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. The mode of nutrition in fungi is:
(a) Autotrophic
(b) Parasitic
(c) Saprophytic
(d) Holozoic

2. The first enzyme that acts on food in the human digestive system is:
(a) Pepsin
(b) Trypsin
(c) Salivary amylase
(d) Lipase

3. In which form is food transported in phloem?
(a) Glucose
(b) Starch
(c) Sucrose
(d) Fructose

4. The normal systolic blood pressure in humans is:
(a) 80 mm Hg
(b) 100 mm Hg
(c) 120 mm Hg
(d) 140 mm Hg

5. Which of the following is released during photosynthesis?
(a) Carbon dioxide
(b) Nitrogen

(c) Oxygen
(d) Hydrogen

6. The connecting link between two chambers of the heart and between heart and blood vessels is:
(a) Septum
(b) Valves
(c) Nodes
(d) Capillaries

7. What is the final product of protein digestion?
(a) Fatty acids
(b) Glucose
(c) Amino acids
(d) Glycerol

8. The process by which water evaporates from aerial parts of plants is:
(a) Transportation
(b) Translocation
(c) Transpiration
(d) Respiration

9. Where does glycolysis take place?
(a) Mitochondria
(b) Cytoplasm
(c) Nucleus
(d) Chloroplast

10. The tube that connects kidneys to the urinary bladder is:
(a) Urethra
(b) Ureter
(c) Renal vein
(d) Collecting duct

SECTION B - Short Answer Questions (2 marks each)

11. Why do fish have gills instead of lungs?

12. What is the significance of ATP in cellular processes?

13. How does lymph differ from blood in composition?

14. What is the role of root pressure in water transport?

SECTION C - Short Answer Questions (3 marks each)

15. Explain the importance of villi in the small intestine with reference to their structure and function.

16. What would happen if there were no platelets in the blood? Explain.

17. Compare xylem and phloem on the basis of their structure, function, and direction of transport.

SECTION D - Long Answer Question (5 marks)

18. Describe the complete pathway of blood through the heart, lungs, and body in human beings. Explain why this is called double circulation.

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

19. Case Study 1:

The human digestive system is a complex arrangement of organs. Food enters through the mouth where mechanical and chemical digestion begins. Teeth break down food into smaller pieces, while saliva containing salivary amylase starts breaking down starch. The food then travels through the oesophagus to the stomach by peristaltic movements. In the stomach, gastric juices containing HCl, pepsin, and mucus act on food. The partially digested food then enters the small intestine where most digestion is completed with the help of bile, pancreatic juice, and intestinal juice. The digested food is absorbed by villi.

Based on the above information, answer the following:

(i) What is peristalsis and why is it important? (1 mark)

(ii) Why is food mixed with saliva before swallowing? Give two reasons. (1 mark)

(iii) Describe the role of different secretions in the stomach during digestion. (2 marks)

20. Case Study 2:

Alveoli are tiny balloon-like structures present in the lungs. Humans have millions of alveoli in their lungs. The walls of alveoli are very thin (one cell thick) and are surrounded by a rich network of blood capillaries. This structure maximizes the surface area available for gas exchange. When we inhale, air rich in oxygen fills the alveoli. Oxygen from the alveolar air diffuses into the blood, while carbon dioxide from blood diffuses into the alveoli to be exhaled. This efficient exchange is vital for cellular respiration and energy production.

Based on the above information, answer the following:

(i) Why are the walls of alveoli very thin? (1 mark)

(ii) What would happen if the number of alveoli were reduced significantly? (1 mark)

(iii) Explain how the structure of alveoli makes them efficient for gas exchange. (2 marks)

DETAILED ANSWER KEY - PAPER 04

SECTION A - Answers to MCQs

1. (c) Saprophytic

Fungi exhibit saprophytic nutrition where they secrete digestive enzymes onto dead and decaying organic matter, break it down externally, and then absorb the digested nutrients.

