RESPIRATION IN ORGANISMS

POWERPOINT PRESENTATION OF BIOLOGY-HOLIDAY HOMEWORK

What is respiration ?

- a process in living organisms involving the production of energy, typically with the intake of oxygen and the release of carbon dioxide from the oxidation of complex organic substances. There are mainly three types of respiration they are—

1. Cellular respiration
2. Aerobic respiration
3. Anaerobic respiration

CELLULAR RESPIRATION

The air we breathe in is transported to all parts of the body and ultimately to each cell. In the cells, oxygen in the air helps in the breakdown of food. The process of breakdown of food in the cell with the release of energy is called cellular respiration. Cellular respiration takes place in the cells of all organisms.

AEROBIC RESPIRATION

In the cell, the food(glucose)is broken down into carbon dioxide and water using oxygen. When breakdown of glucose occurs with the use of oxygen it is called aerobic respiration and food can also be broken down without the use of oxygen and this is called anaerobic respiration

Glucose $\xrightarrow{\text{with the use of oxygen}}$ carbon dioxide+water+energy

ANAEROBES

You should know that there are some organisms such as yeast that can survive in the absence of air. They are called anaerobes. They get energy through anaerobic respiration. In the absence of oxygen, glucose breaks down into alcohol and carbon dioxide, as given below--

glucose $\xrightarrow{\text{Without the use of oxygen}}$ alcohol + carbon dioxide + energy

WHY DO WE RESPIRE ?

all organisms are made of small microscopic units called cells. A cell is the smallest structural and functional unit of an organism. Each cell of an organism performs certain functions such as nutrition, transport, excretion and reproduction. To perform these functions, the cell needs energy. Even when we are eating, sleeping or reading we require energy. But, where does this energy come from? Why are we always insisted to eat ? this Is because the food already has stored energy which is extracted by our body and this process of extraction can take place only if there is oxygen and we get oxygen only when we respire Therefore, all living organisms respire to get energy from food.

EXAMPLES FOR AEROBIC AND ANAEROBIC RESPIRATION

- An example for aerobic respiration is human beings and not only human beings also many animals and plants humans get energy with oxygen if oxygen is not available the energy production will stop
- And an example for anaerobic respiration is yeast. Yeast is also an organism and is used to make breads, buns etc they cannot have oxygen so the glucose they obtain will be broken down into alcohol,carbondioxide and they get energy.

ANAEROBIC RESPIRATION IN HUMANS

Can humans also respire anaerobicaly ? Yes, muscle cells can also respire an aerobically, but only for a short time, when there is a temporary deficiency of oxygen. During heavy exercise, fast running (Fig. 10.1), cycling, walking for many hours or heavy weight lifting, the demand for energy is high. But the supply of oxygen to produce the energy is limited. Then anaerobic respiration takes places in the muscle cells to fulfill the demand of energy:

Glucose ~~in absence of oxygen~~ lactic acid + energy

(in muscles)

Have you ever wondered why you get muscle cramps after heavy exercise? The cramps occur when muscle cells respire an aerobically. The partial breakdown of glucose produces lactic acid. The accumulation of lactic acid causes muscle cramps. We get relief from cramps after a hot water bath or a massage. Can you guess why it is so? Hot water bath or massage improves circulation of blood. As a result, the supply of oxygen to the muscle cells increases. The increase in the supply of oxygen results in the complete breakdown of lactic acid into carbon dioxide and water.

During exercise some muscles may respire aerobically

BREATHING

- If we close our nose and mouth we cannot breath and we would have to move our hand and this proves that we cannot stay without breathing for a long time the reason is that we would not get oxygen. Breathing means taking in air rich in oxygen and giving out air rich in carbon dioxide with the help of

Inhalation and exhalation

The taking in of air rich in oxygen into the body is called inhalation and giving out of air rich in carbon dioxide is known as exhalation. It is a continuous process which goes on all the time and throughout the life of an organism. The number of times a person breathes in a minute is termed as the breathing rate. During breathing inhalation and exhalation take place alternately. A breath means one inhalation plus one exhalation

