LIFE PROCESSES

Nutrition and Respiration in Human Beings

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CLASS: X **BIOLOGY**

Nutrition

1. What are life processes?

The processes that together perform the maintenance job in order to continue living and prevent damage and breakdown are called life processes.

2. What are molecular movements? Why are they needed for life?

- Molecular movements are the invisible movements occurring inside the living cells due to chemical reactions.
- These movements together over a period of time result in visible movements of life like growth.
- Molecular movements drive the life processes at cellular level.

3. What is nutrition?

Nutrition is a process of intake or synthesis of nutrients by an organism and their utilization.

4. Give examples of some life processes taking place in all living organisms.

Nutrition, respiration, transportation and excretion are examples of life processes taking place in living organisms.

5. Why do we require the process of nutrition?

Living organisms require the process of nutrition for following

(i) Nutrients act as energy source for all life processes

(ii) Nutrients provide raw material for growth, development and repair of body.

6. What are enzymes? What is their role in the body of an organism?

Enzymes are biological catalysts that help in biochemical reactions taking place in the cell.

7. Define photosynthesis. Give overall equation of photosynthesis.

The process by which plants prepare their own food from carbon dioxide and water with the help of chlorophyll in the presence of sunlight is called photosynthesis.

8. What are the raw materials required for photosynthesis? How do plants obtain them?

Two raw materials required for photosynthesis are

(i) Water

(ii) Carbon dioxide

- Plants absorb water from soil through **roots**.
- Carbon dioxide is absorbed through **stomata** present on the leaves by the process of simple **diffusion**.

9. In what form do plants and animals store their food in the body?

Plants store their food in the form of starch and animals store their food in the form of Glycogen.

10. Explain the structure of stomata. What causes opening and closing of stomata?

- Stomata are present on the surface of leaves and young green stems.
- They are pores or holes that are surrounded by two specialized bean shaped epidermal cells called the guard cells.
- The inner walls of the guard cells are thicker than the outer walls
  Guard cells swell when water enters them causing the stomatal pore to open.
- Stomata pore closes when water leaves guard cells.

11. What are the three basic steps involved in the process of photosynthesis?

Three basic steps involved in the process of photosynthesis are:-

(i) **Absorption** of light energy by chlorophyll

(ii) **Conversion** of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.

(iii) **Reduction** of CO_2 to carbohydrates.

12. What are the parts of plants involved in exchange of gases?

Although the entire body surface of roots, stem and leaves of plant is involved in exchange of gases but stomata in the leaves are the main regions for gas exchange.

13. What are the differences between autotrophic nutrition and heterotrophic nutrition?

Autotrophic nutrition	Heterotrophic nutrition
The type of nutrition in which organisms synthesize organic materials (carbohydrates) from inorganic substances (water, carbon dioxide, minerals, etc.).	The type of nutrition in which energy is derived from the organic substances that are obtained from plants or animals.
Green plants and autotrophic bacteria.	All animals, fungi and heterotrophic bacteria.

14. What are the outside raw materials used by autotrophs?

Water used in photosynthesis is taken up from the soil by the roots in terrestrial plants.

Other materials like nitrogen, phosphorus, iron and magnesium are taken up from the soil.

Nitrogen is an essential element used in the synthesis of proteins and other compounds.

This is taken up in the form of inorganic nitrates or nitrites. Or it is taken up as organic compounds which have been prepared by bacteria from atmospheric nitrogen.

15. What is the basic strategy used by complex multicellular organisms?

Complex multicellular organisms have evolved **specialized organ system called digestive system** that performs the process of nutrition. Events that take place in this system are.

(i) Taking in of food (ingestion)

(ii) Breakdown of complex food to simple form (Digestion)

(iii) Absorption of simple form of food (Absorption)

(iv) Removal of waste material or undigested food (Egestion)

16. What is the need for crushing the food by our teeth?

We eat complex food material. Food needs to be crushed for following reasons

(i) To produce small particles of similar texture.
(ii) Crushed food helps the enzymes to act on large area of food molecules.
(iii) Small size and uniform texture protects the delicate lining of our digestive tract.

17. Why is our food wetted?

Food gets wet when it comes in contact with saliva. Wetting of food is required for following reasons

(i) It helps to make the passage of food smooth and protect the lining of digestive canal.

(ii) It helps in swallowing of food.

(iii) Saliva also contains enzyme salivary amylase that breaks down starch to sugar.

18. Name the enzyme present in saliva. What is its role?

Salivary amylase or ptyalin is the enzyme present in saliva.
It is secreted by salivary glands present in the mouth region. It breaks down starch to sugar.

19. How does food move in the alimentary canal?

Food moves in the alimentary canal due to peristaltic movements.
Peristaltic movements are rhythmic contraction of the muscles lining the alimentary canal that pushes the food forward.

20. What are the secretions secreted by various glands in stomach collectively called? Write its composition?

Secretions secreted by various glands in stomach are collectively called **gastric juice**.

