explain the family scientifically that women are not responsible for deciding the sex of the child.

I. (a) What is the scientific reason behind birth of a boy or a girl?

(b) What is the purpose of an umbilical cord?

(c) (i) Name one initiative started by government to stop female foeticide.

OR

(ii) Name the life process that helps in the growth of its population.

Ans. (a) The genetic constituents or sex chromosomes i.e. X and Y are responsible for the birth of a girl or a boy.

(b) The umbilical cord connects a baby in the womb to its mother and carries oxygen and nutrients from the placenta to the fetus.

(c) (i) *Beti Bachao*, *Beti Padhao* is one of the initiative started by the government to stop female foeticide.

OR

(ii) Reproduction

II. (a) The gender determination of fetus is based on

(i) health of mother. (ii) nature of egg.

(iii) nature of sperm. (iv) age of mother.

Ans. (iii) nature of sperm.

(b) Sex chromosomes for human male and female are

(i) XX and XY respectively.

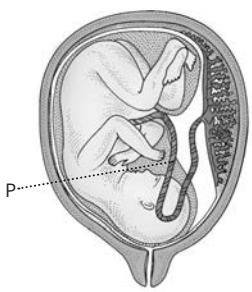
(ii) XY and XX respectively.

(iii) XX in both the cases.

(iv) XY in both the cases.

Ans. (ii) XY and XX respectively.

(c) Identify 'P' from given figure.



The purpose of 'P' is/are

(i) that it serves as blood vascular connection between mother and fetus.

(ii) that it delivers nutrients and oxygen to the fetus.

(iii) that it removes waste products from the fetus.

(iv) all of these.

Ans. (iv) all of these.

(d) Initiative started by the Government to stop female foeticide is

(i) Sukanya Samridhhi Yojana.

(ii) Beti Bachao Beti Padhao.

(iii) Balika Samridhhi Yojana.

(iv) All of these.

Ans. (ii) Beti Bachao Beti Padhao.

(e) During fertilization, the fetus will become a male child, if

(i) X-chromosome is coming from mother.

(ii) Y-chromosome is coming from mother.

(iii) X-chromosome is coming from father.

(iv) Y-chromosome is coming from father.

Ans. (iii) X-chromosome is coming from father.

18. Sexual reproduction is the most common method of reproduction in higher plants and animals. But many higher plants can be grown using vegetative propagation which can occur by natural as well as by artificial methods. Many of the artificial methods of propagation including cutting, layering, grafting and tissue culture are commonly used by gardeners, farmers and horticulturists.

I. (a) What is vegetative propagation?

(b) Name two methods of vegetative propagation by natural means.

(c) (i) State one limitation of vegetative propagation.

OR

(ii) Name two plants which can be propagated by cutting.

Ans. (a) Vegetative propagation is a form of asexual reproduction in which the parts of an old plant like stems, roots and leaves grow and develop into a new plant without the help of any reproductive organ.

(b) Vegetative propagation by adventitious buds (*Bryophyllum*) and by roots (sweet potato).

(c) (i) New varieties cannot be produced by vegetative propagation.

OR

(ii) *Chrysanthemum* and *Bougainvillea*.

II. (a) Select those plants which are reproducing through vegetative propagation.

(i) Banana, papaya, sunflower

(ii) Sugarcane, grape, banana

(iii) Potato, tomato, sunflower

(iv) Sugarcane, potato, sunflower

Ans. (ii) Sugarcane, grape, banana

(b) Vegetative propagation by natural means is/are

(i) propagation through leaf bud.

(ii) propagation through stem cutting.

(iii) propagation through tuber.

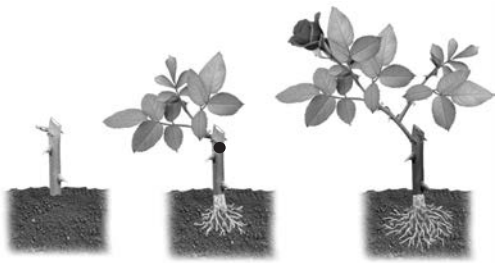
(iv) both (i) and (iii).

Ans. (iv) both (i) and (iii).

(c) *Bryophyllum* and *Begonia* reproduce through
(i) stem tubers. (ii) bulbs.
(iii) rhizomes. (iv) leaf buds.

Ans. (iv) leaf buds.

(d) Which of the following plants reproduces through the method depicted by the given figure?



(i) *Bougainvillea*
(ii) Sweet potato
(iii) Ginger
(iv) Sunflower

Ans. (i) *Bougainvillea*

(e) The major drawback/s of vegetative propagation is/are
(i) loss of vigour.
(ii) new varieties are not produced.
(iii) seedless fruits can be obtained.
(iv) both (i) and (ii).

Ans. (iv) both (i) and (ii).

Very Short Answer Type Questions

19. What does a seed contain? Name any two plants that reproduce by grafting.

Ans. A seed contains a dormant embryo which grows into a new plant on getting suitable conditions for germination.

Mango, pear.

20. What is the effect of errors during copying of DNA?

Ans. Errors during copying of DNA leads to variation.

21. What happens to ovule and ovary after fertilization in flowering plants?

Ans. After fertilization ovary is converted to fruit and ovule to seed.

22. How can pregnancy be prevented surgically?

Ans. By blocking vas deferens in males and fallopian tube in females.

23. State a difference between budding in yeast and budding in *Hydra*.

Ans. In unicellular organisms, like yeast, the bud is formed when the nucleus divides and one of the daughter nuclei passes into the buds. This process continues 3–4 times resulting into a chain of yeast cells. The bud is ultimately detached from the parent cell which grows in size and becomes a new individual. In *Hydra*, the bud arises from one side of the body in the form of a protuberance. The protuberance grows, and develops a mouth and tentacles at its free end. Finally, it gets detached from the parent and grows independently.

24. List reasons for growing plant by vegetative propagation.

Ans. Vegetative propagation is a cheaper and more rapid method of plant propagation than growing plants from seeds. It is the only method of propagation in plants which do not produce viable seeds, for example banana, potato, sugar cane, grape, orange, rose and jasmine plants.

25. (a) Why do spores have a thick wall?
(b) Regeneration is not considered a method of reproduction. Give reasons.

Ans. (a) Spores have thick wall to protect them from unfavourable environmental conditions.

(b) Since multicellular organisms have complex body design having many types of cells, tissues and organs, they cannot depend on being cut to reproduce by regeneration.

Short Answer Type Questions

26. Give reasons:
(a) Placenta has villi on embryo side.
(b) Variation is essential and beneficial to a species.
(c) Oral pills are hormonal preparations.

Ans. (a) Placenta has villi on embryo side to increase the surface area for transporting glucose and oxygen from mother's blood to the foetus and removal of metabolic wastes from the foetus.

(b) Variation is beneficial and essential for a species as it helps the species to survive and flourish in adverse environmental conditions.

(c) Oral pills contain synthetic hormones resembling oestrogen and progesterone which prevent ovulation thus avoiding pregnancy.

27. Why sexual reproduction is considered advantageous over asexual reproduction?

Ans. Sexually reproducing organisms have better chances of survival because more variations are generated in sexual reproduction in which two parents contribute genetic information to produce unique offspring. Accumulation of variations occurs due to sexual reproduction over generation after generation and selection by nature create wide diversity. This ensures survival of species in adverse environmental conditions which ultimately leads to evolution in sexually reproducing organisms proceeding at a faster pace than in asexually reproducing organisms. In case of

asexual reproduction, only the very small changes due to inaccuracies in DNA copying pass on the progeny. Thus, offsprings produced by asexual reproduction are more or less genetically similar to their parents.

28. The sperm are tiny structures that consist of mainly genetic material and a long tail.

(a) Where are the sperm produced?

(b) What is the role of the long tail?

(c) How are the sperm delivered from the site of their production? **(CBSE 2015)**

Ans. (a) Sperms are produced in the seminiferous tubules present in testes of male reproductive system.

(b) The long tail of sperms provides motility to it so that it can travel to the female reproductive system to fertilize the ovum.

(c) Sperms are delivered from their site of production to urethra by vas deferens.

Long Answer Type Questions

29. (a) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.

(b) Name the parts of the human female reproductive system where

(i) fertilization takes place,

(ii) implantation of the fertilized egg occurs.

(c) Explain how the embryo gets nourishment inside the mother's body. **(CBSE 2015)**

Ans. (a) Testis produces sperm as well as secretes the hormone testosterone. Testosterone helps in the maturation of sperm and development of secondary sexual characters in males.

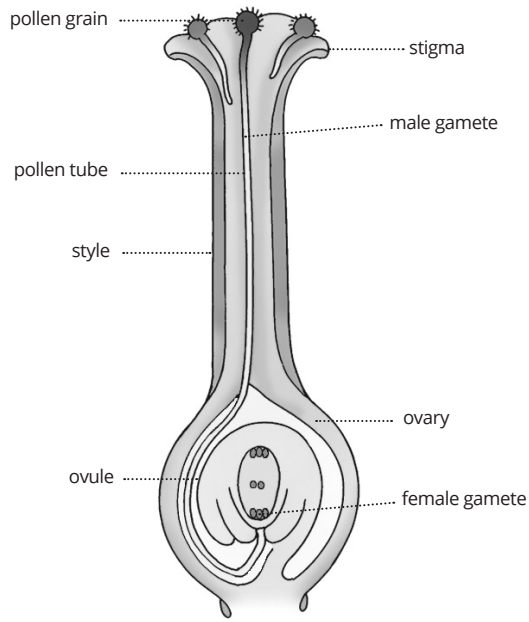
(b) (i) Fallopian tube

(ii) Uterus

(c) The developing embryo is attached to the uterus by a tissue called placenta. It is the physiological connection between the developing embryo and the mother's uterine wall. Placenta serves as a tissue through which oxygen and food are supplied from the maternal blood to the foetus. It also transports carbon dioxide and excretory waste from the foetal blood to the maternal blood.

30. Draw a diagram of a pistil showing pollen tube growth into the ovule and label the following: pollen grain, male gamete, female gamete and ovary.

Ans.



31. (a) Name three techniques/devices used by human females to avoid pregnancy. Mention the side effects caused by each.

(b) What will happen if in a human female (a) fertilization takes place, (b) an egg is not fertilized? **(CBSE 2024)**

Ans. (a) Three techniques/devices used by females to avoid pregnancy:

(i) Intra uterine device (IUD) is a plastic or metal device placed in the uterus by a doctor. It stops embryo implantation. Side effects may include cramping, heavier periods, and irritation of the uterus.

(ii) Oral contraceptive (pills) are hormone preparations that stop ovulation. Side effects may include nausea, headaches, and mood changes due to hormonal changes.

(iii) Tubectomy is a surgical method. Fallopian tubes are cut and tied which stop eggs passing through the oviduct and from reaching the uterus. Side effects may include risks of infections and complications if not done properly. It is an irreversible process.

(b) (a) If the egg is fertilized by the sperm, it initiates pregnancy.

(b) If the egg is not fertilized it leads to menstruation.

Let's Compete

(Page 119)

Multiple-Choice Questions

1. The zygote of rice plants have 24 chromosomes. How many chromosomes are present in its endosperm?

(a) 24 (b) 12
(c) 48 (d) 36

Ans. (d) 36

2. The ovary releases an egg approximately every

(a) 8 days. (b) 14 days.
(c) 21 days. (d) 28 days.

Ans. (d) 28 days.

3. The process of production of mature ova is called

(a) ovulation. (b) oogenesis.
(c) oogonia. (d) implantation.

Ans. (a) ovulation.

4. The site of sperm maturation is

(a) vas deferens. (b) ureter.
(c) epididymis. (d) ejaculatory duct.

Ans. (c) epididymis.

5. At the time of entering into an ovule, the pollen tube has

(a) one gamete nucleus.
(b) two male nuclei.
(c) three male nuclei.
(d) four male gametes.

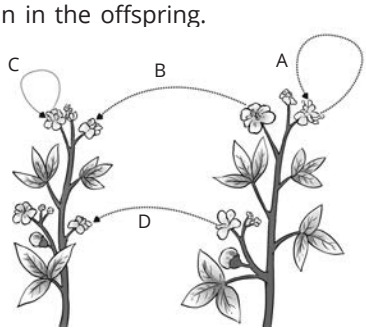
Ans. (b) two male nuclei.

6. The offspring formed as a result of sexual reproduction exhibit more variations because

(a) sexual reproduction is a lengthy process.
(b) genetic material comes from two parents of different species.
(c) genetic material comes from two parents of same species.
(d) genetic material comes from many parents.

Ans. (c) genetic material comes from two parents of same species.

7. The diagram shown below depicts pollination. Choose the options that will show a maximum variation in the offspring.



(a) A, B and C (b) B and D
(c) B, C and D (d) A and C

Ans. (b) B and D

8. Which of these secrete seminal fluid?

(a) Seminal vesicle (b) Prostate gland
(c) Neither of these (d) Both (a) and (b)

Ans. (d) Both (a) and (b)

9. Stock and scion are involved in the artificial propagation method known as

(a) tissue culture. (b) grafting.
(c) cutting. (d) layering.

Ans. (b) grafting.

10. The characters that are transmitted from parents to offspring during sexual reproduction show

(a) only similarities with parents.
(b) only variations with parents.
(c) both similarities and variations with parents.
(d) neither similarities nor variations with parents.

Ans. (c) both similarities and variations with parents.

Life Skills

(Page 119)

1. On World Population Day, Rashid and his friends organized an awareness program on population explosion in their locality. Some elders in the society asked them to stop such a campaign and stop discussing such issues so openly. The children convinced the elders the need for the campaign following which the elders also joined the campaign.

(a) Why are such awareness programs necessary?
(b) What values are exhibited by Rashid and his friends?
(c) What steps should be taken to prevent population explosion?

Ans. (a) Such awareness programs are necessary to:
(i) Keep a check on increasing population.
(ii) To avoid unwanted pregnancy.
(iii) To prevent spread of sexually transmitted diseases.

(b) Values exhibited by Rashid and his friends are:
(i) Scientific temper
(ii) Social cohesion
(iii) Intellectual honesty

(c) Steps to be taken to prevent population explosion are:
(i) The most effective method is to impart education to the masses about various ways of fertility control.
(ii) Use of preventive methods to avoid fusion of the sperm and the egg.

(iii) Educate about the corrective methods if the unwanted conception has taken place.

2. Amit was a very talented cricket player and was the captain of his school team. Once he got sick and came to know that he was HIV positive. He lost interest in everything and went into depression. His friends also started neglecting him. He skipped school and started counting his days. His teachers visited him and counselled him. He regained his confidence and again joined school and played tournament.

(a) What sense of responsibility was exhibited by his teachers?

(b) Is it appropriate to isolate and neglect the person suffering from HIV? Why/Why not?

(c) How can spread of HIV be prevented?

Ans. a. Scientific temper, social justice and helpfulness.

b. No, it is not appropriate to isolate and neglect the person suffering from HIV because HIV is not spread by mere touch or physical contact; it spreads only through body fluids.

c. Although there is no cure for AIDS, the HIV infection can be prevented by taking certain precautions:

(i) Responsible sexual behaviour

- Avoiding multiple sex partners.
- Using a condom or other barrier method of contraception which prevents direct contact between body fluids of two persons.