BREATHING RATE

Breathing always goes on all the time it is not an option it is necessary for us if we breathe normally for 1 minute and count how many times we breath then we would get our breathing rate per minute(bpm-breaths per minute) then if we take a brisk walk of 10 minutes then we would know that our breathing rate increases and then if we run fast for 10 minutes then we would again notice that our breathing rate increases and you also know that the time you were running you were breathing fast but the muscles did not get energy so they also respired anaerobically as mentioned earlier and this also proves that when our body needs energy we breath fast as well as our muscles respire anaerobically. This way body gets oxygen food breaks faster and energy is produced and released.

NORMAL RATE= 15-17 BPM

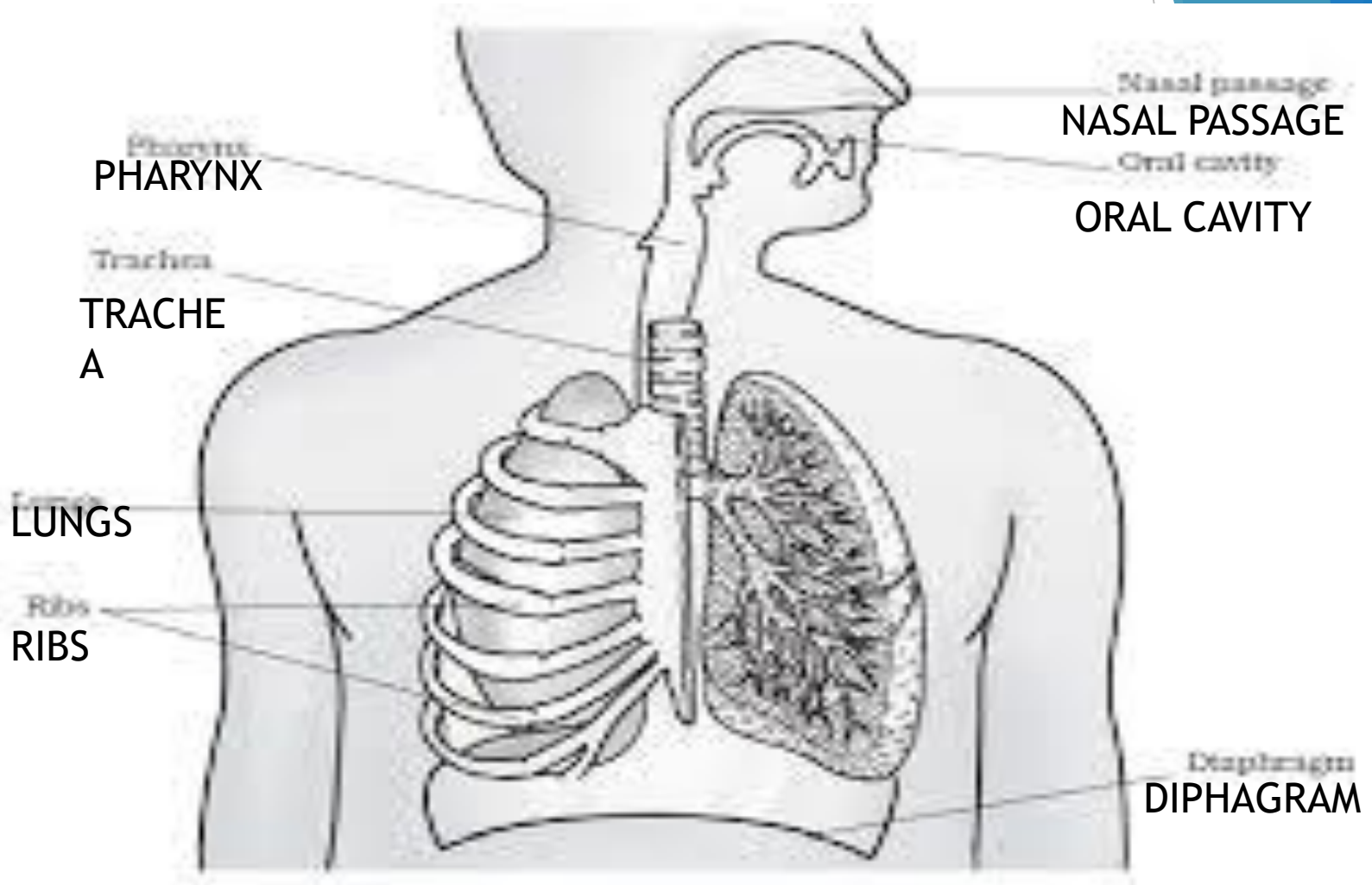
10 MIN FAST RUN= 23-25 BPM

HOW DO WE BREATH ?

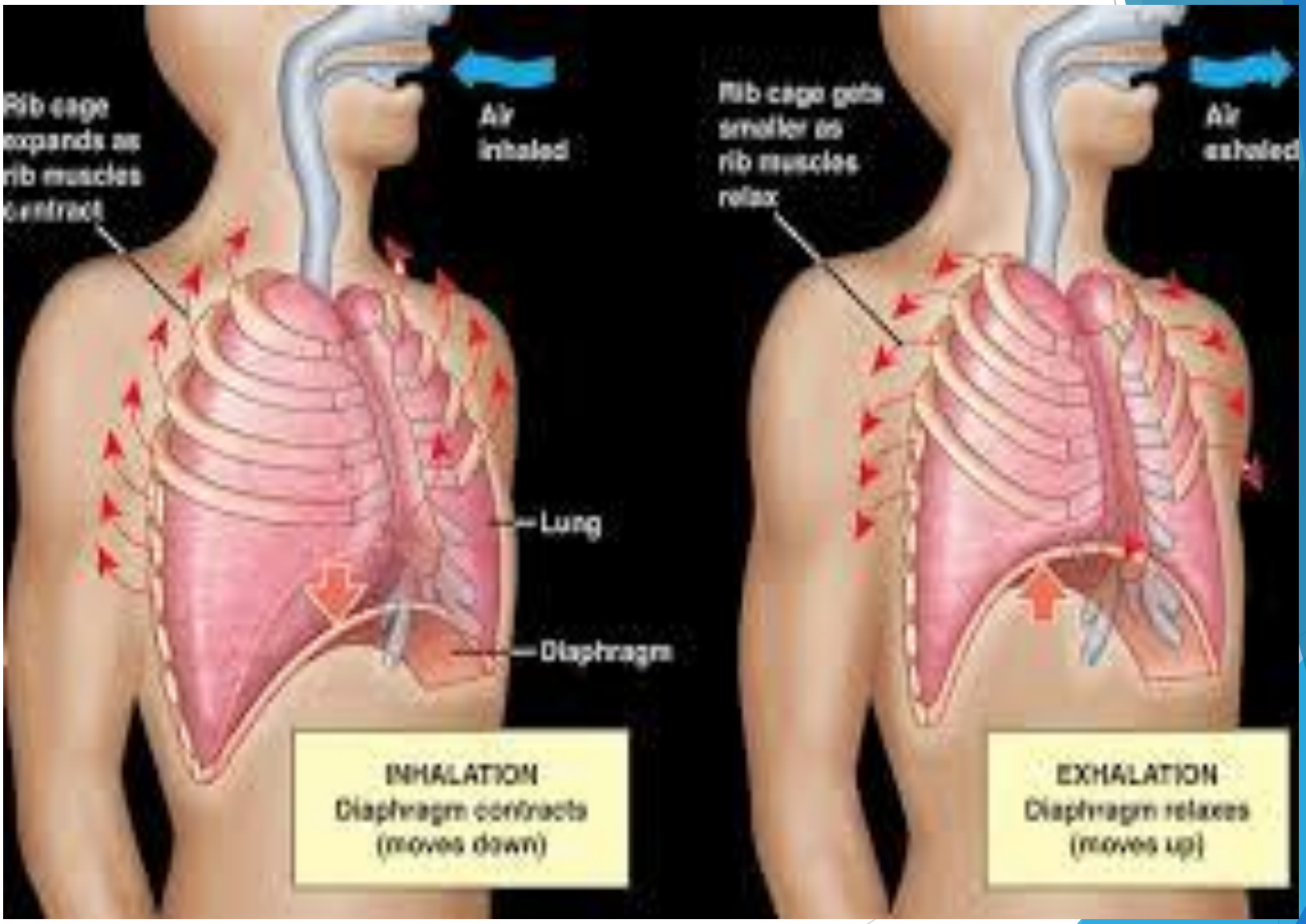
Let us now learn about the mechanism of breathing.

