Chap 5. Life Processes

1. What are life processes?

Life processes are the basic biological activities that are essential to maintain the living state of an organism.
Four essential life processes are nutrition, respiration, transportation, excretion.

2. What is the necessary criterion to decide whether something is alive?

The molecular movement within the organism is considered the most definitive criterion for life. Even when an organism or plant appears completely still, vital molecular movements are constantly occurring inside its cells to repair and maintain its structures.

3. Why sometimes viruses are not considered as living things?

Viruses do not show any molecular movement or life processes inside them, as long as they are outside a living cell. A virus only shows characteristics of life once it infects a living host cell (bacterial, plant, or animal cell). It hijacks the host cell's molecular machinery to replicate itself.

4. Differentiate Autotrophic and Heterotrophic Organisms?

Autotrophic organisms synthesize their own food from simple inorganic raw materials (like CO_2 and water) using sunlight.

Heterotrophic organisms cannot make their own food. They depend directly or indirectly on autotrophic organisms for energy.

5. Write the equation for photosynthesis.

$6CO_2 + 6H_2O$ -------> $C_6H_{12}O_6 + O_2$

• Carbon dioxide (CO_2) is absorbed through stomata from air. Water is absorbed through roots from soil.
• Glucose ($C_6H_{12}O_6$) is stored as food. Oxygen (O_2) is released into the air.
• Sunlight captured by chlorophyll in chloroplasts is the energy source.

6. What is the role of stomata in photosynthesis?

• Stomata allow CO_2 from the air to enter the leaf for photosynthesis.
• O_2 produced during photosynthesis exits through stomata.
• Water vapour exits through stomata, creating suction (transpiration pull) that draws water up from roots through xylem.

7. How do guard cells control stomata?

Stomata are surrounded by two guard cells(bean-shaped). Guard cells control the opening and closing of stomatal pores by changing their shape. It is regulated by the flow of water into and out of them. When guard cells are turgid (full of water), stomata open. When guard cells are flaccid (lose water), stomata close, which reduces water loss.

8. What is the role of HCl in the human stomach?

Hydrochloric acid (HCl) creates an acidic medium (pH 1–2), which activates the enzyme pepsin. It also kills any harmful bacteria or pathogens entering the stomach along with food.

9. What is the role of pepsin in the human stomach?

Pepsin is a proteolytic (protein-digesting) enzyme. It breaks down complex, long-chain proteins from food into smaller, simpler molecules called peptides and peptones.

Pepsin is secreted in the gastric glands in an inactive form called pepsinogen. The hydrochloric acid (HCl) present in the stomach creates an acidic environment (pH 1–2), which converts inactive pepsinogen into active pepsin.

10. How is the small intestine designed ?

The inner lining of the small intestine has millions of tiny, finger-like projections called villi. Villi tremendously increase the surface area for efficient absorption and are richly supplied with blood vessels.

11. Name 3 digestive enzymes and their function

• Salivary Amylase breaks down starch into simple sugars.
• Pepsin digests proteins in the acidic medium of the stomach.
• Trypsin breaks down proteins into peptides in the alkaline medium of the small intestine.

12. How fats are digested in human?

In the small intestine, fats are in the form of large globules, making it difficult for enzymes to act on them.

Bile juice breaks down these large fat globules into smaller droplets. This process is called emulsification, and it

increases the efficiency of enzyme action. Bile juice are secreted by the liver and stored in the gall bladder.

Lipase enzyme (secreted in the pancreas) acts on the emulsified fats. Lipase digests the small fat droplets, converting them into fatty acids and glycerol, which can then be easily absorbed by the villi of the small intestine.

13. Differentiate aerobic and anaerobic respiration.

Aerobic respiration occurs in the presence of oxygen. It-completely breaks down glucose into CO_2 and water, and releases a high amount of energy (38 ATP).

Anaerobic respiration occurs in the absence of oxygen. It partially breaks down glucose into ethanol/CO_2 (in yeast) or lactic acid (in muscle cells). It releases very little energy (2 ATP).

14. Why do we get muscle cramps after sudden heavy exercise?

During vigorous exercise, oxygen demand exceeds supply. The muscle cells switch to anaerobic respiration, leading to the accumulation of lactic acid, which causes painful muscle cramps.

15. How are the alveoli designed to maximize gas exchange in the lungs?

Alveoli are tiny, balloon-like structures at the end of bronchioles. It provide a massive surface area for gas exchange. Their walls are extremely thin (one-cell thick) and are surrounded by an extensive network of blood capillaries.