UNIQUE STUDY POINT

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Class: X	**Subject:** Science	**Session:** 2025-26
Chapter: 05 - Life Processes	**Time:** 1½ Hours	**Max. Marks:** 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

1. Which of the following organisms is autotrophic?
(a) Mushroom
(b) Green plant
(c) Amoeba
(d) Paramoecium

2. The end product of anaerobic respiration in yeast is:
(a) Lactic acid
(b) Ethanol and carbon dioxide
(c) Water and carbon dioxide
(d) Acetic acid

3. Which enzyme is secreted by the pancreas for protein digestion?
(a) Pepsin
(b) Trypsin
(c) Amylase
(d) Lipase

4. The respiratory pigment in human blood is:
(a) Chlorophyll
(b) Carotene
(c) Haemoglobin
(d) Melanin

5. Bile juice is produced by:
(a) Liver
(b) Pancreas

(c) Stomach
(d) Intestine

6. The tissue responsible for translocation of food in plants is:
(a) Xylem
(b) Phloem
(c) Sclerenchyma
(d) Parenchyma

7. Which of the following represents the correct sequence of blood flow in the human heart?
(a) Right atrium → Left ventricle → Lungs
(b) Right atrium → Right ventricle → Lungs
(c) Left atrium → Right ventricle → Body
(d) Left ventricle → Left atrium → Body

8. The energy currency of the cell is:
(a) ADP
(b) ATP
(c) DNA
(d) RNA

9. Bowman's capsule is part of:
(a) Heart
(b) Lung
(c) Nephron
(d) Liver

10. The finger-like projections in the small intestine are called:
(a) Villi
(b) Alveoli
(c) Nephrons
(d) Stomata

SECTION B - Short Answer Questions (2 marks each)

11. What is the significance of emulsification of fats by bile juice?

12. Why do fishes breathe faster than terrestrial organisms?

13. What are the two main stages of photosynthesis? Name them.

14. How do platelets help in blood clotting?

SECTION C - Short Answer Questions (3 marks each)

15. Compare aerobic and anaerobic respiration with respect to site, products, and energy released.

16. Explain the mechanism of gaseous exchange in alveoli.

17. How does transpiration help in the upward movement of water in plants?

SECTION D - Long Answer Question (5 marks)

18. Describe the process of digestion of food in the small intestine. Mention the role of different digestive juices involved.

SECTION E - Case Study Based Questions (4 marks each)

19. Case Study 1:

Respiration is a vital life process that provides energy for all cellular activities. In the presence of oxygen, glucose is completely broken down into carbon dioxide and water, releasing a large amount of energy (aerobic respiration). However, in the absence of oxygen, glucose is incompletely broken down. In muscle cells during intense exercise, glucose breaks down into lactic acid, causing muscle cramps. In yeast cells, glucose breaks down into ethanol and carbon dioxide, a process used in making bread and alcohol.

Based on the above information, answer the following:

(i) What is the main difference between aerobic and anaerobic respiration? (1 mark)

(ii) Why do we get muscle cramps during sudden activity? (1 mark)

(iii) Compare the energy yield of aerobic and anaerobic respiration. Explain why there is a difference. (2 marks)

20. Case Study 2:

Plants have a specialized vascular system for transport consisting of xylem and phloem. Xylem transports water and minerals from roots to leaves through vessels and tracheids. This movement is facilitated by root pressure, transpiration pull, and capillary action. Phloem transports food materials (mainly sucrose) from leaves to other parts of the plant in both upward and downward directions. This process, called translocation, requires energy from ATP. Unlike xylem, phloem tissue consists of living cells.

Based on the above information, answer the following:

(i) What is the main function of transpiration in water transport? (1 mark)

(ii) Why does translocation in phloem require energy while transport in xylem does not? (1 mark)

(iii) Explain how water moves from soil to the xylem in roots. (2 marks)

DETAILED ANSWER KEY - PAPER 02

SECTION A - Answers to MCQs

1. (b) Green plant

Green plants are autotrophic organisms that can synthesize their own food from simple inorganic substances (CO_2 and water) using sunlight energy through photosynthesis.

2. (b) Ethanol and carbon dioxide

During fermentation (anaerobic respiration in yeast), glucose is broken down into ethanol (a two-carbon compound) and carbon dioxide in the absence of oxygen.