It has following components:

(i) **Hydrochloric acid** (HCl) that creates an acidic medium in stomach
(ii) Enzyme **pepsin** that helps in digestion of proteins.
(iii) **Mucus** that protects the inner lining of stomach.

21. What maintains the acidic environment in the stomach and why?

- Hydrochloric acid (HCl) secreted by gastric glands maintains the acidic environment in the stomach.
- Acidic environment in stomach is **required for the action of** protein digesting enzyme **pepsin** secreted in the stomach.
- Acidic environment **may also kill any microorganism** that has entered the body along with the food.

22. What is the role of mucus present in the gastric juice?

Mucus protects the inner lining of the stomach from the action of the hydrochloric acid under normal conditions.

23. What is meant by acidity? How is it caused?

- Our stomach secretes HCl acid that is essential in the digestive process.
- When there is excess production of acid in the stomach, it results in condition known as acidity.

24. Name the muscle that regulates the exit of food from stomach. How and where the food is released.

- Sphincter-muscle of stomach regulates the exit of food.
- From stomach food moves into small intestine.
- Sphincter muscle of stomach releases small amounts of food into small intestine.

25. Which is the longest part of human alimentary canal? How it is fitted into compact space?

Small intestine is the longest part of human alimentary canal. It is fitted into a compact space due to **extensive coiling**.

26. How does the length of small intestine dependent on food habit of an animal?

In herbivores the small intestine is longer where as in carnivores it is comparatively smaller.

27. Why is the small intestine longer in herbivores as compared to carnivores?

The difference in length of small intestine is because of the food habit of these animals. Herbivores are grass/ plant eating animals.

Plant products have **cellulose**, which takes **longer time to digest**. Hence, herbivores have longer small intestine.

Meat is easier to digest hence carnivores have shorter small intestine.

28. What is bile juice? What is its function?

The secretion of liver that is poured in the small intestine is called bile juice. Role of bile is as follows

(i) **Alkaline medium**: It makes the medium alkaline for the pancreatic enzymes to act.

(ii) **Emulsification** of fats: Bile acts on fats to break them into small globules. This helps the fat breaking enzymes to perform their action more efficiently.

29. Why is medium in small intestine changed from acidic to alkaline?

The medium in the small intestine is made alkaline for the pancreatic enzymes to act as these enzymes can function only in alkaline medium.

30. What is the role of pancreas in the process of digestion?

-Pancreas is a digestive gland. It secretes pancreatic juice in the small intestine.

Pancreatic juice contains enzymes like **trypsin** for digesting proteins, **lipase** for breakdown of fats and **amylase** for digestion of carbohydrates.

31. Name the end products formed after digestion of following food items
(i) Proteins
(ii) complex carbohydrates
(iii) Fats.

(i) Proteins - amino acids
(ii) Carbohydrates - glucose
(iii) Fats - fatty acids and glycerol

32. How does small intestine help in absorption of food?

1. The inner lining of the small intestine has numerous **finger-like projections called villi**. They increase the surface area for absorption of digested food.

2. Villi are richly **supplied with blood vessels**, which carry the absorbed food material.

33. What happens to the digested food absorbed in blood?

The digested food absorbed in blood is taken to each and every cell of the body where it is utilized for **obtaining energy**, **building up of new tissues** and the **repair of old tissues**.

34. What happens to unabsorbed food left in small intestine?

The unabsorbed food is called the undigested food. It is sent into the large intestine. The walls of large intestine absorb water from this material. This waste is then removed out of our body from anus through the regulation of anal sphincter muscle.

Respiration

1. What is respiration?

The process of **breakdown of food** in the cells to **generate energy** for various life processes is called respiration.

2. Why do organisms require the process of respiration?

All living organism require **energy** to survive, maintain and sustain their life processes. Respiration is oxidation of food to produce energy in the form of ATP. This energy rich chemical compound serves as an energy currency in all life processes.

3. Name the chemical compound that acts as the starting material for the breakdown process during respiration.

Glucose

4. Name two main types of pathways followed by living organisms during respiration.

Two main types of pathways followed during respiration are
(i) Aerobic Respiration
(ii) Anaerobic Respiration

5. Explain the first step that is common in all cases of respiration. Where does it take place?

In all organisms the first step during the process of respiration is the breakdown of **glucose** molecules (six carbon) into pyruvate (three carbon)
This step (Glycolysis) takes place in the **cytoplasm** of the cell.

6. What is fermentation? Why is it also referred as anaerobic respiration?

In yeast and many bacteria, the pyruvate molecule formed in the first step of respiration is further converted to ethanol, (2 carbon) and carbon dioxide in absence of oxygen. Energy is also produced during the reaction. Since the process takes place in absence of air or oxygen, it is also called as anaerobic respiration.