2. (c) Salivary amylase

Salivary amylase is the first enzyme to act on food in the mouth. It is secreted by salivary glands and begins the breakdown of starch into simple sugars.

3. (c) Sucrose

Food materials, mainly in the form of sucrose (a sugar), are transported through phloem tissue from leaves to other parts of the plant.

4. (c) 120 mm Hg

The normal systolic blood pressure (pressure during ventricular contraction) in healthy humans is about 120 mm Hg, while diastolic pressure is about 80 mm Hg.

5. (c) Oxygen

During photosynthesis, water molecules are split and oxygen is released as a by-product. This oxygen is released into the atmosphere through stomata.

6. (b) Valves

Valves are present between atria and ventricles and between ventricles and arteries. They ensure one-directional blood flow and prevent backflow.

7. (c) Amino acids

Proteins are broken down by enzymes (pepsin, trypsin) into their building blocks called amino acids, which are then absorbed by the body.

8. (c) Transpiration

Transpiration is the process of loss of water in the form of water vapor from the aerial parts of plants, mainly through stomata in leaves.

9. (b) Cytoplasm

Glycolysis, the first step of respiration where glucose is broken down into pyruvate, takes place in the cytoplasm of the cell.

10. (b) Ureter

Ureters are tubes that connect each kidney to the urinary bladder and carry urine from kidneys to the bladder for temporary storage.

SECTION B - Answers to Short Answer Questions

11. Gills in fish

Answer: Fish have gills instead of lungs because:

• Fish are aquatic animals that live in water, so they need to extract oxygen dissolved in water
• Gills are specialized organs with a large surface area and thin walls that allow efficient extraction of dissolved oxygen from water
• As water passes over the gill filaments, oxygen diffuses into blood vessels in the gills
• Lungs are designed to extract oxygen from air and would not work efficiently underwater
• The gill structure is perfectly adapted for the aquatic environment

12. Significance of ATP

Answer: ATP (Adenosine Triphosphate) is significant in cellular processes because:
• ATP is called the "energy currency" of the cell
• Energy released during respiration is immediately used to synthesize ATP from ADP and inorganic phosphate
• ATP stores energy in its high-energy phosphate bonds
• When energy is needed for any cellular activity (muscle contraction, protein synthesis, nerve impulse conduction, active transport), ATP is broken down to release this energy
• It provides a standard, usable form of energy for all cellular processes
• This allows efficient energy transfer and utilization in the cell

13. Lymph vs Blood composition

Answer: Lymph differs from blood in the following ways:

Lymph	Blood
Colourless fluid	Red-coloured fluid due to haemoglobin
Contains less protein	Contains more protein
Has no red blood cells	Contains RBCs, WBCs, and platelets
Contains more white blood cells	Has fewer WBCs proportionally

14. Role of root pressure

Answer: Root pressure plays an important role in water transport:
• Root cells actively take up mineral ions from soil, creating a higher concentration inside roots
• This causes water to move into root cells by osmosis
• As more water enters, it creates a positive pressure called root pressure
• This pressure pushes water upward into the xylem vessels
• Root pressure is particularly important at night when stomata are closed and there is no transpiration pull
• It helps in the initial movement of water from soil into the plant
However, root pressure alone is not sufficient to transport water to great heights in tall plants.

SECTION C - Answers to Short Answer Questions

15. Importance of villi

Answer: Villi are extremely important for efficient absorption in the small intestine:
Structure of villi:
• Villi are numerous finger-like projections on the inner lining of the small intestine
• Each villus has a very thin wall (one cell thick)
• Inside each villus, there is a network of fine blood capillaries and a lacteal (lymph vessel)

• The surface of villi has microvilli (even smaller projections), creating a brush border

Importance and function:

• Villi greatly increase the surface area available for absorption (the total surface area becomes about 10 times larger)

• The thin walls allow easy and rapid diffusion of digested nutrients into blood

• The rich blood supply quickly carries away absorbed nutrients, maintaining a concentration gradient for continuous absorption

• Lacteal absorbs digested fats

• The large surface area ensures that maximum digested food is absorbed before the material reaches the large intestine

Without villi, the absorption would be very slow and inefficient, leading to malnutrition despite adequate food intake.