(ii) Screening of blood before transfusion

- Treatment of all blood and other products used in transfusion to destroy the HIV.

(iii) Avoiding sharing of needles

- By use of disposable syringes and needles.

(iv) Avoiding pregnancy if the mother is HIV positive.

(v) Educating people

3. In our country, several women die every year due to complications arising out of repeated pregnancy and childbirth. These women do not get proper medical support due to illiteracy and poverty.

(a) In your opinion what is the reason behind repeated unwanted pregnancies in women and resultant deaths?

(b) How can we make people aware about this problem?

(c) Name any two mechanical barriers to prevent unwanted pregnancy.

Ans. (a) The reason behind repeated unwanted pregnancies in women and resultant death is due the lack of education and awareness about the different ways of fertility control and the advantages and disadvantages of a large family.

(b) We can make people aware about this problem by educating them about the various ways of fertility control and creating awareness about the advantages of a small family and disadvantages of a large family. We can organize an awareness program to educate illiterate women.

(c) Mechanical barrier methods of contraception: Condoms or nirodh, Diaphragm or cervical cap, Intra uterine device (IUD) or loop.

8

Heredity

Checkpoint (Page 122)

1. What are genes?

Ans. Genes are the functional segment of DNA.

2. Where are genes located? State their functions.

Ans. Genes are located on chromosomes. Genes are the unit of heredity. They are responsible for transmission of characters from parents to offsprings.

Check Your Progress

(Page 131)

Multiple-Choice Questions

1. Who amongst the following is considered as the father of genetics?

(a) Mendel (b) Morgan
(c) Sutton (d) Boveri

Ans. (a) Mendel

2. The number of pairs of contrasting characters in pea plants are

(a) 5. (b) 9.
(c) 7. (d) 10.

Ans. (c) 7.

3. Which one of Mendel's law states that when two homozygous individuals with one or more sets of contrasting characteristics are crossed, the characteristics which appear in F_1 hybrids are dominant and those which do not are recessive?

(a) Law of segregation
(b) Law of dominance
(c) Law of independent assortment
(d) None of these

Ans. (b) Law of dominance

4. In men, a sperm contains autosomes, and

(a) both X- and Y-chromosomes.
(b) either X- or Y-chromosome.
(c) only Y-chromosome.
(d) only X-chromosome.

Ans. (b) either X- or Y-chromosome.

5. The statement that correctly describes the characteristic(s) of a gene is

(a) In individuals of a given species, a specific gene is located on a particular chromosome.
(b) A gene is not the information source for making proteins in the cell.
(c) Each chromosome has only one gene located all along its length.
(d) All the inherited traits in human beings are not controlled by genes. **(CBSE 2023)**

Ans. (a) In individuals of a given species, a specific gene is located on a particular chromosome.

6. Consider the following statements.

(i) The sex of a child is determined by what it inherits from the mother.
(ii) The sex of a child is determined by what it inherits from the father.
(iii) The probability of having a male child is more than that of a female child.
(iv) The sex of a child is determined at the time of fertilization when male and female gametes fuse to form a zygote.

The correct statements are:

(a) (i) and (iii) (b) (ii) and (iv)
(c) (iii) and (iv) (d) (i), (iii) and (iv)
(CBSE 2024)

Ans. (b) (ii) and (iv)

Very Short Answer Type Questions

7. Define allele. If a round, green seeded pea plant (RRyy) is crossed with wrinkled, yellow seeded pea plant (rrYY), what will be the genotype of the seeds produced in F_1 generation?

Ans. Alleles are the alternate forms of a gene or a pair of matching genes affecting the same character, e.g. TT, Tt or tt.

The genotype of the F_1 generation will be RrYy.

8. A child bearing all the basic features of a human being does not look exactly like his parents. Give reasons.

Ans. The hereditary information is transmitted from parents to the offspring through their gametes. Since different offspring receive different combinations of characters of their parents through their gametes, they show distinct variations among themselves as well as from their parents. Therefore, a child does not look exactly like his parents.

9. Define inheritance. What is variation?

Ans. The phenomenon by which living organisms transmit parental characteristics or traits to the successive generations is called heredity or inheritance.

10. A tall pea plant was crossed with a dwarf plant and two types of progenies tall and dwarf were produced in the ratio 1 : 1. What were the genotypes of the parents?

Ans. Genotypes of the parents are Tt (tall parent) and tt (dwarf parent).

11. "The chromosome number of the sexually reproducing parents and their offspring is the same." Justify this statement.

Ans. In a diploid organism like humans, all chromosomes are present in pairs within the cell nucleus. Both the parents contribute equally to the number of chromosomes during sexual reproduction. During meiosis, a gamete receives only one chromosome of a pair. Hence, the germ cells in male or female have only half the number of chromosomes. When two germ cells combine during sexual reproduction, they will restore the normal number of chromosomes in the progeny and ensure the stability of the DNA of the species.

12. A boy has parents with two different hair colours: one with red hair and the other with black hair. The boy has black hair. If we consider the gene for black hair (B) dominating over the gene for red colour (b), what would be the possible genotypes of the boy?

Ans. The possible genotype of the boy is Bb as one of the parent has red hair which is homozygous recessive (bb) and the other parent has black hair which could be homozygous or heterozygous (BB or Bb). Since the boy has black hair, it receives B gene from one parent and b from the other parent.

13. In blood typing the gene for type A and the gene for type B are dominant. The gene for type O is recessive. What will be the blood types of the offspring when the father has blood type O and the mother has blood type A?

Ans. It could be O type or A type blood group.

Short Answer Type Questions

14. If we cross pure-bred tall (dominant) pea plant with pure-bred dwarf (recessive) pea plant, we will get pea plants of F_1 generation. If we now self-cross the pea plant of F_1 generation, then we obtain pea plants of F_2 generation.

(a) What do the plants of F_1 generation look like?

(b) State the ratio of tall plants to dwarf plants in F_2 generation.

(c) State the type of plant not found in F_1 generation but appeared in F_2 generation, mentioning the reason for the same.

Ans. (a) Tall

(b) 3 tall : 1 dwarf

(c) dwarf

Dwarf plant is not visible in F_1 generation as dwarfness is a recessive trait. Recessive trait cannot express itself in presence of dominant gene. It expresses itself only in homozygous condition and all the plants in the F_1 generation are heterozygous. Therefore, dwarfness is hidden in the F_1 generation but reappears in the F_2 generation on selfing of F_1 plants.

15. How do genes control the expression of a trait? Explain taking the example of plant height in case of a pea plant.

Ans. Factors or alleles are segments of DNA or genes that control the expression of traits. They contain information source for synthesis of proteins or enzymes in the cell. A dominant allele of a gene controls the synthesis of a fully functional structural protein or an enzyme, so that it produces its morphological or physiological effect. A recessive allele is less efficient and does not produce fully functional protein or enzyme. Plant height is controlled by hormones. Tallness and dwarfness in plants depend on the amount of plant growth hormone. The amount of plant hormone made depends on the efficiency of the

process of making it. If the enzyme responsible for this process functions efficiently, the amount of hormone produced will be high and the plant will be tall. If there is any alternation in the gene for the enzyme making it less efficient, then the amount of hormone produced will be less and the plant will be short or dwarf.

16. What is the importance of DNA copying during reproduction? Why are offspring formed by asexual reproduction genetically similar to their parents?

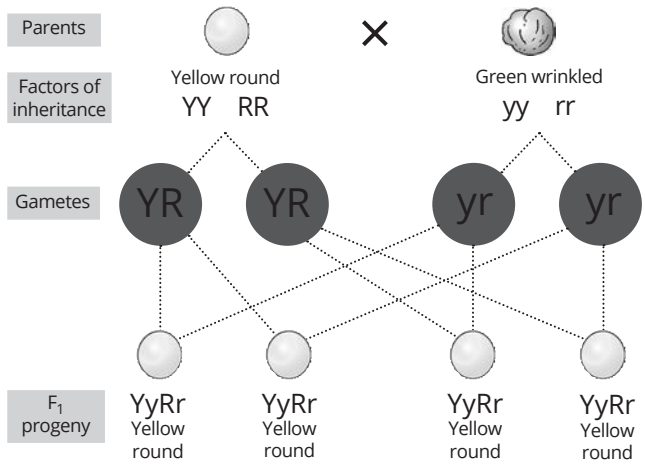
Ans. DNA copying is the most basic event in reproduction. This process is very important as it helps to transfer the characters from parents to offsprings. DNA present in the nucleus of a cell is the blueprint of body design. It contains information for making proteins. The copying of DNA is accompanied by creation of an additional cellular apparatus having its own cell contents with genetic similarities. Subsequently, the two DNA copies separate followed by separation of cellular apparatus and hence one cell divides into two daughter cells which are genetically identical. In addition, some errors occur during copying of DNA which leads to variation and helps the organism to survive the changed environmental condition ultimately leading to evolution.

Offsprings produced by asexual reproduction are genetically similar to their parents as only a single parent is involved and there is no fusion of gamete. Therefore they lack variation and there is no genetic recombination. They are genetically and morphologically identical to their parents.

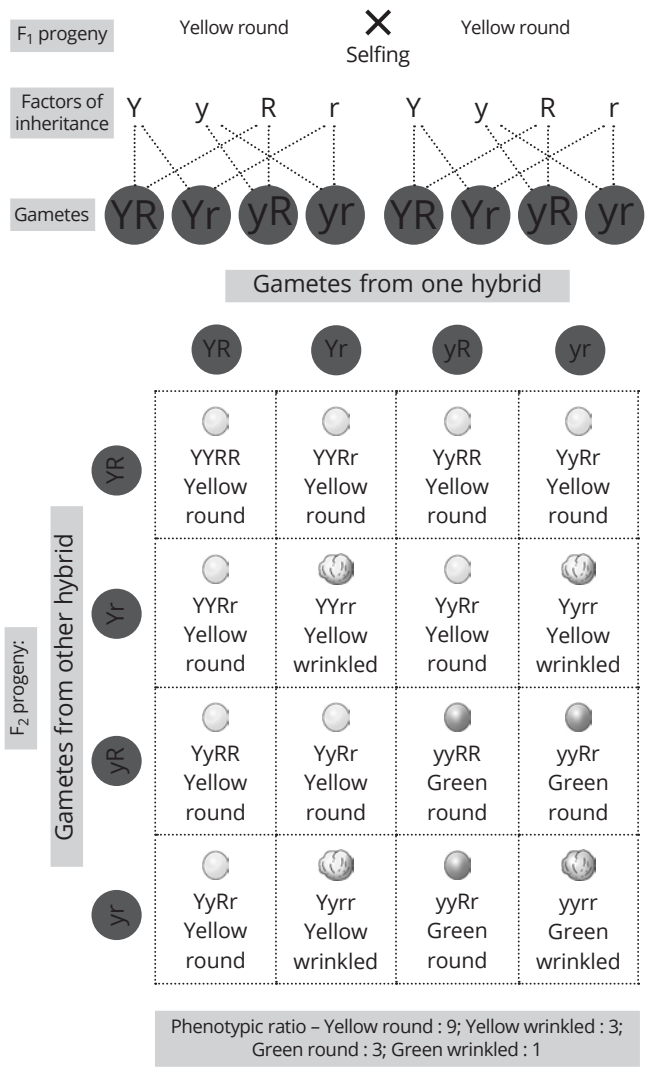
Long Answer Type Questions

17. How does Mendel's experiment show that traits are inherited independently? **(CBSE 2016)**

Ans. Mendel selected pure line variety of pea plant with two different characteristics to explain traits are inherited independently. Such cross are called dihybrid cross. Mendel crossed round seeds of yellow colour with wrinkled seeds of green colour. All the plants in F_1 generation were having round seeds of yellow colour. This showed round seeds were dominant over wrinkled seeds and yellow colour were dominant over green colour. When F_1 plants were self-pollinated, the F_2 plants showed four types of phenotypes of seeds – Round yellow, round green, wrinkled yellow and wrinkled green in the ratio of 9 : 3 : 3 : 1 respectively. It was observed that not only both the parental traits were present, new combination of traits also appeared in F_2 generation. Thus the traits round/wrinkled yellow/green are independently inherited.



(a) Dihybrid cross step 1: Cross-pollination between yellow round and green wrinkled peas plant



(b) Dihybrid cross step 2: Self-pollination of F_1 generation plants

Dihybrid cross between parents with yellow round and green wrinkled seeds

18. A pea plant bearing axial, purple flowers was crossed with a pea plant bearing terminal, white flowers. The F_1 individuals were crossed to produce F_2 individuals.

(a) What are the possible phenotypes in F_1 individuals?

(b) State the dihybrid phenotypic ratio and the phenotype of the offspring of the F_2 generation.

(c) What new characters are formed in the F_2 individuals which were missing in previous generations?

Ans. (a) Axial purple flower

(b) 9 : 3 : 3 : 1

9 Axial purple

3 Axial white

3 Terminal purple

1 Terminal white

(c) Axial white flowers and terminal purple flowers.

Higher Order Thinking Skills (HOTS) Questions

(Page 133)

1. In human beings blue eye colour is recessive to brown eye colour. A brown eyed man has a blue eyed mother.

(a) What is genotype of the man and his mother?

(b) If the man marries a blue eyed woman, what are the possible genotypes of their offsprings?

Ans. (a) Genotype of the man is Bb and that of his mother is bb.

(b) Possible genotypes of offsprings are Bb and bb in the ratio of 1:1.

2. Give reasons why hybrids are generally found superior to their parents.

Ans. Hybrids are artificially produced by crossing between parents having desired traits. The progeny thus produced will have combination of characteristics from both the parents making them superior to their parents.

3. A plant with purple flower was crossed with white flowers producing 50 plants with only purple flowers. On selfing, these plants produced 482 plants with purple flowers and 162 plants with white flowers. What genetic mechanism accounts for these results? Explain.

Ans. The genetic mechanism accounted here is law of dominance which is shown by monohybrid cross. Mendel crossed pure plants with purple flowers with pure white plants to get the F_1 progeny. All the plants in F_1 generation were purple. He then allowed the self-pollination of F_1 plants to get the F_2 progeny. Both purple and white flowered plants were obtained in F_2 generation in the ratio of 3 : 1. The trait which is expressed in F_1 generation (purple here) is called dominant trait while the trait which remains hidden in F_1 generation is called recessive trait. All plants in F_1 are purple flowered but they carry the hereditary unit for white flowered plants.

Self-Assessment

(Page 133)

Multiple-Choice Questions

1. A Mendelian experiment consisted of breeding round yellow with wrinkled green. The progeny bore all yellow but half of them wrinkled. What is the genetic makeup of round yellow parent?

(a) RRyy (b) rrYY

(c) RrYY (d) RRYy

Ans. (c) RrYY

2. What is applicable for Y-chromosomes?

(a) They lack DNA.

(b) They lack histones.

(c) They contain genes for maleness.

(d) They contain genes for femaleness.

Ans. (c) They contain genes for maleness.

3. In the monohybrid cross done by Mendel,

(a) F_1 had 75% tall plants and 25% dwarf plants.

(b) F_1 had all tall plants.

(c) F_1 had all dwarf plants.

(d) None of the above was observed.

Ans. (b) F_1 had all tall plants.

4. Chromosomes

(i) carry hereditary information from parents to the next generation.

(ii) are thread-like structures located inside the nucleus of an animal cell.

