Ch-10- Respiration in Organisms

Aerobic respiration

Anaerobic respiration

<u>Breathing</u>

Breathing in other Animals



Aerobic respiration

Respiration and Its Types

All biological systems require constant supply of energy in order to carry out manifold activities of the living organisms. To ensure this constant supply of energy, many macro-molecules of the cells namely, proteins, carbohydrates or fats are needed to be oxidized to release the locked energy inside the systems.

Respiration is the process of breakdown of food in the cell with the release of energy. Cellular respiration takes place in the cells of all organisms.

The food is the glucose which is broken down to yield carbon dioxide, water and energy. Respiration may be classified into two types:-

- ✤ Aerobic respiration
- Anaerobic respiration

Aerobic respiration

When the glucose is broken down in the presence of oxygen, it is considered as aerobic respiration. In our tissues glucose can be broken down to release energy. The energy is used to make a substance called Adenosine Tri-Phosphate or ATP as it is usually called. ATP can provide energy for other processes such as muscle contractions.

Glucose $\xrightarrow{\text{Presence of } O_2}$ Carbon dioxide + Water + Energy



Anaerobic respiration

Anaerobic respiration occurs in the absence of molecular oxygen and it is also called fermentation. In this, the food is only partially oxidized because only a part of energy is released rest of the energy remains trapped in the intermediate compounds. It is found in lower organisms like yeasts, anaerobic bacteria, in certain parasitic worms like *Ascaris*.

Yeast which is a single cellular organism derives energy through anaerobic respiration.



Yeast

These anaerobes utilize glucose in the absence of oxygen to produce alcohol and carbon dioxide along with the production of energy.

Glucose Absence of O₂ Alcohol + Carbon dioxide + Energy

These yeasts are used in industries for manufacturing alcohol, beer and wines.

After is heavy work out session we get cramps in our muscles. This is due to anaerobic respiration occurring in our muscle. During exercise demand for energy increases and to satisfy this need the glucose breaks into lactic acid in the absence of oxygen. This lactic acid gives rise to cramps. It can be overcome by a massage for a hot water bath. As the supply of oxygen is increased the cell again switches to aerobic respiration and converts the lactic acid to carbon dioxide and water.



Breathing

The process of gaseous exchange i.e. intake of oxygen rich air and giving out carbon dioxide through respiratory organs is called breathing.

When we take in oxygen through our nostrils into the alveoli of lungs it is termed inhalation or inspiration while breathing out of carbon dioxide is called exhalation or expiration. The number of times a person breathes in a minute is termed as the breathing rate. One inhalation along with one exhalation makes up one breath.

Breathing in human beings

The passage through which the oxygen from the atmosphere reaches the lungs is described below.

- Human beings normally take in air through their nostrils.
- From the nostrils this air enters the nasal cavity.
- From the nasal cavity the air reaches our lungs through the windpipe or trachea.
- The lungs which are the respiratory organs are present in the chest cavity. This cavity is surrounded by ribs on the sides.



Human respiratory system

A large muscular sheet called diaphragm forms the floor of the chest cavity.
Breathing involves the movement of the diaphragm and the rib cage.



As the external intercostals & diaphragm contract, the lungs expand. The expansion of the lungs causes the pressure in the lungs (and alveoli) to become slightly negative relative to atmospheric pressure. As a result, air moves from an area of higher pressure (the air) to an area of lower pressure (our lungs & alveoli). During expiration, the respiratory



muscles relax & lung volume decreases. This causes pressure in the lungs (and alveoli) to become slightly positive relative to atmospheric pressure. As a result, air leaves the lungs.



Activity

Cut off the bottom 1/4 of an empty plastic bottle and make a small hole in the centre of the cap of the bottle. Tape a balloon over one end of the straw so that no air can escape between them. Feed the straw through the lid of the bottle and screw the lid on it. Now cut off the top part of another balloon and discard it. Fix the bottom part of the balloon to the bottom of the bottle. Stretch the balloon over the bottom of the bottle. This model shows the method by which our lungs work. The balloon at the bottom acts like the diaphragm.

What do we breathe out?

The carbon dioxide gas given out during exhalation can be confirmed by a simple test. Take a test tube with fresh lime water and breathe out air into it through a straw. It will observe that the lime water turns milky. The calcium hydroxide turns into calcium carbonate. It is a standard test for carbon dioxide.



Breathing in other Animals

Mammals like cows, horse have respiratory system similar to humans. They also breathe by the same mechanism as in humans.

Breathing in Cockroach

Respiration in cockroach is quite different from humans. They have an open system. A cockroach body is divided into three sections, the head, thorax and the abdomen.

This is the internal structure of a cockroach. It has small opening on the body called spiracles through which exchanges of gases takes place. The body possesses a network of air tubes called tracheae for gas exchange. Oxygen rich air rushes through

spiracles into the tracheal tubes, diffuses into the body tissue, and reaches every cell of the body. Similarly, carbon dioxide from the

cells goes into the tracheal tubes and moves out through spiracles.





Earthworm

An earthworm does not possess a respiratory organ. It takes in oxygen directly through its skin and gives off carbon dioxide. Its skin is always moist. The skin is protected by a thin cuticle secreted by the outer layer and kept moist by slimy mucus. A moist surface is necessary for oxygen to be absorbed and carbon dioxide to be given off. Though frogs have pair of lungs like human beings, they can also breathe through their skin, which is moist and slippery.

Breathing under Water

The aquatic animals like fishes have gills for exchange of gases. The oxygen gas is present in the dissolved form in water. Gills are projections of the skin. Gills are well supplied with blood vessels for exchange of gases. The fish draws in water by closing the lid over its gills and opening its mouth. When the fish closes its mouth and opens the gill lid the water is forced out over the respiratory surfaces of the gill filaments.



Respiration in Fish