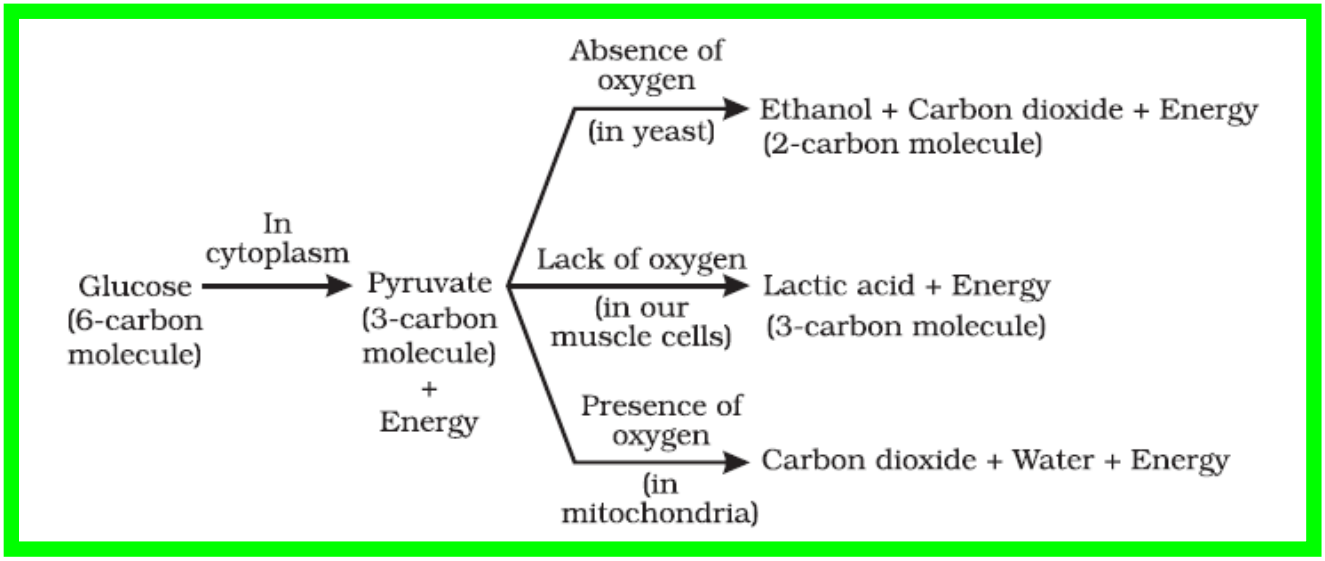
7. Name a part of our body where anaerobic respiration may occur due to lack of oxygen.

Muscle cells

8. Differentiate between aerobic and anaerobic respiration taking place in muscle cells.

Aerobic Respiration	Anaerobic Respiration
It takes place in the presence of oxygen	It takes place in absence of oxygen
End products are CO_2 + water + energy	Lactic acid / Ethanol + CO_2 + Energy
Complete breakdown of glucose occurs	Incomplete breakdown of glucose occurs
Energy released is more (36 / 38 ATP molecules)	Energy released is Less (Only 2 ATP molecules)
It occurs in cytoplasm and Mitochondria	It occurs only in Cytoplasm

9. Draw a flow chart showing different pathways of breakdown of glucose during respiration.



10. Name the energy rich molecules synthesised during respiration in living organisms.

ATP or adenosine triphosphate is the energy rich molecule synthesised during respiration.

11. How is ATP utilized by living beings?

ATP molecule is broken down to produce a fixed amount of energy. Living organisms use this energy during various life processes.

12. Why is the rate of breathing in terrestrial animals slower than aquatic animals?

Amount of dissolved oxygen in water is fairly low as compared to amount of oxygen in the atmosphere (air). So in order to increase the absorption of oxygen, aquatic animals have faster rate of breathing as compared to terrestrial animals.

13. What are the characteristics of respiratory organs in animals that ensures efficient exchange of gases?

Respiratory organs of animals show following characteristics:

(i) The structure of these organs is to provide **large surface area** for exchange of gases.
(ii) Respiratory organs are **richly supplied with blood vessels** for efficient gas exchange.
(iii) Respiratory surfaces are very **thin and delicate** to facilitate easy diffusion of gases.

14. Why are respiratory organs usually placed inside the body of the terrestrial animals?

Respiratory organs are placed inside the body to prevent injury to thin and delicate respiratory surfaces.

15. Why the trachea does not collapse when there is not much air present in it?

Trachea does not collapse when there is not much air in it, as it is supported by **rings of cartilage**.

16. How are gases carried through blood?

The process of transport of gases through blood is as follows:

Transport of oxygen-

Oxygen enters the blood in the alveoli region of the lungs.
Blood contains respiratory pigment **haemoglobin** which has high affinity for oxygen
Oxygen binds with haemoglobin and is then carried to various body parts through blood circulation.
In the tissue region oxygen diffuses from blood to the tissue.

Transport of carbon dioxide

Tissues have more concentration of carbon dioxide which diffuses into the blood. - CO_2 is mainly transported in the dissolved form through blood plasma. Once blood reaches alveoli, CO_2 diffuses out into the lungs.

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