Normally we take in air through our nostrils. When we inhale air, it passes through our nostrils into the nasal cavity. From the nasal cavity, the air reaches our lungs through the windpipe. Lungs are present in the chest cavity (Fig. 10.4). This cavity is surrounded by ribs on the sides. A large, muscular sheet called diaphragm forms the floor of the chest cavity (Fig. 10.4).Breathing involves the movement of the diaphragm and the rib cage. During inhalation, ribs move up and outwards and diaphragm moves down. This movement increases space in our chest cavity and air rushes into the lungs. The lungs get filled with air. During exhalation, ribs move down and inwards, while diaphragm moves up toots former position. This reduces the size of the chest cavity and air is pushed out of the lungs (Fig. 1.2 ON NEXT PAGE)

HUMAN RESPIRATERY SYSTEM



MECHANISM OF BREATHING IN HUMANS



AN ACTIVITY TO SHOW THE MECHANISM OF BREATHING

Take a wide plastic bottle. Remove the bottom. Get a Y-shaped glass or plastic tube. Make a hole in the lid so that the tube may pass through it. To the forked end of the tube fix two deflated balloons. Introduce the tube into the bottle as shown in Fig. 10.7. Now cap the bottle. Seal it to make it airtight. To the open base of the bottle tie a thin rubber or plastic sheet using a large rubber band. To understand the expansion of the lungs, pull the rubber sheet from the base downwards and watch the balloons. Next, push the rubber/plastic sheet upend observe the balloons. Did you seamy changes in the balloons? What do the balloons in this model represent? What does the rubber sheet represent? Now, you should be able to explain the