(iii) always exist in pairs in human reproductive cells.

(iv) are involved in the process of cell division.

The correct statements are:

(a) (i) and (ii) (b) (iii) and (iv)

(c) (i), (ii) and (iv) (d) (i) and (iv)

(CBSE 2024)

Ans. (d) (i) and (iv)

5. Which one of the following statements is not true?

(a) DNA carries the information for inheritance of features from parents to the next generation.

(b) DNA is the information source for making proteins.

(c) Change in the information leads to different proteins.

(d) Features will remain the same even if the protein changes. **(CBSE 2024)**

Ans. (d) Features will remain the same even if the protein changes.

6. Height of a plant is regulated by

(a) DNA which is directly influenced by growth hormone.

(b) genes which regulate the proteins directly.

(c) growth hormones under the influence of the enzymes coded by a gene.

(d) growth hormones directly under the influence of a gene. **(CBSE SP 2024)**

Ans. (c) growth hormones under the influence of the enzymes coded by a gene.

Assertion–Reason Type Questions

For question numbers 7 to 13, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.

(b) Both A and R are true but R is not the correct explanation of the assertion.

(c) A is true but R is false.

(d) A is false but R is true.

7. Assertion: Gene expression refers to the formation of a protein.

Reason: Genetic information is contained in proteins.

Ans. (c)

8. Assertion: TT represents a phenotype.

Reason: Tallness represents a phenotype.

Ans. (d)

9. Assertion: Human males contain one X and one Y chromosome.

Reason: The pair of chromosomes which are not similar in structure are known as homologous pair of chromosomes.

Ans. (c)

10. Assertion: Genes inherited from the parents decide the sex of a child.

Reason: X chromosome in a male child is inherited from his father. **(CBSE 2023)**

Ans. (c)

11. Assertion: Probability of survival of an organism produced through sexual reproduction is more than that of organism produced through asexual mode.

Reason: Variations provide advantages to individuals for survival. **(CBSE SP 2024)**

Ans. (a)

12. Assertion: In pea plant, a phenotypic ratio of 1:1 is obtained in F_1 generation when a tall plant (Tt) is crossed with a dwarf plant (tt).

Reason: Dominant alleles can express themselves in heterozygous form.

Ans. (a)

13. Assertion: In *Chrysemys picta*, if eggs are incubated at temperature lower than 28 °C, males are produced.

Reason: Sex determination in some lower animals are controlled by temperature.

Ans. (a)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

14. There are many traits or characteristics which are developed in response to external environment. But many of the characteristics are passed from parents to offspring. Raju, a curious student has surveyed the type of earlobes of his classmates and observed that there are two types of lobes – free and attached. He made a list and found that twelve out of twenty students had fused earlobes and the remaining ones showed free earlobes.

Free earlobes

Attached earlobes

I. (a) Acquired traits are not capable of directing evolution. Justify.

(b) Differentiate between acquired and inherited traits.

(c) (i) What is the physical basis of heredity?

OR

(ii) Define variation in a species.

Ans. (a) Acquired traits do not direct evolution because they are non-heritable.

(b) A trait which is developed in response to the change in external environment is called an acquired trait and traits which are passed from parent to progeny are inherited traits.

(c) (i) Chromosomes are the physical basis of heredity.

OR

(ii) Variation in a species can be defined as the difference of characteristics among individual of a species.

II. (a) Acquired traits are not capable of directing evolution as because

(i) the changes in the reproductive body cells cannot be passed to the offspring.

(ii) acquired traits occur in germ cells.

(iii) the changes in the non-reproductive body cells cannot be passed to the offspring.

(iv) both (ii) and (iii).

Ans. (iii) the changes in the non-reproductive body cells cannot be passed to the offspring.

(b) Attached earlobe is/are

(i) an acquired trait.

(ii) an inherited trait.

(iii) passed from parent to offspring.

(iv) both (ii) and (iii).

Ans. (iv) both (ii) and (iii).

(c) Which of the following is an inherited character?

(i) Scar on body

(ii) Sun-tanned skin

(iii) Eye colour

(iv) None of these

Ans. (iii) Eye colour

(d) Attached earlobe as discussed in the paragraph, is

(i) an autosomal trait.

(ii) a sex-linked trait.

(iii) a trait found in males only.

(iv) a trait found in females only.

Ans. (i) an autosomal trait.

(e) If a trait is associated with genes on Y-chromosome, the trait will

(i) appear in female child only.

(ii) appear in male child only.

(iii) appear in both male and female child.

(iv) be lost during gamete formation.

Ans. (ii) appear in male child only.

15. The defining foundation of genetics was laid by an Austrian monk, Gregor Johann Mendel who performed extensive experiments on *Pisum sativum* for over a period of eight years. Mendel, through his work on pea plants, discovered the fundamental laws of inheritance and recognized a 'factor' in the gametes of parent generation.

I. (a) How do traits get expressed in organisms?

(b) State the law of segregation.

(c) (i) Who is considered as father of genetics?

OR

(ii) Define allele.

Ans. (a) Traits get expressed in the form of protein in an organism.

(b) Law of segregation states that when a pair of allele is brought together in a hybrid, the members of the allelic pair remain together without mixing and segregate from each other when the hybrid forms gametes.

(c) (i) Gregor Johann Mendel is the father of genetics.

OR

(ii) Alleles are the alternative forms of a gene.

II. (a) Mendel described the factors, those are later known as

(i) alleles. (ii) chromosomes.

(iii) genes. (iv) traits.

Ans. (iii) genes.

(b) In Mendel's experiment on pea plants, Tt genotype represents

(i) homozygous tall plant.

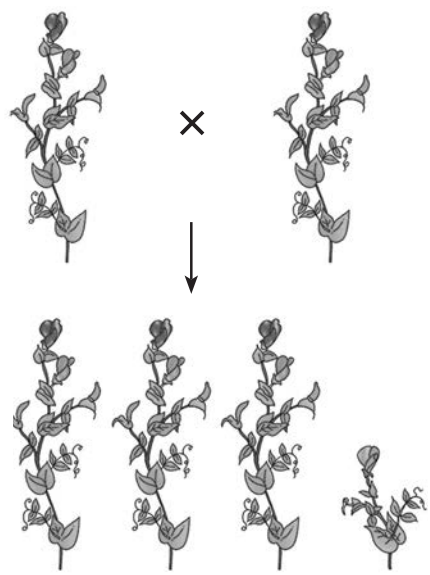
(ii) heterozygous dwarf plant.

(iii) heterozygous tall plant.

(iv) homozygous dwarf plant.

Ans. (iii) heterozygous tall plant.

(c) Study the given cross between two tall varieties of pea plants and select the incorrect option from the following.



(i) The genotypic ratio of the cross is 1 : 2 : 1.

(ii) The dwarf plant is homozygous recessive.

(iii) All tall plants are heterozygous.

(iv) Parent plants, in this cross, have both dominant and recessive alleles for plant height.

Ans. (iii) All tall plants are heterozygous.

(d) Heterozygous condition is when the alleles are

(i) both dominant.

(ii) one dominant and one recessive.

(iii) both recessive.

(iv) coming from one parent only.

Ans. (ii) one dominant and one recessive.

(e) In Meldel's observation, both the parental traits first reappear in

(i) F_1 generation.

(ii) F_2 generation.

(iii) F_3 generation.

(iv) in every generation.

Ans. (ii) F_2 generation.

16. In order to trace the inheritance of traits Mendel crossed pea plants having one contrasting character or a pair of contrasting characters. When he crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds, he observed that no plants with wrinkled and green seeds were obtained in the F_1 generation. When the F_1 generation pea plants were cross-bred by self-pollination, the F_2 generation had seeds with different combinations of shape and colour also.

(a) Write any two pairs of contrasting characteristics of pea plant used by Mendel other than those mentioned above.

(b) Differentiate between dominant and recessive traits.

(c) (i) State the ratio of the combinations observed in the seeds of F_2 generation (in the above case). What do you interpret from this result?

OR

(ii) Given below is a cross between a pure violet flowered pea plant (V) and a pure white flowered pea plant (v). Diagrammatically explain what type of progeny is obtained in F_1 generation and F_2 generation:

Pure violet flowered plant (VV) × Pure white flowered plant. (vv) **(CBSE 2023)**

Ans. (a) Two pairs of contrasting characteristics of pea plants used by Mendel, other than those mentioned (round and yellow seeds, wrinkled and green seeds), are:

Tall and short plants – where tallness (T) is dominant and shortness (t) is recessive.

White and violet flowers – where the violet flower colour (V) is dominant and the white flower colour (v) is recessive.

(b) Dominant traits are those that are expressed in the presence of either one or two copies of the dominant allele that is in both homozygous and heterozygous conditions. For example, in the case of plant height, the dominant allele 'T' results in a tall plant even when only one 'T' allele is present.

Recessive traits are expressed only when both alleles for the trait are identical that is in homozyghous condition. For example, in the case of plant height, the recessive allele 't' results in a short plant only when both alleles are 't' (tt).

(c) (i) F_2 ratio will be 9 : 3 : 3 : 1

9- Plants with round and yellow seeds.

3- Plants with round and green seeds.

3- Plants with wrinkled and yellow seeds.

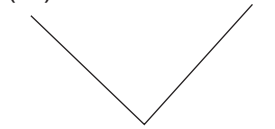
1-Plants with wrinkled and green seeds.

This result indicates that the two traits are inherited independently, following Mendel's Law of Independent Assortment, meaning the inheritance of one trait does not affect the inheritance of another trait.

OR

(ii) Pure violet flower × Pure white flower

(VV) (vv)



F_1 Vv (Violet flowered plant)

F_2 Vv (violet flower) × Vv (violet flower)

	V	v
V	VV (Violet flower)	Vv (Violet flower)
v	Vv (Violet flower)	vv (White flower)

F_2 Phenotypic ratio- 3 : 1

Genotypic ratio- 1 : 2 : 1

17. Mendel worked out the rules of heredity by working on garden pea using a number of visible contrasting characters. He conducted several experiments by making a cross with one or two pairs of contrasting characters of pea

plant. On the basis of his observations he gave some interpretations which helped to study the mechanism of inheritance.

(a) When Mendel crossed pea plants with pure tall and pure short characteristics to produce F_1 progeny, which two observations were made by him in F_1 plants?

(b) Write one difference between dominant and recessive trait.

(c) (i) In a cross with two pairs of contrasting characters

RRYY × rryy
(Round Yellow) (Wrinkled Green)

Mendel observed 4 types of combinations in F_2 generation. By which method did he obtain F_2 generation? Write the ratio of the parental combinations obtained and what conclusions were drawn from this experiment.

OR

(ii) Justify the statement:
"It is possible that a trait is inherited but may not be expressed." **(CBSE 2024)**

Ans. (a) Two observations of Mendel in monohybrid cross are:

— When a cross is made between the contrasting pair of a trait, only one of the traits appears in the F_1 generation.

— The trait, which was not present in the offspring of a particular cross in F_1 generation, again reappears in the F_2 generation. That means the contrasting pair of traits remain together without mixing and separate or segregate from each other when the hybrid forms gametes.

(b) Dominant trait produces its phenotype in both heterozygous as well as in homozygous condition. Recessive trait produces its phenotype only in homozygous condition.

(c) (i) F_2 generation was obtained by self-fertilization of F_1 generation.

The parental combinations of this cross are round yellow and wrinkled green. The ratio in F_2 is 9 : 1. The overall dihybrid ratio is, 9 : 3 : 3 : 1.

Mendel derived the law of independent assortment from dihybrid cross. It states that, when there are two pairs of contrasting characters, then the assortment of each pair of characters to the gametes is independent of the assortment of the other pair of characters.

OR

(ii) Mendel explained that it is possible that a trait is inherited but not expressed through his monohybrid cross. On crossing pure tall pea plants with pure dwarf pea plants, all the F_1 progeny were tall. But when he crossed the F_1 progeny to produce F_2 progeny, then 25 per cent of plants were short and rest tall. From this observation, he concluded that both the traits (tall and dwarf) were inherited in F_1 progeny but dwarfness was suppressed under the dominance of tallness.

Very Short Answer Type Questions

18. When Mendel crossed a tall plant with a dwarf plant, no medium height plants were obtained in the F_1 generation. Why?

Ans. This is because tallness is dominant over dwarfness. F_1 plant is heterozygous (Tt) and hence tallness is expressed while dwarfness remains hidden in F_1 generation. No mixing of traits occurs.

19. What is the cause of variation in asexually reproducing organism?

Ans. Errors during copying of DNA leads to variation in asexually reproducing organism.

20. A boy of 15 years has attached earlobes and weight of 65 kg. Which of these is an acquired trait and which is inherited? Give reasons to support your answer.

Ans. Weight of the boy is an acquired trait while attached earlobes is an inherited trait. Weight of the boy is a trait which develops due to the effect of environmental factors. This trait develops during the life of an individual and dies with the death of the individual. So cannot be inherited.

Attached earlobes develop due to the recessive allele. These traits are passed on from one generation to the next generation and hence are inherited traits.

21. (a) State Mendel's law of dominance.

(b) If a cross is made between hybrid tall and red flowered plant (TtRr) with dwarf and white flowered one (ttrr), what will be the genotypes of plants in F_1 generation?

Ans. (a) The law states that when two homozygous individuals with one or more contrasting characteristics are crossed, the characteristics that are expressed in the F_1 hybrids are dominant and those which do not appear in the F_1 generation are recessive.

(b) TtRr, Ttrr, ttRr and ttrr in the ratio of 1 : 1 : 1 : 1.

22. "The chromosome number of the sexually reproducing parents and their offspring is the same". Justify this statement.

Ans. In a diploid organism like humans, all chromosomes are present in pairs within the cell nucleus. Both the parents contribute equally to the number of chromosomes during sexual reproduction. During meiosis, a gamete receives only one chromosome of a pair. Hence, the germ cells in male or female have only half the number of chromosomes. When two germ cells combine during sexual reproduction, they will restore the normal number of chromosomes in the progeny and ensure the stability of the DNA of the species.

23. Why some traits of an individual cannot be passed on to its progeny? Explain with suitable example. What are those traits called?

Ans. Certain characters or traits developed during the lifetime of an individual. These are expressed physically and do not have any genetic significance, like an increase in the weight and length of the hair. These traits are generally not passed on to the next generation as there are no genes which are coding for these traits. These traits are known as the acquired traits.

24. A cross was made between pure breeding pea plants, one with round and green seeds and the other with wrinkled and yellow seeds.

(a) Write the phenotype of F_1 progeny. Give reason for your answer.

(b) Write the different types of F_2 progeny obtained along with their ratio when F_1 progeny was selfed.

Ans. (a) Phenotype of F_1 is round and yellow seed. This is because round and yellow are dominant over wrinkled and green traits respectively.

(b) Phenotype of F_2 progeny is 9 : 3 : 3 : 1

9 Round yellow

3 Round green

3 Wrinkled yellow

1 Wrinkled green

Long Answer Type Question

25. (a) Define heredity. What is the physical basis of heredity?

(b) The genotype of green stemmed tomato plant is denoted GG and that of purple stemmed tomato plant as gg. When they are crossed:

(i) What colour of stem would you expect in F_1?

(ii) Give the percentage of purple stemmed plant if F_1 is self-pollinating.

(iii) In what ratio would you find GG and Gg in F_2 progeny.