16. Absence of platelets

Answer: If there were no platelets in blood, several serious consequences would occur:

1. Continuous bleeding:

• Even minor cuts or injuries would continue to bleed for a long time

• Platelets are essential for initiating the blood clotting process

• Without them, blood vessels cannot be sealed effectively

2. Internal bleeding:

• Small ruptures in blood vessels occur naturally during normal activities

• Without platelets to seal these ruptures, internal bleeding would occur

• This could lead to bruising and blood accumulation in tissues

3. Loss of blood pressure:

• Continuous blood loss from damaged vessels would reduce blood volume

• This would lower blood pressure, affecting circulation

• Oxygen and nutrient delivery to tissues would be compromised

4. Risk to life:

• Severe blood loss from uncontrolled bleeding could be fatal

• Even surgical procedures would become extremely dangerous

This condition actually exists as a disease called thrombocytopenia, where platelet count is abnormally low, causing excessive bleeding.

17. Comparison of xylem and phloem

Answer: Comparison between xylem and phloem:

Aspect	Xylem	Phloem
Structure	Made of tracheids and vessels (dead cells with thick walls)	Made of sieve tubes and companion cells (living cells)
Function	Transports water and minerals	Transports food (sucrose) and amino acids

Direction	Unidirectional (upward from roots to leaves)	Bidirectional (upward and downward)
Mechanism	Passive process using transpiration pull and root pressure	Active process requiring ATP energy
Cell contents	Hollow tubes (no cytoplasm)	Contains cytoplasm

SECTION D - Answer to Long Answer Question

18. Complete blood circulation pathway

Answer: The complete pathway of blood in human beings involves two circuits:

CIRCUIT 1 - Pulmonary Circulation (Heart → Lungs → Heart):

Step 1: Deoxygenated blood from all parts of the body returns to the heart through two large veins called vena cava (superior and inferior).

Step 2: This blood enters the right atrium of the heart.

Step 3: The right atrium contracts and pushes blood through a valve into the right ventricle.

Step 4: The right ventricle contracts and pumps this deoxygenated blood to the lungs through the pulmonary artery.

Step 5: In the lungs, blood flows through capillaries surrounding the alveoli where it gets oxygenated (picks up O_2 and releases CO_2).

Step 6: Oxygenated blood from lungs returns to the heart through pulmonary veins into the left atrium.

CIRCUIT 2 - Systemic Circulation (Heart → Body → Heart):

Step 7: The left atrium contracts and pushes oxygenated blood through a valve into the left ventricle.

Step 8: The thick muscular left ventricle contracts powerfully and pumps oxygenated blood to all parts of the body through the largest artery called the aorta.

Step 9: The aorta branches into smaller arteries, then arterioles, and finally into capillaries that reach every tissue and organ.

Step 10: In the body tissues, oxygen diffuses from blood to cells, and carbon dioxide from cells enters the blood (blood becomes deoxygenated).

Step 11: Capillaries join to form venules, then veins, which ultimately merge into vena cava, bringing blood back to the right atrium (Step 1 repeats).

