

# Respiration In Organisms

# 11

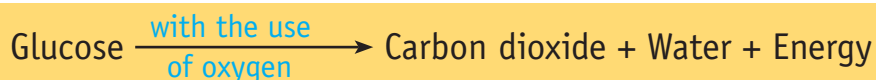
## IN THIS CHAPTER

- *Difference between cellular respiration and combustion.*
- *Respiratory system in humans*
- *How air enters the lungs*
- *Respiration in animals*
- *Respiration in plants*

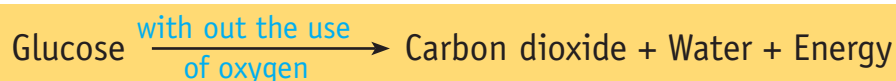
All organisms are made of small microscopic units called cells. A cell is the smallest structural and functional unit of an organism. Each cell of an organism performs certain function such as nutrition, transport, excretion and reproduction, to perform these functions, the cell needs energy. This energy is stored in food, which is released during respiration. Therefore all living organisms respire to get energy from food.

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

In the cell, the food (glucose) is broken down into carbon dioxide and water in the presence of oxygen, in this process energy is released. This process is called aerobic respiration. It is carried out in the bodies of almost all animals.



Some organism such as yeast and some bacteria can live without oxygen. In their cells, glucose is broken into alcohol and carbon dioxide without oxygen to give energy this process is called anaerobic respiration. The amount of energy given out in anaerobic respiration is much less than in aerobic respiration.



Our muscles cells can also respire an-aerobically but only for a short duration when there is a temporary deficiency of oxygen. During cycling, fast running heavy exercise, heavy weight lifting. The demand for energy is high but the supply of oxygen to produce the energy is limited.

Then anaerobic respiration takes place in the muscle cell to fulfill the demand of energy.



Muscles are cramped after heavy exercise due to respiring anaerobically by muscle cells.

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 with oil. Hot bath or massage increase the blood circulation and supply of oxygen to the muscles also increases. The increase in the supply of oxygen breakdown the lactic acid completely into carbon dioxide and water.



## Difference Between Cellular Respiration and Combustion

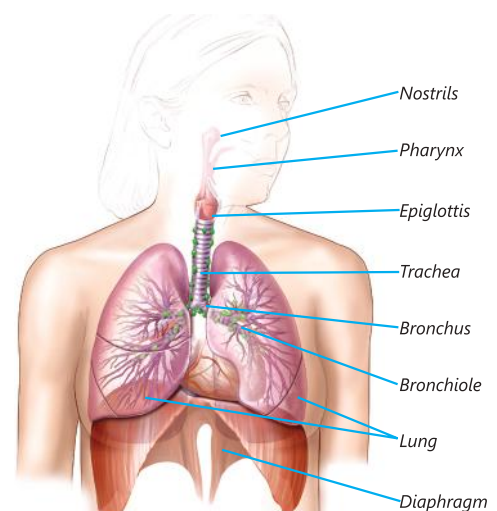
Cellular Respiration	Combustion
It is a slow process.	It is a fast process.
It occurs at body temperature	It occurs at high temperature.
It occurs only in living cells.	It can occur anywhere .
In this process, energy is released slowly and stored in cells.	In this process energy is released in a form of heat and light.

## RESPIRATORY SYSTEM IN HUMANS

Breathing means taking in air rich in oxygen and giving out air rich in carbon dioxide with the help of respiratory organs. The taking 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 all the time and throughout the life in organism.

The human respiratory system consists of organs responsible for taking in oxygen for respiration and releasing carbon dioxide and water vapour which are the waste products formed during respiration. The nostrils (the passages in the nose) trachea (wind pipe) bronchi and lungs are the main organs of the respiratory system.

Lungs are present in the chest cavity. This cavity is surrounded by ribs on the sides. A large muscular sheet called diaphragm forms the floor of the chest cavity. Breathing involves the movement of the diaphragm and the rib cage. The polluted air is not fit to

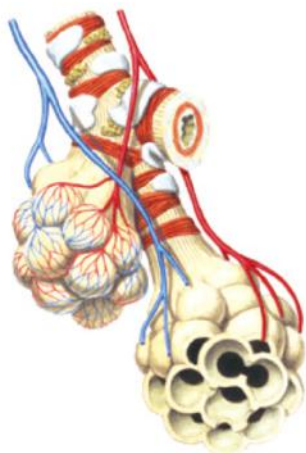


Human respiratory system

enter our lungs. It is polluted and unclean but air should be moist, warm and clean. As the air passes through the nostrils, it is moistened by the slimy mucous present in the nose. Mucous is secreted by the inner lining of the nose. The air is warmed by the blood circulating in the nose.