Explain with an illustration.

Ans. (a) The phenomenon by which living organisms transmit parental characteristics or traits to the successive generations is called heredity.

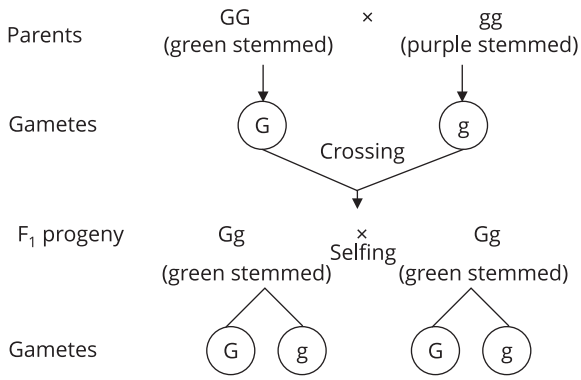
Gene is the physical basis of heredity.

(b)

(i) Green coloured stem.

(ii) 25%

(iii) 1 : 2



F_2 progeny

	G	g
G	GG	Gg
g	Gg	gg

genotypic ratio → 1GG : 2Gg : 1gg

phenotypic ratio → 3 green stemmed : 1 purple stemmed

Let's Compete

(Page 136)

Multiple-Choice Questions

1. Dihybrid cross ratio is

(a) 1 : 1 : 1 (b) 3 : 1

(c) 9 : 3 : 3 : 1 (d) 1 : 1

Ans. (c) 9 : 3 : 3 : 1

2. A cross differing only in one trait is

(a) haploid. (b) diploid.

(c) monohybrid. (d) dihybrid.

Ans. (c) monohybrid.

3. 'R' is a dominant red flower trait while 'r' is recessive white flower trait. Heterozygous red (Rr) is crossed with homozygous red (RR) flowers plant. 64 offsprings are produced. The number of white flower plants is

(a) 64

(b) 32

(c) 16

(d) 0

Ans. (d) 0.

4. The genetic constitution of an individual organism is called

(a) genotype. (b) phenotype.

(c) heredity. (d) gene.

Ans. (a) genotype.

5. A zygote which has inherited an X-chromosome from the father will develop into

(a) a baby boy. (b) a baby girl.

(c) an adult. (d) either boy or girl.

Ans. (b) a baby girl.

6. A pea plant with violet flowers crossed with a pea plant with white flowers. In F_1 generation 50% of plants are produced with white flowers. What is the genotype of that pea plant with violet flowers?

(a) VV (b) Vv

(c) vv (d) Cannot be determined

Ans. (b) Vv

7. Mendel conducted his experiments on pea plants due to certain advantages. Which of the following is/are NOT a correct option regarding pea plant?

(i) Pea plants bear bisexual flowers.

(ii) Pea plants have several distinct types of traits.

(iii) Due to self-fertilization, it is easy to get pure lines for several generations.

(iv) The genes for the seven contrasting characters appear on the same chromosome.

(a) Only option (iii)

(b) Both options (i) and (iii)

(c) Only option (iv)

(d) Options (i), (iii), and (iv)

Ans. (c) Only option (iv)

8. Which of the following is the correct trait with expression of pea plant?

(a) Green pod colour, dominant trait

(b) Purple coloured flower, recessive trait

(c) Terminal flower position, dominant trait

(d) Green cotyledon, dominant trait

Ans. (a) Green pod colour, dominant trait

9. A pea plant with round (RR) seed is crossed with a pea plant with wrinkled (rr) seed. What will be the percentage of pure round seeded pea plants in F_2 generation?

(a) 50% (b) 75%

(c) 25% (d) 100%

Ans. (c) 25%

10. A homozygous tall (TT) pea plant is crossed with a heterozygous tall (Tt) pea plant. Which of the following options is NOT correct regarding this cross?

(i) All the plants in F_1 are tall.

(ii) Homozygous tall plants will be 50%.

(iii) Heterozygous tall plants will be 25%.

(iv) This is an example of back cross.

(a) Only option (ii)

(b) Only option (iii)

(c) Both options (iii) and (iv)

(d) Options (ii), (iii), and (iv)

Ans. (b) Only option (iii)

Life Skills

(Page 137)

1. While visiting a rose garden Rohit noticed that there are many plants having red-coloured roses, however one of them is having pink-coloured roses. This amazes Rohit and he asks his biology teacher the reason for this. The teacher explains the reason.

(a) What is the phenomenon known as for differences among individuals of same species?

(b) What is the basis for such differences?

(c) What values are shown by Rohit?

Ans. (a) Variation.

(b) Errors during copying of DNA.

(c) Rohit is inquisitive, curious, and keen to learn and has a scientific bent of mind.

2. Rohit's father is a wrestler and has a robust body. He was also awarded as Mr. India when he was young. Rohit is his only child. As Rohit grew older, everyone expected him to have the same body built as his father. But, he is thin. His friends tease him and he feels depressed.

(a) Is it true that a wrestler's son should also have heavy muscles?

(b) What type of characteristics is it, acquired or inherited?

(c) What are the values shown by Rohit's friend?

Ans. (a) No, it is not necessary that a wrestler's son has stronger heavy muscles.

(b) It is an acquired trait.

(c) Rohit's friends are insensitive and ignorant.

13

Our Environment

Checkpoint (Page 140)

1. Define pollution. What are pollutants?

Ans. Pollution can be defined as the introduction of substances that contaminates the environment and causes adverse effects on the natural surroundings.

The substances that cause pollution are called pollutants which can be solid, liquid or gas.

2. Which is more toxic to human beings – carbon monoxide or carbon dioxide? Why?

Ans. Carbon monoxide is more toxic to human beings. Haemoglobin present in our blood has high affinity for carbon monoxide. Carbon monoxide binds with haemoglobin present in our blood and thus reducing the oxygen carrying capacity of the blood. It can even cause death of the person due to lack of oxygen.

3. What steps should be taken to prevent pollution due to sewage disposal?

Ans. Some steps that may reduce water pollution due to sewage disposal are:

Setting up sewage water treatment plants.

Use of septic tanks in houses to avoid direct dumping of faecal matter and other wastes.

4. Define pedogenesis.

Ans. Pedogenesis is the process of soil formation.

5. What is soil erosion? What are the major factors contributing to soil erosion?

Ans. The removal and transportation of the top layer of soil from its original position to another place by flowing water or wind is called soil erosion. The causes of soil erosion may be strong winds, heavy rains, improper farming, dust storms, frequent floods and also indiscriminate human activities.

6. How is soil pollution different form soil erosion?

Ans. Removal of useful components from the soil and addition of other substances, which adversely affect the fertility of the soil and kill the diversity of organisms living in it, is called soil pollution. While the removal and transportation of the top layer of soil from its original position to another place by flowing water or wind is called soil erosion.

7. Define biogeochemical cycles. Give examples.

Ans. The circulation of matter or biogenic nutrient elements like carbon, hydrogen, oxygen, nitrogen, phosphorus, calcium and water between the biotic (living) world and the abiotic (physical/non-living) world is known as the biogeochemical cycle. For example, water cycle, nitrogen cycle, etc.

8. What are the steps involved in nitrogen cycle?

Ans. Steps involved in nitrogen cycle are:

(i) Nitrogen fixation
(ii) Nitrogen assimilation
(iii) Ammonification
(iv) Nitrification
(v) Denitrification

Check Your Progress 1

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Multiple-Choice Questions

1. Which of the following represents an artificial ecosystem?

(a) Forest (b) Aquarium
(c) Lake (d) Pond

Ans. (b) Aquarium

2. An ecosystem consists of

(a) non-living things only.
(b) living organisms only.
(c) both living and non-living things.
(d) water, gases and soil.

Ans. (c) both living and non-living things.

3. In the absence of decomposers, functioning of the ecosystem is adversely affected due to

(a) blocking of the mineral cycle.

(b) blocking of energy flow.

(c) blocking of solar energy to herbivores.

(d) increase in the rate of decomposition of other components

Ans. (a) blocking of the mineral cycle.

4. Which of the following cannot be added to composting pit to prepare compost?

(a) Sunflower plants

(b) Flowers of plastic

(c) Fruit and vegetable peels

(d) Red worms

Ans. (b) Flowers of plastic

5. Which of the following features relates to biodegradable substances?

(a) Broken down by biological processes

(b) Remain inert

(c) Persist in environment for long time

(d) May harm the ecosystem **(CBSE SP 2024)**

Ans. (a) Broken down by biological processes

Very Short Answer Type Questions

6. What is an environment?

Ans. Environment can be defined as the physical and biological world where we live.

7. Which of the following materials are non-biodegradable – paper, animal bones, silver-foil, plastic mugs, leather belt?

Ans. Silver foil and plastic mug.

8. Which of the following are not a part of the biotic community?

air, fungi, bird, water, blue-green algae, sunlight

Ans. Air, water and sunlight.

9. Bacteria and fungi are called decomposers. Why?

Ans. Bacteria and fungi are called decomposers because they break down the complex organic compounds present in the dead organisms into simpler inorganic substances.

10. What is the living environment and physical environment of an ecosystem?

Ans. The biotic components of an ecosystem which is made of a community of living organisms (like plants, animals and microbes) is the living environment of the ecosystem.

The non-living components of an ecosystem that include soil, water, air, sunlight, temperature, humidity, moisture, rainfall, etc., constitutes the physical environment of an ecosystem.

11. What are biodegradable substances? Give four examples.

Ans. The materials that can be broken down or decomposed into simple substances in nature by the action of microorganisms in due course of time are called biodegradable materials. For example leather goods, dead plants, animals and tea leaves.

12. Why would you name DDT as a non-biodegradable substance? Give reasons in support of your answer.

Ans. DDT cannot be decomposed into simple, non-poisonous compounds by the action of microorganisms. They remain unchanged chemically and get accumulated in the environment and become harmful for humans, animals and even plants. Hence, DDT is a non-biodegradable substance.

13. Producers are referred to as autotrophs. Comment.

Ans. Producers are referred to as autotrophs as they are able to synthesize organic food such as starch from inorganic substances like carbon dioxide and water in the presence of chlorophyll and sunlight. They convert solar energy into chemical energy. For example, green plants and blue green algae are producers.

14. What will be the impact on ecosystem, if bacteria and fungi are removed from the environment?

Ans. Bacteria and fungi are saprophytic micro-organisms which feed on dead bodies of organisms and organic wastes of living organisms. If bacteria and fungi are removed from the environment, the complex organic compounds present in the dead organisms is not broken into simpler inorganic substances and the elements will not be able to enter the earth again to be taken up by the plants.

Short Answer Type Questions

15. Differentiate between natural and man-made ecosystems.

Ans. Differences between natural and artificial ecosystems:

Natural Ecosystem	Artificial Ecosystem
These develop under natural conditions.	These are modified and managed by human beings for their own benefit.
More stable.	Less stable.
A natural ecosystem has a diverse amount of species and plants.	An artificial ecosystem has a limited amount of species and plants.

Natural ecosystems are self-sustaining and result from spontaneous natural reaction.	Artificial ecosystems are not self sustaining and require the assistance of humans.
Food chain is long and complex in natural ecosystem.	Food chain is short and incomplete in artificial ecosystem.
Examples of natural ecosystem are forest, ocean, desert, pond, lake, etc	Examples of artificial ecosystem are cropland, garden and aquarium, etc.

16. "An ecosystem is independent and self-sufficient unit in nature." Justify the statement with the help of an example.

Ans. An ecosystem is independent and self-sufficient unit in nature. Let us take an example of a garden ecosystem. The garden is a man-made ecosystem. In a garden, there are grasses, flowering plants (like rose, jasmine and marigold), non-flowering plants and large trees. These all can be grouped as producers since they make their own food by photosynthesis. Then, there are also animals like frogs, insects and birds in the garden. These are consumers. Both the plants and animals (living organisms) interact with each other for growth, reproduction and other activities. They also interact with the non-living components like soil, air and water. Also, decomposers like bacteria and fungi help in recycling the inorganic substances back into the soil.

Long Answer Type Question

17. (a) How are the biotic and abiotic components of an ecosystem interdependent?

(b) Why are crop fields known as artificial ecosystems?

Ans. (a) In an ecosystem, both the plants and animals (living organisms) interact with each other for growth, reproduction and other activities. They also interact with the non-living components like soil, air and water. Also, decomposers like bacteria and fungi help in recycling the inorganic substances back into the soil.

(b) In a crop field, plants do not grow naturally rather most of the plants are grown and managed by humans according to the season and type of soil. It is an artificial ecosystem as a major component of the ecosystem comes into origin because of human intervention. The biotic and the abiotic component needed for crop field are created by human. It is not self-sustaining and require human assistance for preparing the soil, sowing the seed, irrigation, etc so as to get a good yield.

Check Your Progress 2

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Multiple-Choice Questions

1. In an ecosystem, flow of energy is

(a) unidirectional. (b) multidirectional.

(c) cyclic. (d) non-directional.

Ans. (d) unidirectional.

2. Oxygen is converted into ozone by the action of

(a) ultraviolet radiation. (b) gamma radiation.

(c) infrared radiation. (d) cosmic radiation.

Ans. (a) ultraviolet radiation.

3. Ozone layer depletion is primarily caused due to which of the following?

(a) Oxygen (b) CFCs

(c) Ammonia (d) Nitrous oxide

Ans. (b) CFCs

4. If 10 kilocalories of energy is available to snakes (fourth trophic level), what will be the energy available at the producer level in the following food chain?

Grass $\rightarrow$ Grasshopper $\rightarrow$ Frog $\rightarrow$ Snake

(a) 100 kilocalories (b) 1000 kilocalories

(c) 1 kilocalorie (d) 10,000 kilocalories

Ans. (d) 10,000 kilocalories

5. Identify the food chain in which the organisms of the second trophic level are missing.

(a) Grass, goat, lion

(b) Zooplankton, phytoplankton, small fish, large fish

(c) Tiger, grass, snake, frog

(d) Grasshopper, grass, snake, frog, eagle

(CBSE 2024)

Ans. (c) Tiger, grass, snake, frog

Very Short Answer Type Questions

6. Name the organisms belonging to the first and the third trophic levels in a food chain comprising frogs, snakes, plants, eagles and insects.

Ans. First trophic level- Plants

Third trophic level- frog

7. How do pesticides and chemicals sprayed on food crops affect human health?

Ans. Human beings are the top consumers and the concentration of these harmful chemical substances is maximum in the body of human beings due to the biological magnification. Therefore, these chemical will have adverse effect on human health.

8. What happens to energy as it passes through various trophic levels?

Ans. At each trophic level in a food chain, a large amount (90%) of energy is utilized by the organisms for their maintenance and lost as heat. Only 10% of the energy is available for transfer to the next trophic level. Therefore, amount of energy at each trophic level goes on decreasing.

9. Why did United Nations act to control the production of chlorofluorocarbons (CFCs) used in refrigerators?

Ans. CFCs are ozone depleting substances. CFCs when released in the air react with ozone gas and destroy it gradually. Therefore, United Nations acted to control the production of CFCs used in refrigeration.

10. Write the food chain operating in a freshwater pond. Mention the food habit of each trophic level in this food chain.