Why it is called DOUBLE CIRCULATION:

• In one complete cycle, blood passes through the heart TWICE

• First passage: Right side of heart → Lungs → Left side of heart (pulmonary circulation)

• Second passage: Left side of heart → Body → Right side of heart (systemic circulation)
• This is in contrast to single circulation in fish where blood passes through the heart only once per cycle

Advantages of double circulation:
• Ensures complete separation of oxygenated and deoxygenated blood
• Allows maintenance of high blood pressure in systemic circulation for efficient oxygen delivery
• Supports the high metabolic rate needed by warm-blooded mammals
• Enables efficient temperature regulation in mammals and birds

SECTION E - Answers to Case Study Based Questions

19. Case Study 1 - Digestive System

(i) Peristalsis and its importance (1 mark):
Peristalsis is the rhythmic contraction and relaxation of muscles in the wall of the alimentary canal (oesophagus, stomach, intestines). It is important because it pushes food forward along the digestive tract in a regulated manner, ensuring food moves from mouth to anus and is processed properly in each organ. Without peristalsis, food would not move through the digestive system.

(ii) Why food is mixed with saliva (1 mark):
Two reasons:
• **Lubrication:** Saliva moistens and lubricates the food, making it easier to chew and swallow through the dry oesophagus
• **Digestion begins:** Saliva contains salivary amylase enzyme that starts breaking down starch into simple sugars, beginning the chemical digestion process even before food reaches the stomach

(iii) Role of stomach secretions (2 marks):
The gastric glands in the stomach wall secrete three important substances:

1. Hydrochloric acid (HCl):
• Creates a highly acidic environment (pH 1-2) in the stomach
• This acidic medium is essential for the enzyme pepsin to function
• Kills harmful bacteria and germs that enter with food, protecting the body from infections
• Helps in breaking down food particles

2. Pepsin enzyme:
• Is a protein-digesting enzyme
• Works effectively in the acidic medium created by HCl
• Breaks down complex proteins into simpler peptides
• Begins the process of protein digestion

3. Mucus:
• Forms a thick protective layer on the stomach's inner lining
• Protects the stomach wall from the corrosive action of HCl
• Prevents the stomach from digesting itself (auto-digestion)
• Without mucus, the acid and pepsin would damage the stomach lining, causing ulcers

20. Case Study 2 - Alveoli and Gas Exchange

(i) Why walls are thin (1 mark):
The walls of alveoli are very thin (only one cell thick) to allow easy and rapid diffusion of gases. Oxygen can quickly pass from the alveolar air into the blood capillaries, and carbon dioxide can move from blood into the alveoli. Thick walls would slow down this gas exchange, making respiration inefficient.

(ii) Effect of reduced alveoli (1 mark):
If the number of alveoli were reduced significantly, the total surface area available for gas exchange would decrease drastically. This would lead to:
• Insufficient oxygen absorption into blood
• Inadequate removal of carbon dioxide
• Breathlessness even during light activity
• Reduced energy production as cells don't get enough oxygen for aerobic respiration
• This condition actually occurs in the disease emphysema where alveoli are damaged

(iii) Efficiency of alveolar structure (2 marks):
The structure of alveoli makes them extremely efficient for gas exchange due to several features:

1. Enormous surface area:
• Millions of alveoli (approximately 300 million in human lungs)
• If spread out, the total surface area would be about 80 m^2 (roughly the size of a tennis court)
• This massive surface area allows large amounts of gas to be exchanged simultaneously

2. Thin walls:
• Alveolar walls are only one cell thick (about 0.2 micrometers)
• This minimal thickness allows rapid diffusion of gases
• Oxygen and CO_2 can pass through quickly based on concentration gradients

3. Rich blood supply:
• Each alveolus is surrounded by a dense network of blood capillaries
• This ensures that blood is in close contact with alveolar air
• Constant blood flow maintains the concentration gradient
• Fresh deoxygenated blood continuously arrives, and oxygenated blood is quickly removed

4. Moist surface:
• The inner surface of alveoli is moist, which facilitates gas diffusion
• Gases first dissolve in this moisture before diffusing

5. Balloon-like shape:
• The spherical shape maximizes surface area while minimizing volume
• Provides structural support and prevents collapse

All these features work together to ensure that gas exchange occurs efficiently, providing body cells with the oxygen they need for energy production and removing the waste carbon dioxide.
