

Board – ICSE

Class – 9

Topic – Respiration in Plants

1. Define the following:

- a. Respiration
- b. Breathing
- c. Fermentation

Ans. (i) Respiration: It is the process of breakdown of food materials to produce energy.

(ii) Breathing: It is a mechanism by which organisms obtain oxygen from the environment and release carbon dioxide.

(iii) Fermentation: The process by which micro-organisms obtain their energy by anaerobic respiration is called fermentation.

2. List any four differences between respiration and combustion.

Ans. Comparison between Respiration and Combustion

| Respiration | Combustion |
|---|---|
| 1. Occurs in living organisms. | 1. Occurs in non-living objects. |
| 2. Enzymes take part. | 2. No enzymes involved. |
| 3. Energy is released step by step (in many steps). | 3. Energy is released at once in one Step |
| 4. Occurs at body temperature. | 4. Occurs at high temperature. |

3. Write about the process of respiration in a simplified form.

Ans. Respiration is a much more complex process. It is a biochemical process and includes

(i) Breathing — the exchange of gases (O_2 and CO_2), and

(ii) Oxidation of food in order to release energy. In this process, carbon dioxide and water are produced as byproducts. The process of respiration can be summarized as follows:

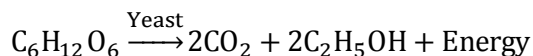
Food + Oxygen \longrightarrow Carbon dioxide + Water + Energy

4. What are the main types of respiration? Write about them.

Ans. Respiration is of two types (i) aerobic respiration (ii) anaerobic respiration.

- a. Respiration in the presence of oxygen is known as aerobic (or oxybiotic) respiration and the organisms which undergo aerobic respiration are called aerobes.

- b. Less common type of respiration which occurs in the absence of oxygen is known as anaerobic (or anoxybiotic) respiration and the organisms are called anaerobes. Certain bacteria are complete anaerobes.

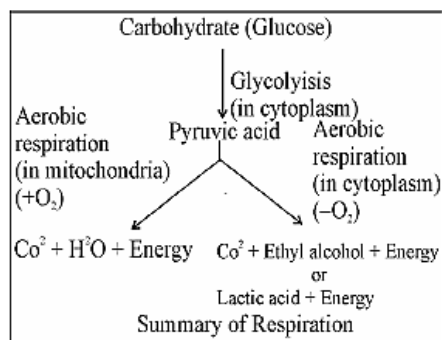


5. With the help of a reaction, write down how respiration occurs in yeast.

Ans. Respiration occurring in yeast is anaerobic respiration, i.e. it occurs in absence of oxygen. It may also be called fermentation. Here glucose is metabolized to form carbon dioxide, ethyl alcohol and energy.

6. Write down in brief about the mechanism of respiration.

Ans. Respiration occurs in two stages. The first stage is known as glycolysis and produces pyruvic acid (in the form of pyruvate) from glucose. The second stage is called Krebs's cycle in which pyruvic acid is further broken down. The degradation of food material up to pyruvic acid formation is same in both aerobic and anaerobic respiration, while the further degradation of pyruvic acid differs in the two types of respiration.



7. Write any two differences between glycolysis and Krebs cycle.

Ans.

| Glycolysis | Krebs cycle |
|---|--|
| (i) Glycolysis occurs in the cell cytoplasm. | (i) Krebs cycle takes place inside mitochondria. |
| (ii) Incomplete breakdown of glucose occurs forming pyruvate. | (ii) Complete breakdown of glucose occurs forming CO ₂ , H ₂ O and energy. |