MECHANISM OF BREATHING

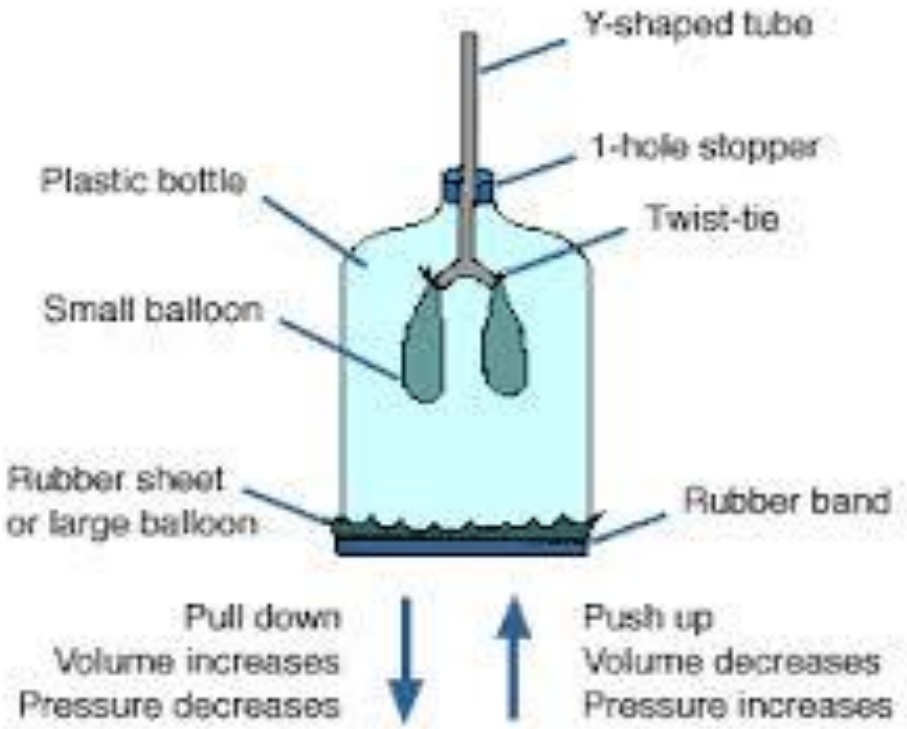
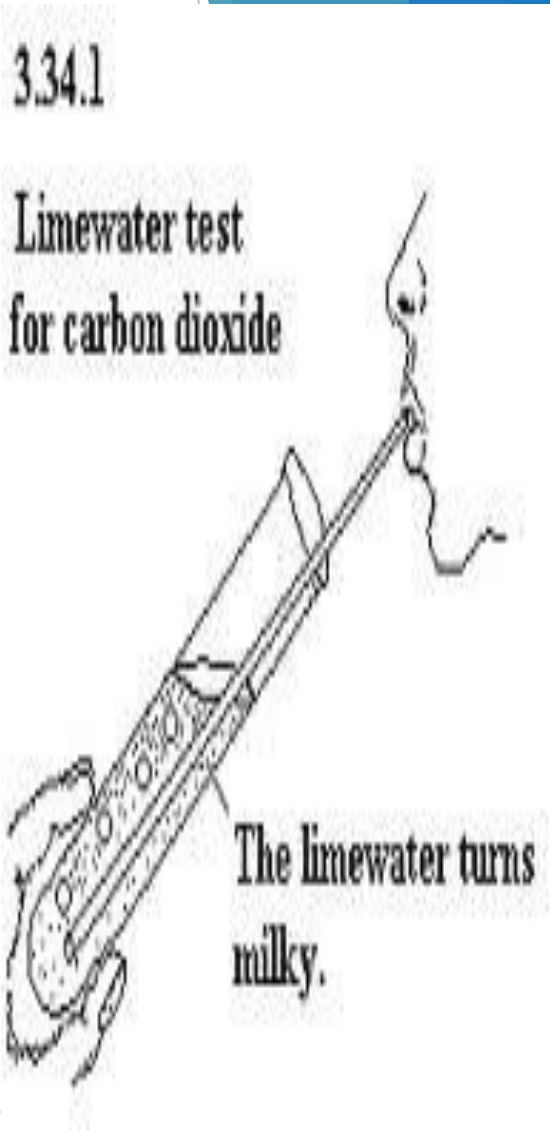


Figure 22-1

What do we exhale ?

Take a small test tube and Insert a plastic straw through the hole in the lid in such a way that it dips in lime water. Now blow gently through the straw a few times (Fig.10.8). Is there a change in the appearance of lime water ? yes, the lime water would change milky as you would exhale carbon dioxide and oxygen and a chemical change takes place that is lime water($CaCo_3 + Co_2 + o_2 \rightarrow CaCo_3$) You are aware that air we inhale or exhale is a mixture of gases. What do we exhale? Do we exhale only carbon dioxide or a mixture of gases along with it? You must have also observed that if you exhale on mirror, a film of moisture appears on its surface. From where do these droplets come? Because we exhale $Co_2 + O_2 + H_2o$…



INHALED AND EXHALED AIR

constiuent	inhalation	exhalation
Oxygen	20.0%	16%
Carbon dioxide	0.03%	4.0%
Water vapour	varible	Variable,but more than inhaled air
nitrogen	78.1%	78.1%
Noble gases	0.94%	0.94%

BREATHING IN OTHER ANIMALS

Animals such as elephants, lions, cows, goats, frogs, lizards, snakes, birds, have lungs in their chest cavities like the human beings. How do other organisms breathe? Do they also have lungs like those of human beings? Let us find out. Cockroach: A cockroach has small openings on the sides of its body. Other insects also have similar openings. These openings are called spiracles(Fig. 10.9). Insects have 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. These air tubes or tracheae are found only in insects and not in any other group of animals.