We do not get clean air if we breathe through our mouth instead of our nose. Therefore, we should always breathe through the nose. It will protect us from infection.

From the nose cavity, the air passes through the or throat cavity to the windpipe or trachea. The windpipe branches into two smaller tubes called the bronchi. Each bronchus enters a lung. In the lungs, each bronchus branches out into smaller tubes called bronchioles. At the end of these tubes tiny air sacs are present and are called alveoli.



Magnified view of branch and alveoli in the lungs

Each lung contains about 300 million alveoli. The air we breathe in eventually reaches these air sacs. The sacs are surrounded by blood vessels. The oxygen present in the air so breathe in, goes into the blood contained in blood vessels. The carbon dioxide present in the blood passes out of the blood into the air sacs. Thus exchange of gases takes place in the lungs.

The blood takes the oxygen to all the cells of the body where it is used to get energy from food. The carbon dioxide released by the cells as waste goes back into the blood and is released into the air sacs of the lung. It is then breathed out by us.

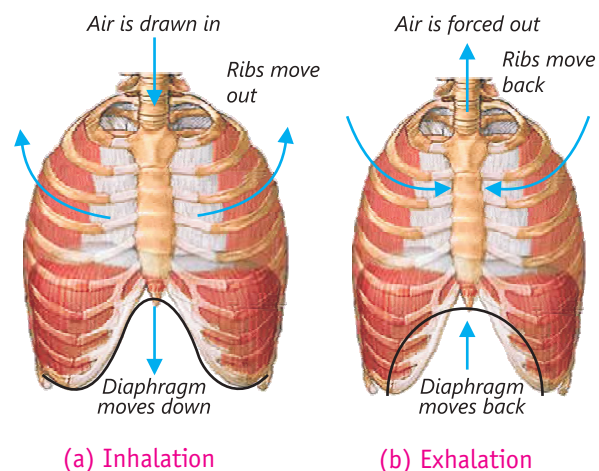
## HOW AIR ENTERS THE LUNGS?

We do an activity to understand it. Take a bell jar. Fix two thin balloons to the two arms of a Y-shaped glass or plastic tube.

Fix a one hole rubber cork to the mouth of the bell jar. Pass the Y-tube through the cork. Tie a rubber sheet tightly around the open rim of the bell jar.

Now pull the rubber sheet down and after few seconds release it.

Similarly when we breathe in air the diaphragm goes down, increasing the space in the chest cavity. The air from the atmosphere enters lungs and they expand. When we breathe out, the diaphragm moves up, decreasing the space in the chest cavity. By this air goes out of the lungs.



## Breathing Rate

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 breathe means one inhalation and

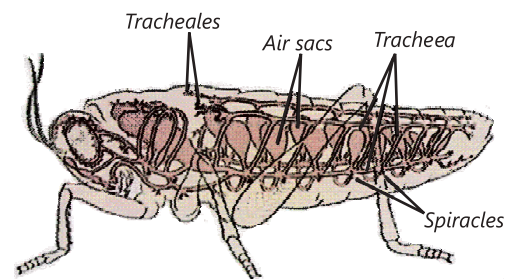
one exhalation. Breathing rate is different in performing different activities. When a person is running, then he needs more oxygen to release more energy. On an average, an adult human being at rest breathes in and out 15-18 times in a minute. During heavy exercise or running the breathing rate can increase upto 25 times per minute. During exercise, sometimes we take a deep breathe to take more oxygen for more energy.

## RESPIRATION IN ANIMALS

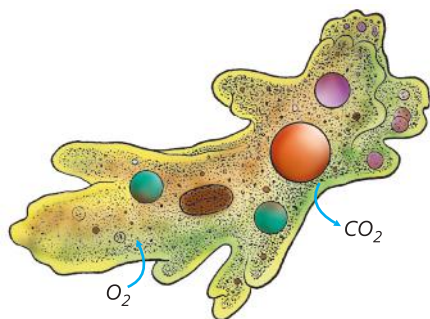
Animals are of different types. They have different ways in which exchange of oxygen and carbon dioxide occurs in their bodies.