8. Differentiate between aerobic and anaerobic respiration.

Ans. Comparison between Aerobic and Anaerobic Respiration

| Aerobic Respiration | Anaerobic Respiration |
|--|---|
| 1. It occurs in the presence of oxygen. | 1. It occurs in the absence of oxygen. |
| 2. Glucose, the respiratory substrate, is oxidized completely into CO ₂ and H ₂ O. $\begin{array}{l} \text{Glucose} \xrightarrow{\text{Glycolysis}} \text{Pyruvate} \\ \text{Pyruvate} \xrightarrow[\text{+O}_2]{\text{Kreb's cycle}} \text{CO}_2 + \text{H}_2\text{O} + \text{Energy} \end{array}$ | 2. The respiratory substrate is incompletely oxidized into CO ₂ and ethyl alcohol (in alcoholic fermentation) or lactic acid (in lactic acid fermentation). $\begin{array}{l} \text{Glucose} \xrightarrow{\text{Glycolysis}} \text{Pyruvate} \\ \text{Pyruvate} \xrightarrow[\text{O}_2]{\text{Fermentation}} \text{Ethyl alcohol} + \text{CO}_2 + \text{Energy} \end{array}$ |
| 3. The energy released is more. | 3. The energy released is less. |
| 4. While the first step (glycolysis) takes place in the cytoplasm, the second step (Krebs cycle) takes place inside the mitochondrion. | 4. Both the first step (glycolysis) and the second step, i.e., conversion of pyruvic acid to lactic acid or ethyl alcohol takes place inside the cytoplasm. |

9. Write any three differences between respiration in plants and animals.

Ans. Respiration in plants differ from animals in the three aspects —

1. The different parts of a plant, like the root, stem and leaf, perform respiration, separately. This is in contrast to respiration in animals where it occurs as a unit.
2. There is little transport of gases from one part of the plant body to the other. In animals, the respiratory gases are transported to long distances inside the body.
3. In plants, respiration occurs at a much slower rate than in the animals.

10. How does respiration occur in roots?

Ans. Respiration in Roots: Roots obtain oxygen from the air present in between the soil particles by the process of diffusion. Oxygen diffuses into root hairs and reaches other cells of the root. Carbon dioxide produced in the cells of the root during respiration moves out from the root hairs into the soil by the process of diffusion. This gaseous exchange occurs in young roots. The older portions of the root do not possess root hairs. In these portions, the gaseous exchange occurs through tiny openings called lenticels

11. What is pneumatophore? What is its importance?

Ans. The breathing or respiratory root found in the plants growing in mangroves or saline swamps are called pneumatophore. Each pneumatophore bears breathing pores or lenticels near the apical region which helps in exchange of gases.

12. How does respiration occur in leaves and stems?

Ans. In higher plants, the exchange of gases occurs through the
(i) stomata present in the leaves and young stems and
(ii) lenticels present in the bark of woody plants. A lenticel consists of loosely arranged thin walled rounded cells (complementary cells). The complementary cells enclose intercellular spaces for exchange of gases. Oxygen moves in through the stomatal pores or lenticels by simple diffusion into the intercellular spaces. From these intercellular spaces the oxygen diffuses into the cells. Similarly, CO₂ diffuses from the cells into the intercellular spaces and then through the stomata and lenticels to the exterior.

13. Write the differences between photosynthesis and respiration.

Ans. Differences between photosynthesis and respiration

| Photosynthesis | Respiration |
|--|--|
| It takes place only in the presence of light. | It occurs in all the tissues during both day and night. |
| Only green cells of plants can perform photosynthesis. | This occurs in all the cells of an organism. |
| It takes place inside chloroplast. | Aerobic respiration involves mitochondria and cytoplasm. |
| It is an anabolic process and builds up complex compounds (sugars) from inorganic substances (CO ₂ and H ₂ O). | It is a catabolic process in which complex compounds (sugars) are broken into simpler substances (CO ₂ and H ₂ O). |
| It absorbs energy and is an endothermic process. | Energy is given out thus, it is an exothermic process. |
| $6\text{CO}_2 + 12\text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O} + 6\text{O}_2$ | $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$ |

14. Match the items in Column A with those in Column B

| Column A | Column B |
|---------------------------|------------------------------|
| (a) Anaerobic respiration | (i) Krebs cycle |
| (b) Muscle | (ii) Lactic acid |
| (c) Glycolysis | (iii) Alcoholic fermentation |
| (d) Mitochondria | (iv) Cytoplasm |

- Ans.** (a) — (iii)
(b) — (ii)
(c) — (iv)
(d) — (i)

15. Complete the following statements by choosing the correct alternative out of those given within brackets.

- a. During respiration, temperature _____.
(Rises considerably/remain low/does not change)
- b. Respiration is controlled by _____.
(Enzyme/catalyst/heat)
- c. Respiration is a _____ process.
(Physical/chemical/biochemical)

- Ans.** (i) Does not change (ii) Enzyme (iii) Biochemical