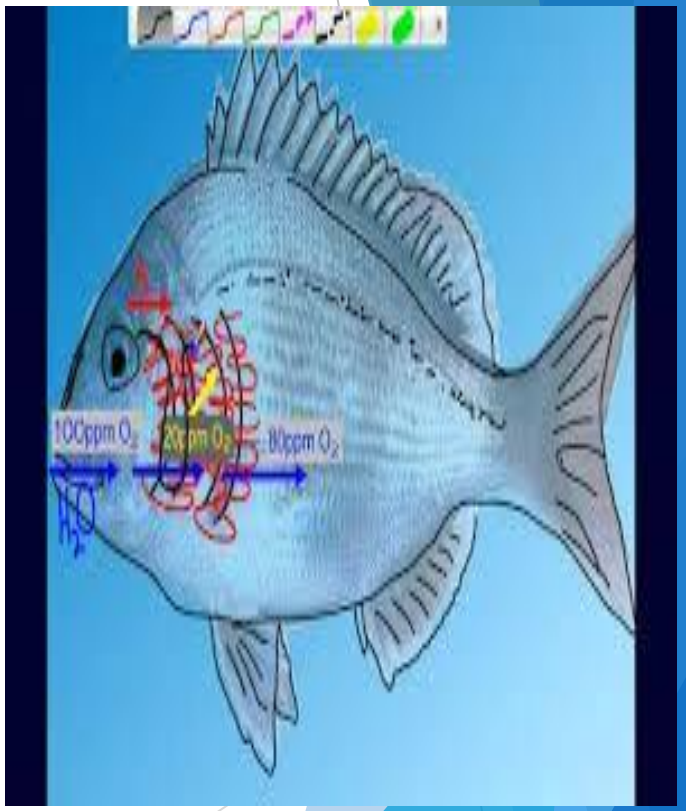
EARTHWORM

Earthworm: Recall from Chapter 9 of Class VI that earthworms breathe through their skins. The skin of an earthworm feels moist and slimy on touching. Gases can easily pass through them. Though frogs have a pair of lungs like human beings, they can also breathe through their skin, which is moist and slippery

Breathing under the water

Can we breathe and survive in water?