Ans. Food chain operating in a freshwater pond:

$$\text{Algae} \rightarrow \text{Protozoan} \rightarrow \text{Small fish} \rightarrow \text{Big fish}$$

Food habit of each trophic level:

(a) Algae are autotrophs and therefore act as producers.

(b) Protozoans are herbivores or primary consumers and depends on producers for their food.

(c) Small fishes are small carnivores or secondary consumers.

(d) Large fishes are top carnivores or tertiary consumers.

11. Using *kulhads* as disposable cups to serve tea in trains proved to be a bad idea. Give reason.

Ans. This is because manufacturing *kulhads* on such a large scale is very difficult and it would result in the loss of fertile topsoil.

12. Which chemical is used in fire extinguishers? How is it harmful?

Ans. Chlorofluorocarbon (CFCs) is used in fire extinguisher. CFCs are ozone depleting substances which when released in the air react with ozone gas and destroy it gradually.

13. Explain an agricultural practice that has a harmful effect on ecosystem. **(CBSE 2015)**

Ans. Pesticides and chemicals sprayed on the plants being non-biodegradable chemicals, remain toxic in the soil from where they are washed off into water bodies. They are absorbed by the plants and from plants they enter into animal body, when they consume these plants. When human beings consume these plants or animals, these chemicals reach their bodies. In a food chain, effect of this chemical goes on increasing at each trophic level which is called biomagnification.

14. Mention the harmful effects of UV radiation. Name the gas that protects us from it.

Ans. UV radiations can cause diseases in human beings, such as, cataract, skin cancer, dimming of eyesight and immune system malfunctioning. It may cause mutations. Ozone in the upper atmosphere protects us from the dangerous UV radiation from the sun.

15. How do harmful chemicals get accumulated progressively at each trophic level in a food chain? **(CBSE 2023)**

Ans. Harmful substances like pesticides are non-biodegradable. These chemicals are added to crops to protect them from pests and diseases. These chemicals are washed down into the soil and absorbed by the plant along with water and minerals and hence enter the food chain. Being non-biodegradable, these substances get accumulated at each trophic level. When the organisms of previous trophic levels are eaten up by organisms of next trophic level, the concentration of these chemicals keeps on increasing. As the tertiary consumers occupy the highest trophic level of food chain, they get the maximum quantity of these harmful chemicals.

Short Answer Type Questions

16. Why is Government of India imposing a ban on the use of polythene bags? Suggest two alternatives to these bags and explain how this ban is likely to improve the environment.

Ans. Government of India is imposing a ban on the use of polythene bag as these wastes are non biodegradable and cannot be degraded or decomposed into simple non-poisonous compounds by the action of microorganisms in nature and thus get accumulated in the environment and become harmful for humans, animals and even plants.

Banning of these bags will prevent the accumulation of non biodegradable waste in the environment and reduce pollution.

Alternatives to these bags are cloth bags and jute bags which are environment friendly. Paper bags should be used which can be reused and recycled and biodegradable.

17. "Energy flow in a food chain is unidirectional." Justify this statement. Explain how pesticides enter a food chain and subsequently get into our body.

Ans. Food chain is a sequential process in which one organism consumes another organism to transfer

food energy. At each trophic level in a food chain, only 10% of the energy is transferred to next trophic level and a large amount (90%) of energy is utilized by organisms and lost as heat. Since energy lost cannot be regained, the energy flow is said to be unidirectional.

Various pesticides and chemicals which are used to protect the crops from pests enter the food chain and cause biomagnification. This can be understood using a flow chart.

Pesticides sprayed on crops
↓
Pesticides washed down into the soil or water during irrigation and rains
↓
Plants absorb them along with other nutrients.
Pesticides taken up by aquatic plants and animals in water bodies.
↓
Hence, they enter the food chain.

Being non-degradable, these substances get accumulated at each trophic level. When the organisms of previous trophic level are eaten up by organisms of next trophic level, the concentration of these chemicals keeps on increasing. As the tertiary consumer occupies the highest level of food chain, they get the maximum quantity of these harmful chemicals.

18. Explain the process of biomagnification with the help of an example.

Ans. The increase in the concentration of harmful chemical substances in the body of living organisms at each trophic level of a food chain is called biological magnification or biomagnification.

We can take another example of biomagnification in a food chain operating in a pond, river or lake. These water bodies usually contain a small amount – 0.02 ppm (parts per million) of harmful chemicals like DDT. When this water is consumed by phytoplanktons and zooplanktons, the concentration of DDT increases to 0.04 ppm. Small fishes feeding on these planktons were found to contain 0.5 ppm of DDT. Large fishes feeding on these small fishes were found to contain 2 ppm of DDT. Birds feeding on these large fishes were found to contain 25 ppm of DDT. Thus, there is an increase in the concentration of DDT at each trophic level.

19. What is garbage? What does garbage consist of? What does disposal of waste mean?

Ans. The household waste or rubbish is called garbage. This garbage may be leftover food, peels of vegetables and fruits, waste paper, unwanted and broken plastic items, glass articles, metal objects, polythene, cloth rags, discarded leather, old and broken wooden objects and sewage. Some of this garbage waste may be biodegradable while other is non-biodegradable.

Disposal of waste means to get rid of the waste material. The method of disposal of the waste depends on the nature of the waste.

20. Plants → Deer → Lion

In the given food chain, what will be the impact of removing all the organisms of second trophic level on the first and third trophic level? Will the impact be the same for the organisms of the third trophic level in the above food chain if they were present in a food web? Justify. **(CBSE 2024)**

Ans. Suppose we remove all deer population from the food chain. This will decrease the lion population as no food (prey) will be available to them. Lions may even resort to killing and feeding on other prey such as domestic animals or even human beings. On the other hand, with no herbivores (Deer) to consume the plants, the plant population will increase.

If lion or deer are operating in a food web, then removal of deer would disturb the ecosystem, but lion population can survive with alternate prey.

Long Answer Type Questions

21. (a) "Vegetarian food habits can sustain a larger number of people." Justify the statement in terms of food chain.

(b) Which of the following food chains is more advantageous in terms of energy to top carnivores? Why?

(i) A food chain having three organisms

(ii) A food chain having five organisms

Ans. (a) According to the ten per cent law, only 10% of the total energy enters a particular trophic level of a consumer, and out of this, only 10% is available for transfer to the next trophic level. For example, suppose 1000 J of solar energy is received by green plants, then only 1% of solar energy available on the earth is utilized by plants, so, only 10 J (1% of 1000 J) is trapped by plants and the rest 990 J of energy is lost to the environment. So, plants utilize only 10 J of energy. Next, only 10% of the 10 J energy of plants, that is 1 J is available to the herbivore animal while 9 J is lost to the environment. Again, just 10% of the 1 J of energy of herbivore animals is utilized by carnivore animals. Thus, carnivore animals have only 0.1 J of energy while 0.9 J is lost to the environment. Therefore, in a long food

chain, very little of the energy entering the producer is available to the top carnivore. Hence vegetarian food habits can sustain a large number of people.

(b) A food chain having three organisms will be more efficient in terms of energy to top carnivores because with each trophic level, the amount of available energy goes on decreasing because of 10% of energy will be transferred to the next trophic level. The lesser the trophic levels, the more will be the energy available to the next level.

22. (a) How do human activities affect the environment?

(b) Why do harmful chemicals concentrate as we go up in a food chain?

(c) If the primary consumer has 400 J of energy, what was the energy trapped by the producer and also write the energy present at the quaternary consumer level?

Ans. (a) Due to human activities like indiscriminate cutting of forests, construction activities and pollution, the food chains get disturbed. This leads to imbalance in the functioning of ecosystem. For example, due to extensive hunting of lions in Rajasthan, the food chain got disturbed leading to increase in the population of herbivores. These herbivores fed on grass and due to overgrazing, most parts of Rajasthan were converted into desert.

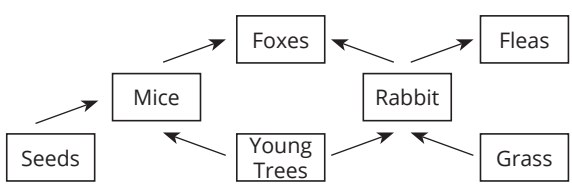
(b) Harmful chemicals are non biodegradable. Being non-biodegradable, these substances get accumulated at each trophic level. When the organisms of previous trophic level are eaten up by organisms of next trophic level, the concentration of these chemicals keeps on increasing. As the tertiary consumer occupies the highest level of food chain, they get the maximum quantity of these harmful chemicals.

(c) Energy trapped by the producer is 4000 J. Energy present at the quaternary consumer level is 0.4 J.

Higher Order Thinking Skills (HOTS) Questions

(Page 153)

1. A food web is given below. Observe the figure and answer the questions given below.



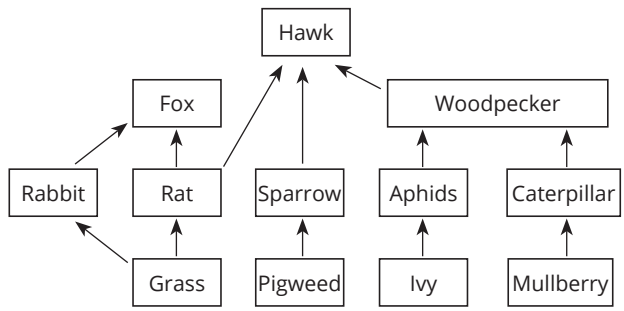
(a) Identify the primary consumers in the food web.

(b) How will the food web be affected if all the foxes are killed due to a disease?

Ans. (a) Rabbits and mice are the primary consumer in the given food web.

(b) The foxes feed on rabbits and mice. If all the foxes are killed, the rabbits and mice will increase in number in the given ecosystem. These primary consumers will overgraze on producers which will affect the stability of the ecosystem.

2. Pesticides are used in crop fields to kill pests. In a crop field, pesticide is sprayed to kill caterpillars. A food web involving caterpillars is given below.



Identify the organism from the food web which will home the highest level of pesticide accumulated in it after some time.

Ans. The hawks will have the highest level of insecticides in its body as it preys on woodpeckers which feed on aphids and caterpillars. Since hawk belongs to the fourth trophic level, highest level of insecticides, a non biodegradable substance will accumulate in its body due to biomagnification.

3. Ozone shield normally has steady concentration of ozone in the stratosphere. Give reason.

Ans. Ozone is formed in the upper atmosphere by the action of ultraviolet radiation on oxygen gas which splits oxygen molecule into free oxygen atoms. The free oxygen atoms are very reactive and combine with oxygen molecule to form ozone.

$$\underset{\text{Ozone}}{O_3} \rightleftharpoons^{\text{uv radiation from sun}} \underset{\text{oxygen molecule}}{O_2} + \underset{\text{oxygen atom}}{O}$$

The two reactions (photodissociation of ozone and its generation) are in equilibrium thereby maintaining the steady concentration of ozone in the stratosphere.

4. The gas 'A' is inhaled by man to oxidize food and obtain energy by the process of respiration. The radiation 'X' acts on gas 'A' and convert it into

another gas 'B'. The gas 'B' if inhaled is poisonous. However, at higher levels of atmosphere, it forms a layer 'C' which absorbs the radiation 'X' coming from the sun and prevents them from reaching the earth. Some chemical substances 'D' are released from refrigerators and fire extinguishers that destroy the layer 'C', and has already caused a hole in it over the area 'E'.

(a) Name the gases 'A' and 'B'. Write their molecular formula.

(b) Name 'X' and 'D'.

(c) Name the area 'E'.

(d) Name the layer 'C'. How is it useful for us?

(e) How will you save the layer 'C' from depletion?

Ans. (a) Gas A $\rightarrow$ Oxygen $\rightarrow$ O_2
Gas B $\rightarrow$ Ozone $\rightarrow$ O_3

(b) X – Ultraviolet rays
D – Chlorofluorocarbons

(c) Antarctic region.

(d) Ozone layer. It protects us from harmful ultraviolet rays.

(e) By stopping the use of aerosol and other ozone depleting substances.

Self-Assessment

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Multiple-Choice Questions

1. Organization involved in formulating programmes for protecting environment is

(a) WHO. (b) UNDP.
(c) UNEP. (d) UNICEF.

Ans. (c) UNEP.

2. Which of the following contains only non-biodegradable things?

(a) Leaves, wood, plastics
(b) Polythene, aluminium can, mercury
(c) DDT, cowdung, fruit peels
(d) Kitchen waste, sewage, pen

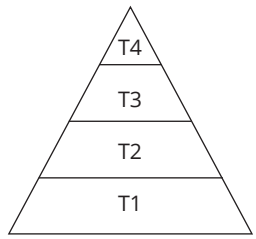
Ans. (b) Polythene, aluminium can, mercury

3. In which form is the 10% energy available for transfer from one trophic level to the next in an ecosystem?

(a) Light energy
(b) Mechanical energy
(c) Heat energy
(d) Chemical energy

Ans. (d) Chemical energy

4. In the given figure, the various trophic levels are shown in a pyramid. At which trophic level is maximum energy available?



(a) T4 (b) T2
(c) T1 (d) T3

Ans. (c) T1

5. The decomposers in an ecosystem

(a) convert inorganic material to simpler forms.
(b) convert organic material to inorganic forms.
(c) convert inorganic material into organic compounds.
(d) do not break down organic compounds.

Ans. (b) convert organic material to inorganic forms.

6. In 1987, an agreement was formulated by the United Nations Environment Programme (UNEP) to freeze the production of "X" to prevent depletion of "Y". "X" and "Y" respectively referred here are:

(a) Ozone; CFCs
(b) CFCs; rays UV
(c) CFCs; Ozone
(d) UV rays; Diatomic oxygen **(CBSE SP 2024)**

Ans. (c) CFCs; Ozone

Assertion–Reason Type Questions

For question numbers 7 to 16, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.

(b) Both A and R are true but R is not the correct explanation of the assertion.

(c) A is true but R is false.

(d) A is false but R is true.

7. **Assertion:** All living things are the biotic components of an ecosystem.
Reason: Soil, sunlight and rainfall comes under the abiotic components of an ecosystem.

Ans. (b)

8. **Assertion:** Neem is an example of flora of a region.
Reason: Tiger is an example of flora of a region.

Ans. (c)

9. **Assertion:** Gardens and crop fields are man-made ecosystem.
Reason: Forests and rivers are natural ecosystem.

Ans. (b)

10. Assertion: Photoautotrophic organisms are responsible for sustaining life on our planet.

Reason: Photoautotrophic organisms are the only producers in the entire food web.

Ans. (a)

11. Assertion: The amount of energy keeps on decreasing as we move up from lower to higher trophic levels.

Reason: A food chain do not have more than four or five trophic levels.

Ans. (b)

12. Assertion: Ozone is formed from oxygen.

Reason: Ozone performs a useful function of protecting us from harmful UV rays of the sun.

Ans. (b)

13. Assertion: Ozone layer acts as a protecting blanket over the surface of the earth.

Reason: Ozone layer prevents harmful UV rays from reaching the surface.

Ans. (a)

14. Assertion: Plastic is an example of biodegradable material.

Reason: Biodegradable substance gets broken down naturally by the action of decomposer.

Ans. (d)

15. Assertion: Accumulation of harmful chemicals is maximum in the organisms at the highest trophic level of a food chain.

