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STUDY MATERIAL SCIENCE
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Respiration in organisms

Each cell of an organism performs functions like nutrition, transport, excretion and reproduction for this purpose, it needs energy. Our food is stored energy which is released during respiration. Breathing is the process during which, we breathe in air having oxygen and we breathe out air rich in carbon dioxide. The air rich in oxygen is transported to all parts of the body and ultimately to each cell. This oxygen is utilised by the cell for respiration. Tbe process of breakdown of food in the cells of an organism with the release of energy is called cellular respiration.

Types of Respiration

On the basis of the presence or absence of oxygen, respiration is classified into two types:

1. Aerobic Respiration

When the breakdown of glucose occurs with the use of oxygen, it is called aerobic respiration. During aerobic respiration, glucose is completely broken down into carbon dioxide and water and energy is released. Aerobic respiration takes place in mitochondria.

It can be shown by the following equation:

Glucose(food) Oxygen−→−−−− Carbon dioxide + Water + Energy

Aerobic respiration is seen in most of the organisms such as humans (man), dogs, cats, lions, elephants,

cows, buffaloes, goats, snakes, earthworms, frogs, fishes, etc.

2. Anaerobic Respiration

When a breakdown of glucose takes place without using oxygen, it is called anaerobic respiration. The glucose is not completely broken down into carbon dioxide and water. An intermediate compound is formed with the release of less amount of energy during this process. It can be shown as follows:

Glucose (No oxygen or air)−→−−−−−−−−−−−−−−−− Alcohol + Carbon dioxide + Energy

Yeasts such as Saccharomyces cerevisiae and certain bacteria carry out anaerobic respiration. These organisms that carry out respiration in the absence of oxygen are called anaerobes.

Yeast is a single-celled organism. During anaerobic respiration (also called fermentation), yeast produces ethanol or alcohol as a byproduct which is used in making wine and beer. The carbon dioxide produced by yeast is used in the bread making industry. The C02 gas released during this process causes the bread dough to rise.

Anaerobic Respiration in Muscles

Usually, aerobic respiration takes place in humans, but under certain conditions, anaerobic respiration may also occur in our muscles for a short time, due to temporary deficiency of oxygen. When we perform a heavy exercise like running, cycling, walking, weight lifting, etc., we require a large amount of energy. To meet the energy requirement our muscle cells perform anaerobically. respiration. During this process, the glucose or food in the muscle cells is partially broken

down in the absence of oxygen to form lactic acid and some extra energy is released.

The following equation shows the production of lactic acid:
Glucose(Food) Undefined control sequence \xrightarrow Lactic acid + Energy

This ours because during vigorous physical activity, the utilisation of oxygen ours at a faster rate in the muscles that can be supplied by the blood.

When the lactic acid produced during anaerobic respiration, gets accumulated in the muscles, it causes muscle cramps. The muscle cramps can be relieved by taking a hot water bath or a massage. This improves the circulation of blood and oxygen supply to the muscle cells increases. The increased supply of oxygen results in the complete breakdown of lactic acid into carbon dioxide and water, thereby giving relief from cramps.