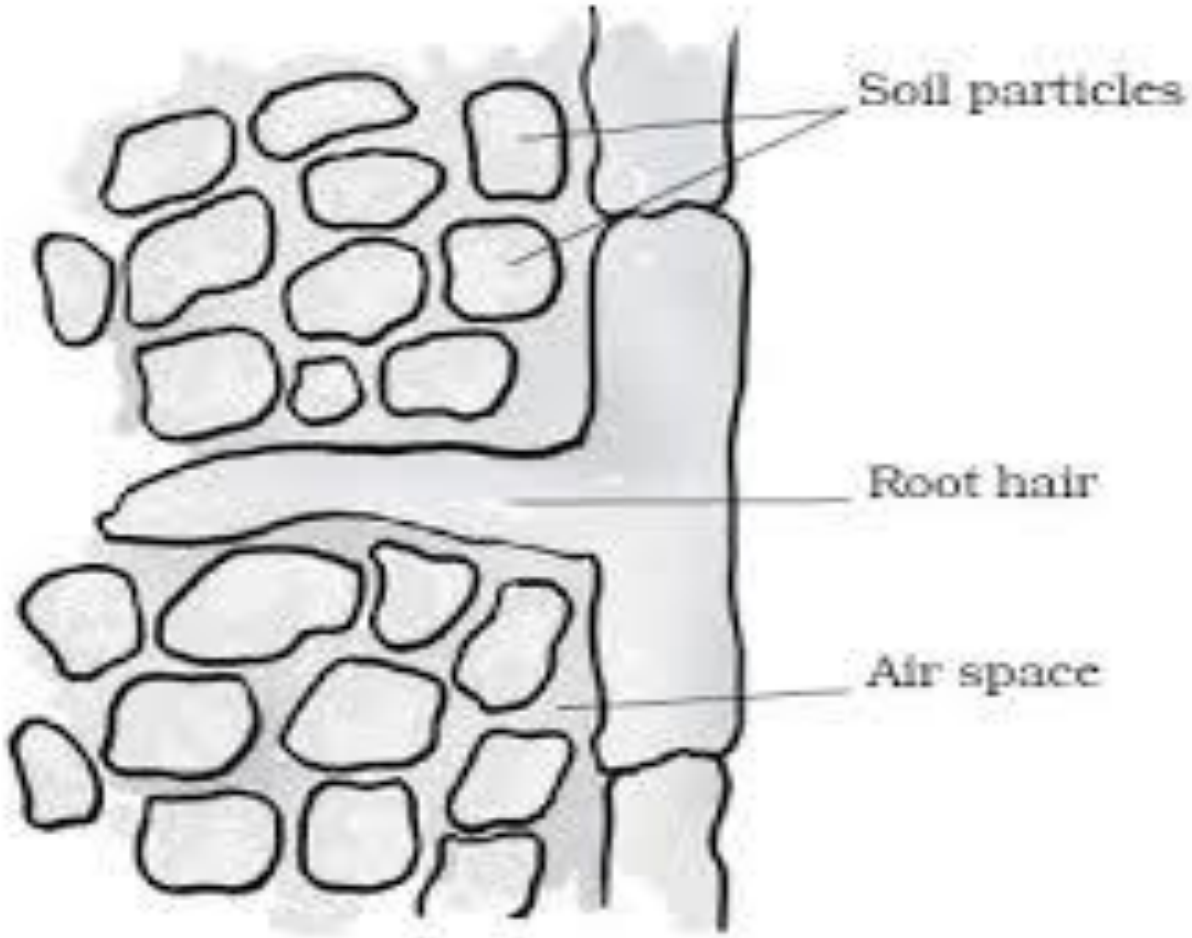
There are many organisms which live in water. How do they breathe under water? You have studied in Class VI that gills in fish help them to use oxygen dissolved in water. Gills are projections of the skin. You may wonder how gills help in breathing. Gills are well supplied with blood vessels for exchange of gases.



BREATHING IN PLANTS

Like other living organisms, plants also respire for their survival as you have learnt in Class VI. They also take in oxygen from the air and give out carbon dioxide. In the cells oxygen is used to break down glucose into carbon dioxide and water as in other organisms. Implants each part can independently taken oxygen from the air and give out carbon dioxide. You have already learn tin Chapter 1 that the leaves of the plant shave tiny pores called stomata for exchange of oxygen and carbon dioxide. Like all other living cells of the plants, the root cells also need oxygen to generate energy. Roots take-up air from the air spaces present between the soil particles (Fig. 10.11)

Roots take in air from soil



Summary

1. Respiration is essential for survival of living organisms. It releases energy from the food.
2. The oxygen we inhale is used to breakdown glucose into carbon dioxide and water. Energy is released in the process.
3. The breakdown of glucose occurs in the cells of an organism (cellular respiration).
4. If the food is broken down with the use of oxygen, it is called aerobic respiration. If the breakdown occurs without the use of oxygen, the respiration is called anaerobic respiration.

Summary II

1. During heavy exercise when the supply of oxygen to our muscle cells is insufficient, food breakdown is by anaerobic respiration.
2. Breathing is a part of the process of respiration during which an organism takes in the oxygen-rich air and gives out air rich in carbon dioxide. The respiratory organs for the exchange of gases vary in different organisms.
3. During inhalation, our lungs expand and then come back to the original state as the air moves out during exhalation.
4. Increased physical activity enhances the rate of breathing.
5. In animals like cow, buffalo, dog and cat the respiratory organs and the process of breathing are similar to those in humans.
6. In earthworm, the exchange of gases occurs through the moist skin.
7. In fishes it takes place through gills and in insects through the tracheae.
8. In a plant the roots take in air present in the soil. Leaves have tiny pores called stomata through which they exchange gases. The breakdown of glucose in the plant cells is similar to that in other living beings.

THANK YOU !!