Chapter 10

Respiration in Organisms

Why do we Respire?

Respiration:

• The process by which energy is released from the digested food is called respiration. The food has stored energy, which is released during respiration. Therefore, all living organisms respire to get energy from food.

• We breathe air that contains oxygen. In the cells, oxygen helps in the breakdown of food. This process of breakdown of food in the cell with the release of energy is called cellular respiration.

• Types of respiration:

(a) Aerobic Respiration:

The process of the breakdown of glucose with the use of oxygen is called aerobic respiration. For example, Humans, dogs, cats, lion, frog, fish, etc.

(b) Anerobic Respiration:

The process of the breakdown of glucose without the use of oxygen is called anaerobic respiration. For example, it occurs in some organisms like yeast. They can survive in the absence of air. In absence of oxygen-glucose is breakdown into alcohol and carbon dioxide and energy is released.

Muscular Respiration

The muscle cells in human beings can also respire anaerobically but only for a short period of time. When we do heavy exercise like fast running, cycling or heavy weight lifting, our muscles need a lot of energy. To produce more energy, our muscles need more oxygen. But the supply of oxygen through blood is limited. Under these conditions, anaerobic respiration takes place in the muscle cells to fulfill the demand of energy.

During anaerobic respiration in our muscle cells, glucose breaks down partially to form lactic acid and releases some energy. The accumulation of lactic acid causes muscle cramps.

Breathing

• Breathing is the process by which air rich in oxygen is taken inside (inhalation) the body and air rich in carbon dioxide is expelled from the body (exhalation) with the help of a breathing organ.

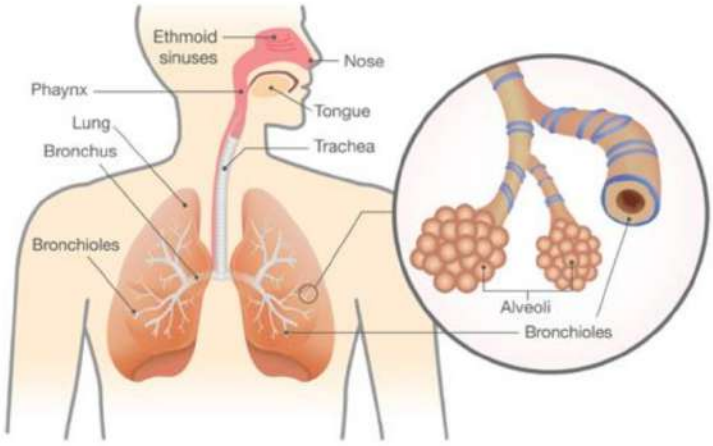
• One breath means one inhalation plus one exhalation.

Breathing rate:

The number of times a person breathes in a minute is termed the breathing rate.

* Tip: On average, the breathing rate in an adult human being is 15-18 times in a minute and it increases up to 25 times in a minute when we do heavy exercise.

How do we Breathe?



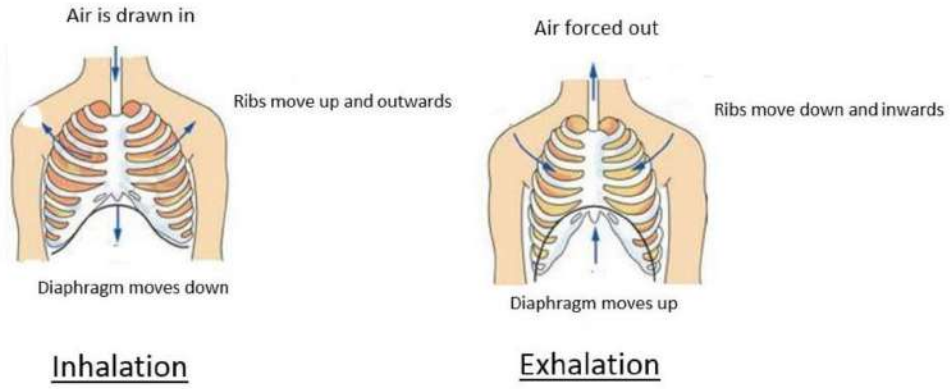
Human Respiratory System

• The process of breathing takes place in our lungs. Lungs are connected to our nostrils through nasal passage and windpipe and reach our lungs.

• Our lungs are present in the chest cavity. At the bottom of the chest cavity is a curved sheet of muscle called the diaphragm.

• Diaphragm forms the floor of the chest cavity. Breathing involves the movements of the rib cage and the diaphragm.

♦ Inhalation and Exhalation:



Inhalation Exhalation

• During inhalation, the ribs move up and outwards and the diaphragm moves down. This increases the space in the chest cavity and makes it larger. The chest cavity becomes larger and air rushes into the lungs.

• During exhalation, the ribs move down and inwards and the diaphragm moves up to its former position. This reduces the size of the chest cavity and air pushed out of the lungs.

Amount of O_2 and CO_2 in:

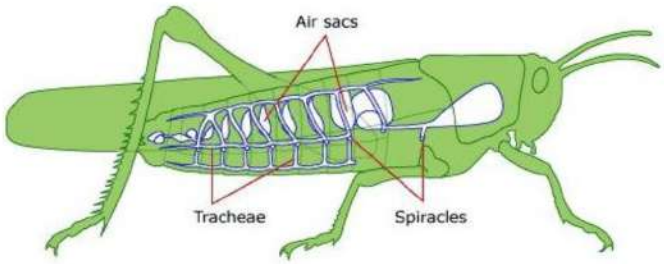
Inhaled Air: O_2 - 21%, CO_2 – 0.04%

Exhaled Air: O_2 – 16.4%, CO_2 – 4.4%

* Tip: During physical activity, we require more energy and we breathe faster. More oxygen is supplied to our cells. Due to this breakdown of food increases and more energy is released. Due to the rapid breakdown of food, we feel hungry.

Breathing in Other Animals

♦ Cockroach:



Cockroach and some other insects have small openings on the sides of its body. These openings are called spiracles. They have a network of air tubes called tracheae. Air enters through spiracles into the tracheal tubes, diffuses into the body tissue, and reaches every cell of the body.

♦ Earthworm:

Earthworm skin is moist and slimy. It respires through moist skin. The skin of earthworms is quite thin. Gases can easily pass through the skin of earthworms. The skin has a good blood supply. So, they absorb the oxygen needed for respiration through their thin and moist skin. This oxygen is then transported to all the cells of the earthworm by its blood.

♦ Fish:

Fish does not have lungs for breathing. They breathe through a special organ called gills. Gills are the respiratory organs in aquatic animals. Gills are the projections of the skin. Gills have blood vessels for the exchange of respiratory gases.

♦ Frog:

The frog lives on land as well as in water. They have lungs for breathing and they also respire through their moist skin when they are in the water.

* Tip: Breathing rate is higher in fish because they use the oxygen dissolved in water and the amount of oxygen dissolved in water is low as compared to the amount of oxygen in air on land. So, the breathing rate is much higher in fish as compared to other animals.

Pulmonary Respiration – It is the respiration through lungs. Ex: Humans, dogs, cats, etc.

Branchial Respiration – It is the respiration through gills. Ex: Fish

Cutaneous Respiration – It is the respiration through skin. Ex: Earthworm

Respiration in Plants

Like other organisms, the plant also respires for its survival. The plant gets energy by the process of respiration in which glucose breaks down in the presence of oxygen to form carbon dioxide and water with the release of energy. In-plant each part can independently take in oxygen from the air and give carbon dioxide. Respiration in plants occurs in leaves (through stomata) and roots (by root hair).