Reason: Harmful chemicals are sprayed on the crops to protect them from diseases and pests. **(CBSE 2024)**

Ans. (b)

16. Assertion: Biodegradable substances result in the formation of compost and natural replenishment.

Reason: It is due to breakdown of complex inorganic substances into simple organic substances. **(CBSE SP 2024)**

Ans. (c)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

17. Tanu is planning to organize a birthday party for her friend Parul. She has made a list of party essentials like balloons, plastic balls, disposable utensils and cutlery. When she discussed this list with her friend Rohit, he suggested few eco-friendly alternatives for these items. Like Tanu, we all are using many such items in our daily routine that adversely affect our environment and pollute water, soil and air through which pollutants enter into the food chain.

I. (a) Name the items from the list which are non-biodegradable.

(b) What are pollutants?

(c) (i) Suggest one alternative choices which Tanu can make.

OR

(ii) What is biomagnification?

Ans. (a) Balloons, plastic balls and disposable utensils.

(b) Substances that cause pollution are called pollutant. It can be a solid, liquid, gas or a radiation that has undesirable or adverse effect on environment.

(c) (i) Tanu can replace decorative items with eco-friendly alternatives such as paper hangings and flowers.

OR

(ii) Increase in the concentration of harmful chemical substances in the body of living organisms at each trophic level is called biomagnification.

II. (a) Which of the following from Tanu's list is/are non-biodegradable?

(i) Balloons
(ii) Plastic balls
(iii) Disposable utensils
(iv) All of these

Ans. (iv) All of these

(b) Which kind of pollution majorly can be occurred by these discussed items?

(i) Soil pollution
(ii) Air pollution
(iii) Noise pollution
(iv) None of these

Ans. (i) Soil pollution

(c) One alternative choice for the items that Tanu can make is/are

(i) use of thermocol plates.
(ii) use of plastic coated paper plates.
(iii) use of flowers for decoration instead of balloons.
(iv) all of these.

Ans. (iii) use of flowers for decoration instead of balloons.

(d) Some pollutants may enter into our food chain and enhance their concentration along with the food chain. This is called

(i) bioaccumulation.
(ii) biomagnification.
(iii) biodegradation.
(iv) eutrophication.

Ans. (ii) biomagnification.

(e) DDT has been banned in many countries because it
(i) is non-biodegradable.
(ii) can cause biomagnifications.
(iii) can be broken down into non-poisonous substances.
(iv) both (i) and (ii).

Ans. (iv) both (i) and (ii).

18. A lot of garbage or waste is generated everyday including household waste like peels of vegetables, waste paper, broken items and so on. Rohan has seen all the garbage being thrown in one dustbin at his home. There is no system of segregation of waste. Recently the Resident Welfare Association (RWA) of his housing society has issued a circular to all the people to arrange two dustbins at home so that the waste can be segregated as wet and dry waste.

I. (a) Why do we need to segregate our waste?

(b) State one use of the kitchen waste.

(c) (i) Differentiate between biodegradable and non-biodegradable waste.

OR

(ii) Which of the following materials are non-biodegradable – paper, animal bones, egg shell, plastic mug and aluminium foil?

Ans. (a) Segregated waste can be easily recycled.

(b) Kitchen waste can be used to prepare organic compost.

(c) (i) Biodegradable substances can be broken down to simple, non-poisonous substances by the action of microorganisms while non-biodegradable substances cannot be broken down to simple substances.

OR

(ii) Plastic mug and aluminium foil.

II. (a) We need to segregate our domestic wastes at the time of disposal because
(i) some are biodegradable some are not.
(ii) they need one kind of treatment.
(iii) some are recyclable some are not.
(iv) both (i) and (iii).

Ans. (iv) both (i) and (iii).

(b) We can use our kitchen wastes to produce
(i) recycled product.
(ii) organic manure.
(iii) green manure.
(iv) all of these.

Ans. (ii) organic manure.

(c) Which of the following comprises of dry wastes only?
(i) Vegetable peels, paper, plastic bag
(ii) Cardboard, plastic bottle, leftover food
(iii) Vegetable peels, rotten fruits, leftover food
(iv) Paper, plastic bottle, broken glass jar

Ans. (iv) Paper, plastic bottle, broken glass jar

(d) How many items from the list given below are non-biodegradable?

Paper, Animal bones, Egg shell, Plastic mug, Aluminum foil

(i) 3 (ii) 4
(iii) 2 (iv) 5

Ans. (iii) 2

(e) Study the given table showing list of recyclable and non-recyclable wastes and select the row that has incorrect items.

	Recyclable waste	Non-recyclable waste
I.	Plastic water bottle	Light bulbs
II.	Deodorant bottle	Fiberglass
III.	Ceramics	Computer hardware
IV.	Old clothing	Food waste
V.	Bubble wrap	Batteries

(i) (I) and (III) (ii) (III) and (IV)
(iii) (III) and (V) (iv) Only (V)

Ans. (iii) (III) and (V)

Very Short Answer Type Questions

19. Where is CFC found? How does it affect the ozone layer?

Ans. Chlorofluorocarbons are used in refrigerators and air conditioners as coolants, in aerosol sprayers, etc. CFCs are ozone depleting substances. They react with ozone and destroy it gradually.

20. Draw a diagram to represent a common food chain in a grassland ecosystem.

Ans. Plants → Rats → Snakes → Hawks.

21. Define a food web.

Ans. The network of various food chains which are interconnected at various trophic levels is called a food web.

22. Categorize as primary, secondary and tertiary consumers:

Grasshopper, snake, hawk, owl, rat and rabbit.

Ans. Primary consumer: grasshopper, rabbit, rat

Secondary consumer: snake, owl

Tertiary consumer: hawk.

23. State the reasons behind the death of the top carnivores.

Ans. Due to biomagnifications, the concentration of non biodegradable substances is maximum in the body of top carnivores which causes their death.

24. Explain why a food chain usually cannot have more than three or four trophic levels.

Ans. At each trophic level, only 10% of energy is passed to the next trophic level and the rest 90% of energy is lost to the environment due to respiration and other metabolic activities. Thus, with increase in trophic level, the amount of energy available decreases. If there is more than three or four trophic levels, the amount of energy available for the next trophic level will be negligible. Therefore, a food chain usually cannot have more than three or four trophic level.

25. Why can the pesticides not be removed from food grains by washing?

Ans. Pesticides are non biodegradable substances which are absorbed by the plants and becomes accumulated in the plant products. Hence pesticides cannot be removed from food grains by washing.

26. What is UNEP agreement of 1987?

Ans. In 1987, the United Nations Environment Programme (UNEP) had an agreement to freeze CFC production at 1986 levels. At our individual level, we can stop the use of aerosol sprays that emit CFCs to prevent ozone layer depletion.

27. (a) How is energy introduced into the ecosystem?

(b) Consider the following food chains.

(i) Plants $\rightarrow$ mice $\rightarrow$ snakes $\rightarrow$ hawks

(ii) Plants $\rightarrow$ mice $\rightarrow$ hawks

If energy available at the producer level in both the food chains is 100 J, in which case will hawks get more energy as food and by how much? Justify your answer.

Ans. (a) Energy from the sun is captured by green plants by the process of photosynthesis.

(b) As per ten percent law, energy received by hawk in the first food chain will be 0.1 J and that in the second food chain will be 1 J. Therefore, hawk will receive ten times more energy in the second food chain. The second food chain has only three trophic levels therefore more energy is available for the top carnivore as compared to first food chain which has four trophic levels.

Short Answer Type Questions

28. Why is improper disposal of waste harmful to environment?

Ans. Improper disposal of waste is harmful to environment because it can cause substantial harm to human health and pollutes the environment, air, water, soil and cause harmful effects on living organisms.

29. What is ten per cent law? Explain with an example.

Ans. According to the ten percent law, only 10% of the total energy enters a particular trophic level of a consumer, and out of this, only 10% is available for transfer to the next trophic level. For example, suppose 1000 J of solar energy is received by green plants, then only 1% of solar energy available on the earth is utilized by plants, so, only 10 J (1% of 1000 J) is trapped by plants and the rest 990 J of energy is lost to the environment. So, plants utilize only 10 J of energy. Next, only 10% of the 10 J energy of plants, that is 1 J is available to the herbivore animal while 9 J is lost by metabolic processes and as heat. Again, just 10% of the 1 J of energy of herbivore animals is utilized by carnivore animals. Thus, carnivore animals have only 0.1 J.

30. A gas 'X' which is a deadly poison is found at the higher levels of atmosphere and performs an essential function.

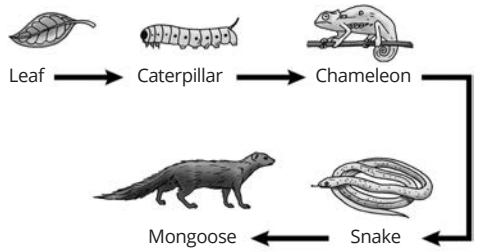
Name the gas and write the function performed by this gas in the atmosphere. Which chemical is linked to the decrease in the level of this gas? What measures have been taken by an international organization to check the depletion of the layer containing this gas? **(CBSE 2024)**

Ans. Gas 'X' mentioned in the question is Ozone. It forms a layer in the upper part of the atmosphere and absorbs harmful ultraviolet (UV) radiation from the sun. It is thus very important for life on the earth, since it prevents harmful UV rays of the sun from reaching the surface.

Chlorofluorocarbons (CFCs) are the main synthetic chemicals leading to ozone layer depletion.

In 1987, the United Nations Environment Programme (UNEP) had an agreement to freeze CFC production at 1986 levels.

31. Study the food chain given below and answer the questions that follow:



(a) If the amount of energy available at the third trophic level is 100 joules, then how much energy will be available at the producer level? Justify your answer.

(b) Is it possible to have 2 more trophic levels in this food chain just before the fourth trophic level? Justify your answer. **(CBSE SP 2024)**

Ans. (a) 10000 J because only 10% of energy is available for the next trophic level.

(b) No, since the loss of energy at each step is so great that very little usable energy will remain after fourth trophic levels.

Long Answer Type Questions

32. What is ozone hole? Where is it located? How is it formed?

Ans. Ozone hole is a region of depleted ozone in stratosphere region of atmosphere.

It is located in the Antarctica region.

There are many substances that we use in our day-to-day life which cause ozone layer depletion. These substances are called ozone depleting substances (ODS).

Chlorofluorocarbons (CFCs) are the main synthetic chemicals leading to ozone layer depletion. The CFCs are mainly used in fire-extinguishers, refrigerants (like in air conditioners) and aerosol sprays. CFCs when released in the air react with ozone gas and destroy it gradually.

33. What are planktons? Differentiate with example between phytoplanktons and zooplanktons.

Ans. Planktons are the diverse collection of organisms that live in large bodies of water and are unable to swim against a current. They provide a crucial source of food to many large aquatic organisms, such as fish and whales. These organism include bacteria, archaeabacteria, algae, protozoa etc that inhabit oceans, seas, or fresh water bodies.

Phytoplankton	Zooplankton
Plant like aquatic microorganisms found in marine and fresh water.	Animal like aquatic microorganisms found in marine and fresh water.
Autotrophic	Heterotrophic.
Primary producer of aquatic food chain.	Primary consumer of aquatic food chain.
Common examples are algae and blue green algae.	Common examples are protozoans.

Let's Compete

(Page 157)

Multiple-Choice Questions

1. In an ecosystem, there is a flow of

(a) energy only. (b) nutrients only.
(c) water only. (d) energy and nutrients.

Ans. (d) energy and nutrients.

2. Which of the following is biodegradable?

(a) Plastic mugs (b) Tea leaves
(c) Silver foil (d) Nylon

Ans. (b) Tea leaves

3. An example of biotic component of the environment is

(a) water. (b) temperature.
(c) ingestion. (d) vegetation.

Ans. (d) vegetation.

4. A food chain comprises of frog, snake, grass and grasshopper. The organism at third trophic level is

(a) frog. (b) snake.
(c) grass. (d) grasshopper.

Ans. (a) frog.

5. In an ecosystem, herbivores represent

(a) producers. (b) primary consumers.
(c) secondary consumers. (d) tertiary consumers.

Ans. (b) primary consumers.

6. Ozone layer is destroyed due to

(a) CO_2. (b) CFC.
(c) SO_2. (d) NH_3.

Ans. (b) CFC.

7. A sequential process in which one organism consumes another organism to transfer food energy is called

(a) pollution. (b) biomagnification.
(c) food chain. (d) food web.

Ans. (c) food chain.

8. In an aquatic ecosystem, which of the following are producers?

(a) Small fish (b) Large fish

(c) Zooplankton (d) Phytoplankton

Ans. (d) Phytoplankton

9. On an average, energy transferred from one trophic level to another is

(a) 12%. (b) 8%.

(c) 10%. (d) 20%.

Ans. (c) 10%.

10. A food chain is comprised of plants, butterfly, lizard and eagle. In this food chain, lizard is

(a) the primary consumer.

(b) on the second trophic level.

(c) not affected by the number of butterfly.

(d) the secondary consumer.

Ans. (d) the secondary consumer.

Life Skills

(Page 157)

1. The activities of man have had adverse effects on all forms of living organisms in the biosphere. Unchecked exploitation of nature by man has disturbed the delicate ecological balance between the living and non-living components of the biosphere. The unfavourable conditions created by man himself have threatened the survival of not only himself but also of the entire living organisms on the earth. One of your classmates is an active member of 'Eco club' of your school which is creating environmental awareness amongst school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings.

(a) Why is it necessary to conserve our environment?

(b) State the importance of green and blue dustbins in the safe disposal of household waste.

(c) List two values exhibited by your classmate who is an active member of Eco club of your school. **(CBSE 2016)**

Ans. (a) It is necessary to conserve our environment for sustenance of present life form as well as for future generation.

(b) Green dustbin is used to dispose off biodegradable waste while blue to dispose non-biodegradable waste. Biodegradable waste can be converted to compost and biogas for agricultural purposes and other use. Non-biodegradable waste can be sent to factories for recycling.

(c) My classmates are environment friendly, initiative taker and sensible students.

2. A lot of waste such as kitchen waste, paper waste, etc. is generated in Mohit's home daily. His mother segregates the waste into biodegradable and non-biodegradable and throws in different dustbins for each type. However, the municipality workers disposes it of in a common bin. Mohit's mother notices this and explains the municipal workers to dispose the waste separately, and they were convinced.

(a) What values are displayed by Mohit's mother?

(b) What will happen if biodegradable and non-biodegrable wastes are not segregated prior to disposal?

(c) How can Mohit's mother recycle the kitchen waste?

Ans. (a) Mohit's mother is observant, environment-friendly and sensible.

(b) If biodegrable and non-biodegradable wastes are not segregated, they cannot be treated accordingly to produce compost neither they can be recycled.

(c) She can recycle the kitchen waste by composting which can be used in kitchengarden.

3. Students in a school listened to the news read in the morning assembly that the mountain of garbage in Delhi, suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. In the brainstorming session, the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points – one is self management of the garbage we produce and the second is to generate less garbage at individual level.

(a) Suggest two measures to manage the garbage we produce.

(b) As an individual, what can we do to generate least garbage? Give two points.

(c) List two values the teacher instilled in the students in this episode. **(CBSE 2018)**

Ans. (a) (i) Segregating biodegradable and non biodegradable wastes.

(ii) Disposing waste by recycling, composting, incineration, landfill and sewage treatment.

