Life Processes

Type of Respiration

❖ **Definition:**

The process by which assimilated food is oxidised and energy is released is called as Respiration.

- In this process oxygen from air is taken in, this oxygen reacts with food molecules present in the body cells and oxidise them slowly to release energy.
- This energy is stored in the form of ATP molecules inside the cell for further use and the waste products i.e. CO2 and H2O, are eliminated out of the body.

$$\text{Food} + O_2 \xrightarrow{\text{Oxidation}} CO_2 + H_2O + \text{Energy (ATP)}$$

- ✓ Note : The process by which organisms obtain oxygen from environment and release carbon dioxide produced during oxidation of food to the outer environment is called as Breathing. It is a part of respiration.

❖ **Types of respiration :** Process of respiration can be divided into the following two categories :

AEROBIC RESPIRATION :- When oxygen is used for respiration it is called aerobic respiration.

$$\text{Glucose} \xrightarrow[\text{(in cytoplasm)}]{\text{Glycolysis}} \underset{\text{(1 molecules)}}{\text{Pyruvate or Pyruvic acid}} \xrightarrow[(in\ Mitochondria)]{Oxygen} \underset{\text{(2 molecules)}}{6CO_2 + 6H_2O + \text{Energy [38 ATP]}}$$

Mechanism of Respiration :- The mechanism of respiration involves following two processes :

(i) **Glycolysis – a series of reactions which does not require oxygen and by which glucose molecule is broken into pyruvic acid.**

(ii) **Further breakdown of pyruvic acid molecules by aerobic (in the presence of oxygen) or anaerobic (in the absence of oxygen) methods.**

Respiration involves stepwise breakdown of glucose by a series of reactions in which the energy is released in some of the exergonic steps. Glucose, the most common respiratory substrate, may be broken either aerobically or anaerobically. Both processes start the same way by using the anaerobic reaction pathway called **glycolysis.** Under aerobic conditions the products of glycolysis are completely oxidised and CO_2 and H_2O are formed as the end products, and under anaerobic conditions alcohol or lactic acid CO_2 are produced.

Anaerobic respiration: When oxidation of food material does not require oxygen or it occurs in absence of oxygen, it is called as Anaerobic Respiration. It also includes glycolysis which takes place in the cytoplasm. During this process one molecule of glucose is degraded into two molecules of pyruvic acid (pyruvate) and little energy (2 ATP).The Pyruvic acid is further oxidised into ethyl alcohol (ethanol) or lactic acid.

$$\text{Glucose} \xrightarrow[(in\ cytoplasm)]{Glycolysis} \text{Pyruvate or Pyruvic acid} \xrightarrow{in\ yeast} 2C_2H_5OH + 2CO_2 + 2ATP$$

$$\text{Glucose} \xrightarrow[(in\ cytoplasm)]{Glycolysis} \text{Pyruvate or Pyruvic acid} \xrightarrow{in\ mucles\ cells} \text{Lactic acid} + 2CO_2 + 2ATP(\text{during exercise})$$