3. (b) Trypsin

The pancreas secretes trypsin enzyme in pancreatic juice, which helps in the digestion of proteins in the small intestine.

4. (c) Haemoglobin

Haemoglobin is the respiratory pigment present in red blood cells that has a very high affinity for oxygen and helps transport it from lungs to body tissues.

5. (a) Liver

Bile juice is produced by the liver and stored in the gall bladder. It is released into the small intestine to help in fat digestion.

6. (b) Phloem

Phloem tissue is responsible for the translocation (transport) of food materials, especially sugars like sucrose, from leaves to other parts of the plant.

7. (b) Right atrium → Right ventricle → Lungs

Deoxygenated blood enters the right atrium, moves to the right ventricle, and is then pumped to the lungs for oxygenation through the pulmonary artery.

8. (b) ATP

ATP (Adenosine Triphosphate) is called the energy currency of the cell as it stores and supplies energy for all cellular activities.

9. (c) Nephron

Bowman's capsule is the cup-shaped structure at the beginning of a nephron that surrounds the glomerulus and collects the filtrate from blood.

10. (a) Villi

Villi are numerous finger-like projections on the inner lining of the small intestine that increase the surface area for absorption of digested food.

SECTION B - Answers to Short Answer Questions

11. Significance of emulsification

Answer: Bile juice contains bile salts that break down large fat globules into smaller droplets, a process

called emulsification. This is significant because:

- It increases the surface area of fats
- This makes it easier for lipase enzymes to act on fats
- It increases the efficiency of fat digestion
- This is similar to how soap breaks down dirt into smaller particles

12. Faster breathing in fishes

Answer: Fishes breathe faster than terrestrial organisms because:

- The amount of dissolved oxygen in water is much lower than the amount of oxygen present in air
- To obtain sufficient oxygen from water for their body needs, fishes must process a larger volume of water
- Therefore, their rate of breathing (opening and closing of mouth and gills) is much faster than the breathing rate of terrestrial animals

13. Two stages of photosynthesis

Answer: The two main stages of photosynthesis are:

1. Light-dependent reaction (Light reaction): This occurs in the presence of sunlight where light energy is absorbed by chlorophyll and converted to chemical energy. Water molecules are split into hydrogen and oxygen.

2. Light-independent reaction (Dark reaction): This stage does not require direct sunlight. Carbon dioxide is reduced to carbohydrates using the chemical energy produced in the light reaction.

14. Role of platelets

Answer: Platelets are cell fragments present in blood that help in clotting:

- When there is an injury to a blood vessel, platelets quickly gather at the site
- They release chemicals that activate the clotting mechanism
- Platelets help form a plug that seals the damaged blood vessel
- This prevents excessive blood loss and helps maintain blood pressure in the circulatory system

SECTION C - Answers to Short Answer Questions

15. Comparison of respiration types

Answer: Comparison between aerobic and anaerobic respiration:

Aspect	Aerobic Respiration	Anaerobic Respiration
Oxygen requirement	Requires oxygen	Does not require oxygen
Site	Cytoplasm and mitochondria	Only in cytoplasm
End products	CO_2 and H_2O	Ethanol + CO_2 (in yeast) or Lactic acid (in muscles)
Energy released	High (38 ATP molecules)	Low (2 ATP molecules)

16. Gaseous exchange in alveoli

Answer: The mechanism of gaseous exchange in alveoli involves the following:

Structure: Alveoli are balloon-like structures with very thin walls (one cell thick) surrounded by a rich network of blood capillaries.

Exchange process:

• Blood coming to the alveoli from body tissues is deoxygenated and rich in carbon dioxide

• The air in alveoli has higher oxygen concentration and lower CO_2 concentration than blood

• Oxygen from alveolar air diffuses across the thin walls into the blood capillaries due to concentration gradient

• Carbon dioxide diffuses from blood into alveolar air due to its higher concentration in blood

• The oxygenated blood is then carried back to the heart and pumped to body tissues

This exchange occurs by simple diffusion based on concentration gradients. The large surface area of millions of alveoli and their thin walls make this exchange very efficient.