(b) (i) By using paper or cloth bag instead of plastic bags.

(ii) By segregating biodegradable and non-biodegradable waste.

(iii) Awareness and eco-friendliness.

Sustainable Management of Natural Resources

Checkpoint (Page 161)

1. What is biosphere?

Ans. The life-supporting zone of the earth where all three zones, namely atmosphere, hydrosphere and lithosphere interact with each other, making life possible is called biosphere.

2. Why is atmosphere essential for life?

Ans. Atmosphere covers the earth like a blanket. Air is a bad conductor of heat. The atmosphere keeps the average temperature of the earth steady during daytime and also around the whole year. It prevents the sudden increase in temperature during daytime. It also slows down the escape of heat into outer space during night and as a result does not let the weather become too cold during night.

3. Define greenhouse effect.

Ans. We know that sun rays pass through the earth's atmosphere and some of them are reflected back into space. Thus, most of the sun rays that are absorbed warm the earth's surface. There are some gases such as carbon dioxide which prevent the escape of heat from the earth. An increase in the percentage of such gases in the atmosphere would increase the average temperature worldwide. This is called the greenhouse effect. An increase in the carbon dioxide or methane content in the atmosphere causes more heat to be trapped and retained by the atmosphere, leading to greenhouse effect.

4. What do you mean by global warming?

Ans. The increase in temperature of the earth's surface and lower atmosphere due to greenhouse effect is called global warming.

5. Define acid rain.

Ans. When fossil fuels are burnt, different oxides of nitrogen and sulphur are produced. The oxides of nitrogen and sulphur combine with water to form nitric acid and sulphuric acid, respectively. These acids dissolve in rainwater and fall as acid rain.

6. What are the various effects of air pollution on human health?

Ans. Air pollution is known to cause irritation in the eyes, lungs, nose, and throat. It creates respiratory problems such as asthma and bronchitis. It also causes lung cancer, allergies, giddiness, headache, and cardiovascular malfunctioning.

7. How does greenhouse effect cause global warming?

Ans. An increase in greenhouse gases like carbon dioxide or methane content in the atmosphere causes more heat to be trapped and retained by the atmosphere, leading to global warming.

Check Your Progress 1

(Page 166)

Multiple-Choice Questions

1. Which of the following is not a natural resource?

(a) Soil (b) Electricity
(c) Water (d) Air

Ans. (b) Electricity

2. Select the wrong statement.

(a) Forests provide variety of products
(b) Forests have great plant diversity
(c) Forest do not conserve soil

(d) Forests conserve water

Ans. (c) Forest do not conserve soil

3. Arabari forest of Bengal is dominated by

(a) bamboo. (b) teak.

(c) *sal*. (d) *Eucalyptus*.

Ans. (c) *sal*.

4. With which tree is Amrita Devi Bishnoi associated?

(a) Khajoor (b) Khejrali

(c) Khejri (d) Keekar

Ans. (c) Khejri

Very Short Answer Type Questions

5. Name any two common natural resources.

Ans. Air, water, soil, forest, coal, petroleum, natural gas.

6. List any four items which can be obtained from forest.

Ans. Fruits, nuts, medicine, bamboo, wood, fodder.

7. List any two industries based on forest produce.

Ans. Timber industry, paper industry, sports equipment industry.

8. What does presence of coliform in water indicate?

Ans. The presence of coliform bacteria in waterbodies indicates contamination by intestinal disease causing microorganisms.

9. What is 'Amrita Devi Bishnoi National Award'?

Ans. 'Amrita Devi Bishnoi National Award' is an award instituted by Government of India for Wildlife Conservation in memory of Amrita Devi Bishnoi.

10. What is meant by conservation? Why should we conserve natural resources?

Ans. The protection, preservation, restoration, and rational use of all the resources in the environment is known as conservation.

We should conserve natural resources for:

(i) sustainable development.

(ii) future generation.

(iii) equitable distribution of natural resources.

(iv) preventing damage to environment.

11. What was the initial objective and nature of wildlife conservationists?

Ans. There are many nature and wildlife conservationists who recognise the need to preserve biodiversity as a whole as opposed to their initial focus on conservation of large animals like lions, tigers, elephants and rhinoceros.

12. Management of forest and wildlife resources is a very challenging task. Why? Give reasons.

Ans. The haphazard use of natural resources for the benefit of mankind has made their management a challenging task. Few reasons are:

(i) Deforestation which leads to loss of biodiversity, flood as well as drought condition

(ii) Poaching which leads to ecological instability

(iii) Indiscriminate use of fossil fuel which leads to greenhouse effect, global warming, acid rain etc.

(iv) Excess use of chemical fertilizers and pesticides leading to loss of soil fertility.

Short Answer Type Questions

13. What are biodiversity hotspots? Name four stakeholders of this hotspot.

Ans. Forests are biodiversity hotspot. Stakeholders of forest ecosystem are:

(i) Various people who live in or around the forests and depend on forest produce (obtained from forests) for their living.

(ii) Various industries using forest produce (such as 'tendu' leaves to make *bidis*, wood to make paper, furniture, etc.). These industries use various forest produce, but are not dependent on the forests of any one particular area.

(iii) The forest authorities of the government which control the resources from forests and are responsible for their management.

(iv) The nature and wildlife conservationists/ activists who want to conserve nature.

14. What is *Chipko Andolan*? How did this movement ultimately benefit the local people and the environment? **(CBSE 2016)**

Ans. *Chipko Andolan* was the result of efforts of local people to protect their forests.

Chipko Andolan or 'Hug the trees movement' took place in the year 1974 in the Garhwal region, as a result of indiscriminate cutting down of forest trees. The inhabitants of village Reni in Garhwal region started agitating against the cutting down of trees. They used to hug trees and shield them from axes preventing the contractors from cutting of trees. Thus, this movement quickly spread across a larger area and forced the authorities to rethink their priorities in the use of forest produce.

Local people were benefitted as preventing trees from cutting resulted in easily availability of forest products to them leaves – for fodder, herbs for medicines, fruits and nuts for food. Environment was benefitted as the quality of soil, air and water was not adversely affected.

15. List two problems that may arise by converting forests to monocultures of pine, teak and *Eucalyptus.*

Ans. When a vast area of forests are converted to monocultures of *Eucalyptus*, teak or pine trees due to unplanned cutting of trees, huge areas are first cleared of vegetation in order to plant these trees.

This leads to:

(i) Destruction of a large amount of biodiversity in that area resulting in ecological imbalance.

(ii) Deprives the local people of their basic needs – leaves for fodder, herbs for medicines, fruits and nuts for food.

Long Answer Type Question

16. Give an example where participation of local people has led to efficient management of forests.

Ans. With the active participation of local people in the management of forests, there can be an increase in the forest produce as well as the forests can be conserved.

In 1972, the West Bengal Forest Department recognized its failures in reviving the degraded *sal* forests in the south-eastern districts of the state. The complete alienation of the local people from administration resulted in frequent clashes and was a major cause in the Naxalite upheaval. Accordingly the Department devised a scheme to revive the degraded *sal* forests by involving local people. It began from Arabari forest range in Midnapore district. A Forest Officer, A K Banerjee involved the local villagers to protect 1,272 hectares of badly degraded *sal* forest. In return, these villagers were given employment in both silviculture and harvesting operations, and 25 per cent of the final forest produce. They were also allowed to collect firewood and fodder from forest area at a nominal payment. With the active participation of local people, the *sal* forests again became thick and green and revived within 10 years from a worthless to ₹ 12.5 crores forest.

Check Your Progress 2

(Page 171)

Multiple-Choice Questions

1. *Surangams* are the age old concept of water harvesting in

(a) Karnataka. (b) Kerala.

(c) Tamil Nadu. (d) Andhra Pradesh.

Ans. (b) Kerala.

2. When combustion of coal takes place in insufficient air (oxygen), the gas formed instead of carbon dioxide is

(a) sulphur dioxide. (b) nitrous oxide.

(c) carbon monoxide. (d) nitrogen peroxide.

Ans. (c) carbon monoxide.

3. Which of the following R's is not used to save the environment?

(a) Reduce (b) Recycle

(c) Reuse (d) Remove

Ans. (d) Remove

4. Groundwater will not be depleted due to

(a) afforestation.

(b) thermal power plants.

(c) loss of forest, and decreased rainfall.

(d) cropping of high water demanding crops.

Ans. (a) afforestation.

Very Short Answer Type Questions

5. Mention the names of any two dams whose construction faced opposition.

Ans. Sardar Sarovar dam and Tehri dam.

6. Construction of a dam on a river often results in reduction in fish catch. Give reason.

Ans. Construction of dam results in change in the temperature of water. Cold water released from dams affect the reproduction of fish resulting in its decline.

7. Name a greenhouse gas. What happens when its amount increases in the atmosphere?

Ans. Carbon dioxide. Increase of carbon dioxide in the atmosphere causes intense global warming by trapping more heat.

8. Name the Booker Prize winner who actively took part in Narmada Bachao Andolan.

Ans. Arundhati Roy.

9. In which way management of fossil fuels is different from other natural resources?

Ans. Fossil fuels are non renewable source of energy and their combustion produce polluting gases which causes global warmimg and acid rain. On the other hand, natural renewable resources can be easily managed. Water can be managed by using effective water treatments plants. Forests can be conserved by reducing deforestation. Rain water harvesting is another resource management technique.

10. Name the chief elements found in coal and petroleum. How does burning of coal and petroleum affect our environment?

Ans. Since coal and petroleum were formed from biomass, in addition to carbon, they also contain hydrogen, nitrogen and sulphur. When these are burnt, oxides of hydrogen, nitrogen, carbon and sulphur are produced. At high concentration, carbon dioxide is a greenhouse gas, while oxides of sulphur and nitrogen cause acid rain and

carbon monoxide is a poisonous gas. If the amount of carbon dioxide in the atmosphere is increased, it will cause intense global warming.

11. What is water harvesting? How can this technique help in conservation of water? **(CBSE 2016)**

Ans. Water harvesting is the process of collecting rainwater and storing it for direct use or recharging it into the ground for indirect use. This helps to recharge groundwater levels and even brings rivers back to life.

Short Answer Type Questions

12. What does watershed management mean and aim at? What are the advantages of watershed management?

Ans. Watershed management is the implementation of sustainable land use practices and water management practices to protect and improve the quality of the water and other natural resources so as to maintain ecological balance.
Advantages of watershed management:

(i) Watershed management increases the production and income of the watershed community.

(ii) Mitigates droughts and floods and increases the life of the downstream dam and reservoirs.

13. Name two traditional water harvesting system. What are the two advantages of giving people control over their local water resources?

Ans. Khadin and Bhandaras. Giving local people control over local water resources ensures:

(i) Proper management and utilization of water resources.

(ii) Equitable distribution of water resource.

14. List few practices which would help in conserving fossil fuels.

Ans. Some steps which we can take to conserve energy by limiting the use of fossil fuels like coal and petroleum for generation of energy are:

(i) Using public transport instead of using your own vehicle.

(ii) Using fluorescent tubes instead of bulbs in your homes.

(iii) Increasing the efficiency of machines and engines by ensuring complete combustion.

(iv) Using stairs instead of lift.

Long Answer Type Questions

15. What are fossil fuels? How are coal and petroleum formed? Why fossil fuels should be used judiciously?

Ans. Exhaustible natural resources like coal, petroleum and natural gas which are formed from the dead remains of living organism are called fossil fuels.
Coal and petroleum are formed from the degradation of biomass, millions of years ago. Coal forms in swampy areas as the result of the decay of plants in the absence of oxygen. Biochemical changes produced by bacteria release oxygen and hydrogen and concentrate carbon. Petroleum and natural gas form over millions of years as the result of the decay of marine organisms. These organisms die and collect on the ocean floor.
Since coal and petroleum were formed from biomass, in addition to carbon, they also contain hydrogen, nitrogen and sulphur. When these are burnt, oxides of hydrogen, nitrogen, carbon and sulphur are produced. At high concentration, carbon dioxide is a greenhouse gas, while oxides of sulphur and nitrogen cause acid rain and carbon monoxide is a poisonous gas. If the amount of carbon dioxide in the atmosphere is increased, it will cause intense global warming. In addition, coal and petroleum takes millions of years to form, these resources will be exhausted, sooner or later (petroleum in about 40 years and coal in about 200 years). Even though coal and petroleum are produced by the degradation of biomass, we need to use them judiciously and conserve them.

16. Building of dams is advantageous on one hand and disadvantageous on the other. Why? Give reasons.

Ans. **Advantages of building a dam**: Many dams have been built by the government to effectively manage the flow of water for generating electricity as well as other purposes.

1. Dams ensure the storage of adequate water for irrigation and also for generating electricity.
2. From these dams, a large amount of water can be transferred by canals to great distances for use by people for drinking, bathing and other use.

For example, the Indira Gandhi Canal has supplied water to a large part of Rajasthan bringing greenery to considerable areas.

Disadvantages of building a dam: There may be many disadvantages of dams also. For example, mismanagement of the water supply from dams may lead to social and other problems. When there is no equitable distribution of water, people close to the source get more water and grow water intensive crops like sugar cane and rice, while people farther downstream do not get any water.

1. Social Problems: A large number of people living in a particular area for centuries get displaced due to building up of dams. This

adds to discontentment among the people who are displaced by the building of the dam and its canal network. These people are largely poor people who do not get any direct benefits from these projects. They feel alienated from their lands and forests without adequate compensation.

2. Economic Problems: Construction of dams requires huge amount of public money. However, it does not generate proportionate benefits.
3. Environmental Problems: Dams require a large area of land running into kilometres. This leads to deforestation and enormous loss of biodiversity. Many important medicinal plants and other flora and fauna get submerged in the water reservoir and are damaged.

Higher Order Thinking Skills (HOTS) Questions

(Page 172)

1. "Energy stored in coal and petroleum is obtained from the sun". Justify this statement.

Ans. Coal and petroleum are formed from the degradation of biomass, millions of years ago. Green plants trap solar energy during the process of photosynthesis. The food produced by plants is used for survival of all animals. When the dead plants and animal decays for millions of years in the absence of oxygen, coal and petroleum is formed. Thus, energy stored in coal and petroleum is obtained from the sun.

2. How has religious beliefs helped in conservation of forest biodiversity in India?

Ans. Religious beliefs have helped in conservation of forest biodiversity in India. Some trees are considered as sacred and cutting such trees are opposed by local people on a larger scale. Such religious belief has protected many varieties of trees. One such example is Khejri tree which was protected by the Bishnoi community in Rajasthan.

3. Increase in demand of energy is affecting the environment. How?

Ans. Increasing demand of energy has led to the over exploitation of fossil fuel. Fossil fuel contains carbon, hydrogen, nitrogen and sulphur. When these are burnt, oxides of hydrogen, nitrogen, carbon and sulphur are produced. At high concentration, carbon dioxide is a greenhouse gas which results in global warming. Oxides of nitrogen and sulphur causes acid rain while carbon monoxide in a poisonous gas.

4. Future generations of mankind will depend more and more on non-conventional sources of energy. Justify this statement.

Ans. Conventional sources of energy like fossil fuels are non-renewable sources of energy. Fossil fuels like coal and petroleum are mainly used as fuels to run vehicles, generate electricity and other purposes. These resources are available in limited amount. Once exhausted, it will take millions of years to be replenished. Hence, it will not be available to the future generations of mankind and they will have to depend on non-conventional sources of energy.

Self-Assessment

(Page 172)

Multiple-Choice Questions

1. The most rapidly dwindling natural resource in the world is

(a) soil. (b) forest.
(c) water. (d) wind.

Ans. (b) forest.

2. Which of the following is the age old concept of water harvesting system in Madhya Pradesh?

(a) Ponds (d) *Bandhis*
(c) *Nadis* (d) *Bandhases*

Ans. (d) *Bandhis*

3. Tehri Dam is being constructed on

(a) Yamuna. (b) Narmada.
(c) Ganga. (d) Godavari.

Ans. (c) Ganga.

4. Which of the following implies change in all aspects of life?

(a) Economic development
(b) Industrial development
(c) Sustainable development
(d) Social development

Ans. (c) Sustainable development

5. *Pynes* system of irrigation is common in

(a) Himachal Pradesh. (b) Bihar.
(c) Rajasthan. (d) Uttar Pradesh.

Ans. (b) Bihar.

Assertion–Reason Type Questions

For question numbers 6 to 13, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of the assertion.

(b) Both A and R are true but R is not the correct explanation of the assertion.

(c) A is true but R is false.

(d) A is false but R is true.

6. **Assertion:** Coliform bacteria like *E.coli* are commonly found in human faeces.
Reason: Coliform bacteria are used as an indicator of contamination in a water sample.

Ans. (b)

7. **Assertion:** MPN is the unit to measure the number of coliform bacteria in a water sample.
Reason: MPN value is lower in a sample collected upstream of a city than the one collected from downstream.

Ans. (b)

8. **Assertion:** There are five R's which can provide solution to the environmental problems.
Reason: Repurpose is not one of the five R's.

Ans. (c)

9. **Assertion:** Stakeholders include people who live in or around the forests and directly or indirectly depend on forest produce.
Reason: Forest department people are not stakeholders in the conservation of forest.

Ans. (c)

10. **Assertion:** No conservation effort is successful without the involvement of local people.
Reason: Local people have great knowledge of indigenous floral and faunal diversity.

Ans. (a)

11. **Assertion:** Sustainable development is the solution to manage our resources well.
Reason: The resources on earth are limited and exhaustible.

Ans. (a)

12. **Assertion:** Traditional methods of water harvesting were introduced by Britishers in India.
Reason: Kulhs system is a part of traditional irrigation system in Himachal Pradesh.

Ans. (d)

13. **Assertion:** Increase in air pollution is due to increase in the amount of oxygen in air.
Reason: Burning of fossil fuels release toxic elements including arsenic and lead which may leads to deadly disease like cancer.

Ans. (d)

Source-based/Case-based/Passage-based/ Integrated assessment questions

Answer the questions on the basis of your understanding of the following passages and the related studied concepts.

14. Plastic pollution has become one of the most concerning environmental issue worldwide as the rapid production of plastic products overwhelms the world's ability to deal with them. We are so much dependent on plastic and non disposable products that we cannot even imagine our daily routine without using them. Being an aware individual Mona's mother is very particular about carrying cloth bag every time she goes shopping. She also refuses to take things in a polythene bag and avoid using single use plastic.

I. (a) Why do you think she carries a shopping bag with her?

(b) How much time does it take for the polyethylene to degrade naturally?

(c) (i) State one advantage of not using single use plastic.

OR

(ii) List few changes in our lifestyle to reduce plastic pollution.

Ans. (a) Mona's mother carry her own shopping bag to reduce plastic waste.

(b) Polyethylene takes many hundred to thousands of year to degrade naturally.

(c) (i) Reduction in single use plastic will reduce the global plastic waste.

OR

(ii) We can reduce plastic pollution by using biodegradable things such as cloth carry bag, our own cutlery while travelling and reusable cups.

II. (a) What is the fate of plastic wastes?

(i) These are eventually degraded into soil.
(ii) They just break into little pieces, never fully goes away.
(iii) All are recycled.
(iv) Both (ii) and (iii).

Ans. (ii) They just break into little pieces, never fully goes away.

(b) Recycling of plastic wastes is difficult because

(i) these are adhesive in nature.
(ii) these are very tough.
(iii) they come in different sizes.
(iv) they contain different types of polymers.

Ans. (iv) they contain different types of polymers.

(c) Which is the best way to control plastic pollution?

(i) Composting (ii) Burning
(iii) Reuse (iv) Source reduction

Ans. (iv) Source reduction

(d) The majority of plastic waste is end up in

(i) ocean.
(ii) landfills.
(iii) burned for energy.
(iv) recycling.

Ans. (i) ocean.

(e) Which of the following is/are non-biodegradable?
(i) Broken glass materials
(ii) Plastic bottles
(iii) Electronic devices
(iv) All of these

Ans. (i) Broken glass materials

15. Every year after Diwali, air quality of many regions of India including Delhi NCR become hazardous. This leads to state of public health emergency and closure of schools in many cities. Burning of agriculture stubbles further compounds the problem of air pollution which is extremely harmful for everyone especially children and old aged people. The government has announced the odd-even scheme for plying of private vehicles on Delhi roads.

I. (a) Name two air pollutants.
(b) How does burning of agriculture stubbles aggravates the problem?
(c) (i) What is odd-even scheme of the government?

OR

(ii) Why are CNG vehicles exempted from odd-even rule?

Ans. (a) Carbon monoxide and nitrogen oxides
(b) Burning of agriculture stubble leads to enhanced emission of greenhouse gases, particulate matter and smog that cause health hazards.
(c) (i) According to the odd-even scheme, odd-numbered and even-numbered vehicles will ply on the roads on alternate days.

OR

(ii) Private CNG vehicles were exempted in earlier phases of odd-even scheme but in November 2019, they were not exempted.

II. (a) Which of the following is/are air pollutants?
(i) Particulate matter
(ii) Smoke
(iii) Nitrogen oxides
(iv) All of these

Ans. (iv) All of these

(b) Burning of agricultural stubbles aggravates air pollution by contributing
(i) CO_2.
(ii) CO.
(iii) sulfur oxides.
(iv) all of these.

Ans. (iv) all of these.

(c) Odd-even rule was imposed to decrease the air pollution in Delhi. It imposed on
(i) auto rikshaws.
(ii) only private cars.
(iii) all the buses.
(iv) all the vehicles.

Ans. (ii) only private cars.

(d) CNG vehicles were exempted from odd-even rule because
(i) CNG only releases sulfur oxides.
(ii) CNG reduces carbon monoxide emission.
(iii) CNG is used in public buses only.
(iv) CNG is used in private cars only.

Ans. (ii) CNG reduces carbon monoxide emission.

(e) Which of the following is considered as clean fuel?
(i) Petrol
(ii) Diesel
(iii) CNG
(iv) None of these

Ans. (iii) CNG

Very Short Answer Type Questions

16. How does mining cause problem?

Ans. During mining to extract metals, a lot of pollution is caused due to the large amount of slag which is discarded for every tonne of metal extracted.

17. Name any two wastes that can be recycled and reused.

Ans. Reuse: paper, glass bottles and jars.
Recycle: old clothes, paper

18. The leaf of which plant is used to make *bidis*?

Ans. Leaf of Tendu plant.

19. List any two causes of our failure to sustain availability of underground water.

Ans. Deforestation and overexploitation of water resource by growing population.

20. Name the forest officer responsible for reviving the degraded *sal* forest in West Bengal.

Ans. A.K. Banerjee.

21. What are natural resources? State two factors that work against the equitable distribution of these resources.

Ans. Anything obtained from natural environment that is required by man to meet his various requirements is known as a natural resource. Two factors that work against the equitable distribution of these resources are:
(i) Over exploitation of resources by industrialists for short term benefit.
(ii) Human greed, corruption, and lobby the interest need of rich and influentials.

22. How do advantages of exploiting natural resources with short-term aims differ from the advantages of managing our resources with a long-term perspective?

Ans. Short term aim of exploiting the resources will harm the environment by depleting the resources in such a way that it will not be available for future generation but with the long term perspective the resources can last for generations to come if it is used in a sustainable manner.

23. What led to the loss of control of local water resources by local people?

Ans. After large scale projects such as large dams and canals were conceived and implemented, it led to the neglect of the local irrigation methods and the government took over the administration of this system leading to the loss of control over the local water sources by the local people.

24. Name any two poisonous products formed by burning of fossil fuels.

Ans. Burning of fossil fuel produce carbon dioxide, oxides of nitrogen and sulphur and carbon monoxide.

Short Answer Type Questions

25. What is sustainable management? Why is reuse considered better in comparison to recycle?

(Delhi 2017)

Ans. Sustainable development is the use of natural resources judiciously for a more stable development and also preserving these resources for use by future generations.

Energy is utilised in recycling items to make new items from old ones, e.g. using old clothes for making carry bags and newspapers for envelopes but no energy is utilised in reusing items again for some other purpose, e.g. a worn-out dress or towel can be used as a duster or mopping cloth.

26. How do various stakeholders influence the conservation of forests?

Ans. There are various stakeholders who influence the forest conservation:

(i) Various people who live in or around forests and depend on forest produce for their living and daily needs. However, these people have been using the forest resources judiciously for centuries without causing much damage to the forest resource. They use the forest resource in a sustainable manner.

(ii) Various industries using forest produce: There are many industries based on forest produce including timber, paper, lac and sports good industries which has resulted in overexploitation of forest resources. These industries consider forest as merely a source of raw material for their factories without being interested in sustainable development of the area.

(iii) Forest Department of the Government: The forest authorities owns and controls the resources from forests. They also do not involve the local people and ignore their experience and knowledge. They promote monoculture of pine, teak and eucalyptus which generates revenue for the Forest Department at the cost of loss of biodiversity in the area.

(iv) Nature and Wildlife Enthusiast: These people are in no way dependent on the forests but they recognise the need to conserve the biodiversity as a whole.

Long Answer Type Question

27. How can an individual contribute or make a difference to the management of

(a) forest? (b) fossil fuels?

Ans. (a) Steps to manage forest:

(i) By organising tree plantation campaign.

(ii) By making people aware of environmental hazards caused by deforestation.

(iii) Making people aware of law of conservation of forest.

(iv) By recycling paper and reducing the use of paper which will minimize cutting down trees.

(b) Steps to manage fossil fuels:

Some steps which we can take to manage fossil fuels like coal and petroleum are:

(i) Using public transport instead of using your own vehicle.

(ii) Using fluorescent tubes instead of bulbs in your homes.

(iii) Increasing the efficiency of machines and engines by ensuring complete combustion.

(iv) Using stairs instead of lift.

(v) Wearing an extra sweater or warm clothes instead of using heater during winters.

Let's Compete

(Page 174)

Multiple-Choice Questions

1. Namami Ganga Plan was launched in

(a) July 2012. (b) June 2014.

(c) July 2014. (d) June 2012.

Ans. (c) July 2014.

2. The main cause for abundant coliform bacteria in the river Ganga is

(a) washing of clothes.

(b) run off water from crop fields.

(c) discharge of human excreta directly.

(d) discharge of waste from chemical plants.

Ans. (c) discharge of human excreta directly.

3. The waste product generated during metal extraction is

(a) slag. (b) lac.

(c) oxygen. (d) coal.

Ans. (a) slag.

4. Which of the following is not a natural resource?

(a) *Neem* tree (b) Sunlight

(c) Earthworm (d) Wooden house

Ans. (d) Wooden house

5. Which one of the following is not eco-friendly?

(a) Pooling of car to office

(b) Carrying jute bag for shopping

(c) Windmill for generating power

(d) Using heater on a cold day

Ans. (d) Using heater on a cold day

6. Of the following stakeholders of forest, which one causes the maximum damage to the forest?

(a) People who live in or around the forest

(b) The industrialists

(c) The wildlife and nature enthusiasts

(d) The forest department of the government of India.

Ans. (b) The industrialists

7. The presence of which microorganism in Ganga indicate contamination?

(a) *Amoeba* (b) *Lactobacillus*

(c) *Pseudomonas* (d) *Escherichia coli*

Ans. (d) *Escherichia coli*

8. What are coliforms?

(a) Group of virus (b) Group of algae

(c) Group of bacteria (d) Group of microorganisms

Ans. (c) Group of bacteria

9. The five R's to save the environment are

(a) Reserve, Reduce, Recycle, Reuse, Refuse.

(b) Revise, Reserve, Reduce, Replenish, Reuse.

(c) Reduce, Reuse, Recycle, Refuse, Repurpose.

(d) Reduce, Reuse, Reserve, Repurpose Replenish.

Ans. (c) Reduce, Reuse, Recycle, Refuse, Repurpose.

10. Plantation of which trees cause their monocultures?

(a) Pine (b) *Eucalyptus*

(c) Teak (d) All of these

Ans. (d) All of these.

Life Skills

(Page 175)

1. On a picnic to a bird sanctuary, Sanjay notices that there is littering of leftover food and other stuffs everywhere. Sanjay and his friends find that polythene bags, etc. have been thrown in the nearby pond. Sanjay along with his friends decided to clean the place and requests authorities to ensure cleanliness in the area.

(a) What values are shown by Sanjay and his friends?

(b) How do various stakeholders influence the conservation of national parks and sanctuaries?

(c) Why should we conserve our natural habitats?

Ans. (a) Sanjay and his friends are environment friendly, initiative taker and sensible.

(b) The stakeholders in the management of national park and wildlife sanctuaries are:

(i) People living in/around the area – The local people ensure sustainable use of natural resources for their daily needs. Since they have been living in these areas for centuries, they have developed certain ways to ensure that they do not harm the nature or exhaust the natural resources.

(ii) Nature and wildlife conservationists – These people look after preservation of biodiversity as a whole.

(iii) Tourists: These are the people who visit the national park and wildlife sanctuaries for aesthetic pleasure.

(iv) People involved with the forest department – These people control the resources available from forests but do not involve the local people and ignore their experience and knowledge. This ultimately results in destruction of a large amount of biodiversity.

(c) We should conserve our natural habitat as it helps in promoting biodiversity for a healthy and functional ecosystem. The conservation of the natural habitat enriches our planet and keeps the nature's balance.

2. Kapil notices that a lot of water is run-off as waste in the process of water purification by RO system installed in his kitchen. He discusses

it with his parents who then decide to store this water and reuse it for other purposes such as watering plants and cleaning.

(a) What values are shown by Kapil?

(b) Why should we conserve water?

(c) Name any other such way by which water can be conserved and reused.

Ans. (a) Kapil is aware and knows the importance of conserving water.

(b) We should conserve water as life is not possible without water. Water is required throughout the year for the purpose of agriculture, domestic use and industries, etc. Saving water helps to preserve our environment.

(c) Rain water harvesting.

3. Certain organizations motivate the general public to donate books, toys, clothes, utensils, etc. They further segregate and distribute these items to the needy.

After reading this passage, answer the following questions.

(a) What objectives are fulfilled by these initiatives?

(b) How does five R's come into play in this initiative?

(c) What values are shown by these organizations?

Ans. (a) (i) A good and environmental friendly approach including the components of 5 R's.

(ii) Promoting awareness in general public towards community service.

(b) Instead of throwing away these items, it was reused by someone else thus reducing accumulation of waste in the environment. Hence reuse and reduce come into play.

(c) The organization is environment friendly and socially responsible.