17. Role of transpiration in water transport

Answer: Transpiration helps in upward movement of water through the following mechanism:

Transpiration pull:

• Water evaporates from the cells of leaves through stomata (transpiration)

• This loss of water creates a suction effect or pull in the leaf cells

• Water moves from xylem vessels in the leaf into these cells to replace the lost water

• This creates a suction throughout the xylem vessels extending down to the roots

• This continuous column of water is pulled upward from roots through stem to leaves

• The transpiration pull is strong enough to transport water to the top of even very tall trees

Thus, transpiration creates the major driving force for upward movement of water and dissolved minerals in plants. It also helps in cooling the plant and maintaining water balance.

SECTION D - Answer to Long Answer Question

18. Digestion in small intestine

Answer: The small intestine is the site of complete digestion of food. The process involves:

Entry of food:

• Partially digested acidic food (chyme) from the stomach enters the small intestine through the sphincter muscle

• It enters in small amounts so that complete digestion can occur

Digestive juices involved:

1. Bile juice (from liver):

• Makes the acidic food alkaline as pancreatic enzymes work in alkaline medium

• Bile salts emulsify fats, breaking large fat globules into smaller droplets

• This increases the surface area for enzyme action

2. Pancreatic juice (from pancreas):

• Contains trypsin enzyme that digests proteins into amino acids

• Contains lipase enzyme that breaks down emulsified fats into fatty acids and glycerol

• Contains pancreatic amylase that further breaks down carbohydrates

3. Intestinal juice (from intestinal glands):

• Contains various enzymes that complete the digestion process

• Converts remaining proteins to amino acids

• Converts complex carbohydrates to simple sugars (glucose)

• Completes fat digestion to fatty acids and glycerol

Final products:

• Proteins → Amino acids

• Carbohydrates → Glucose

• Fats → Fatty acids and glycerol

Absorption:

These end products are absorbed by villi present on the inner lining of the small intestine. The villi have blood vessels that carry the absorbed nutrients to all body cells through the bloodstream.

SECTION E - Answers to Case Study Based Questions

19. Case Study 1 - Respiration

(i) Main difference (1 mark):

The main difference is that aerobic respiration requires oxygen and completely breaks down glucose into CO_2 and water, while anaerobic respiration occurs without oxygen and incompletely breaks down glucose into either lactic acid (in muscles) or ethanol and CO_2 (in yeast).

(ii) Muscle cramps (1 mark):

During sudden intense activity, muscle cells do not get sufficient oxygen. This causes them to respire anaerobically, producing lactic acid. The accumulation of lactic acid in muscles causes muscle cramps and fatigue.

(iii) Energy yield comparison (2 marks):

Aerobic respiration produces approximately 38 ATP molecules per glucose molecule, while anaerobic respiration produces only 2 ATP molecules per glucose molecule.

Reason for difference:

• In aerobic respiration, glucose is completely oxidized to CO_2 and water in the presence of oxygen, releasing all the chemical energy stored in glucose bonds

• In anaerobic respiration, glucose is only partially broken down without oxygen, so much energy remains locked in the end products (lactic acid or ethanol)

• Complete oxidation releases much more energy than partial breakdown

• This is why aerobic respiration is more efficient and preferred by most organisms.

20. Case Study 2 - Transport in Plants

(i) Function of transpiration (1 mark):

Transpiration creates a suction pull (transpiration pull) that draws water upward from roots through the xylem vessels. The evaporation of water from leaves creates a negative pressure that pulls the continuous water column upward.

(ii) Energy requirement (1 mark):

Translocation in phloem requires energy because it involves active transport against concentration gradient. Food materials must be actively loaded into phloem tissue using ATP energy. In contrast, water transport in xylem is a passive process driven by physical forces like transpiration pull and root pressure,

requiring no metabolic energy.

(iii) Water movement to xylem (2 marks):

Process:

- Root cells in contact with soil actively take up mineral ions from the soil using energy
- This creates a higher concentration of ions inside root cells compared to soil
- Due to this concentration difference, water moves from soil into root cells by osmosis
- Water continues to move from cell to cell toward the center of the root where xylem vessels are located
- This creates root pressure that pushes water into the xylem vessels
- From xylem, water and dissolved minerals are transported to all parts of the plant.