### Through Air Holes

Insects such as cockroaches, grasshoppers have openings called spiracles on their sides. Air enters through these openings and reaches all parts of the body through respiratory tubes called trachea and their branches called tracheales.



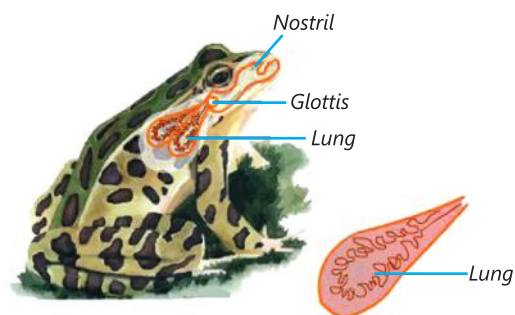
Tracheal System



Exchange of gases through skin

### Through Lungs

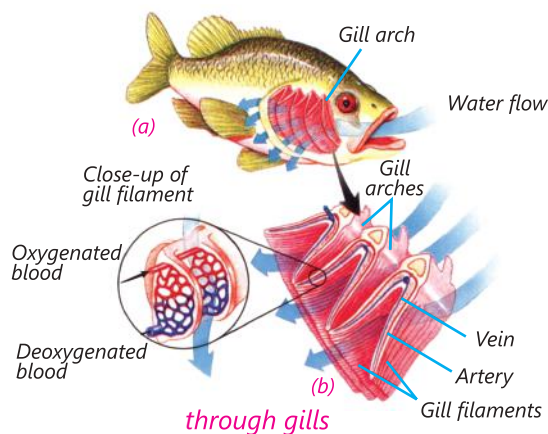
A tadpole has gills but as it grows into a frog it develops air bags called lungs for gaseous exchange. Birds and mammals also have highly developed lungs where gaseous exchange takes place.



Through lungs

### Through Skin

In unicellular animals such as Amoeba and Paramecium exchange of gases occurs by diffusion through the cell membrane. In hydra and earthworm, exchange of gases takes place by diffusion through the moist outer surface.



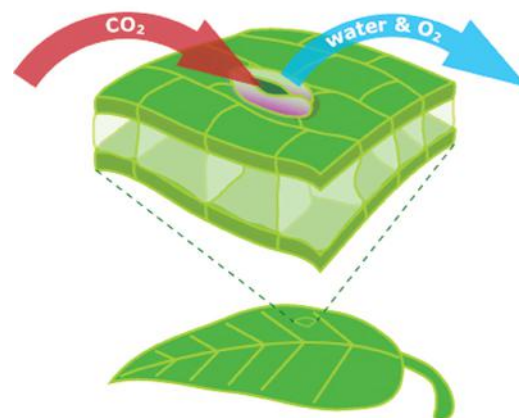
### Through Gills

Fishes use gills for exchange of gases. Gills are made up of a large number of filaments, richly supplied with thin blood veins called capillaries. As water enters through the mouth it flows over the gills. The blood in the capillaries absorbs oxygen and gives out carbon dioxide through its gills.

## RESPIRATION IN PLANTS

Plants are living beings so they also respire by taking in oxygen and giving out carbon dioxide. (Note that during photosynthesis plants take in carbon dioxide and give out oxygen.) Plants do not have any organs for breathing. The exchange of oxygen and carbon dioxide takes place by diffusion through small pores called stomata, present in the leaves and stems. Stomata along with its nearby guard cells and subsidiary cells are called the stomata apparatus.

Guard cells are two paired cells. The opening between them is the stomata. The expansion and shrinking of guard cells results in opening and closing of stomata.



Stomata are small pores used to exchange gases

### Know the Keywords :

**Respiration :** Respiration is essential to release energy from food.

**Animal's Respiration :** Exchange of oxygen and carbon dioxide during respiration in animals occurs through diffusion through skin, spiracles, gills and lungs.

**Plant's Respiration :** In plants, the exchange of oxygen and carbon dioxide takes place by diffusion through stomata present in leaves and stem.

### Point to Remember

- All organisms are made of small microscopic units called cells.
- The taking of air rich in oxygen into the body is called inhalation.
- The giving out of air rich in carbon dioxide is known as exhalation.
- The number of times a person breathe in a minute is termed as the breathing rate.
- Gills are made up of a large number of filaments, richly supplied with thin blood veins called capillaries.

## EXERCISE TIME

### A. Answer the following questions :

1. What are the main organs of the respiratory system ?
2. What is aerobic respiration ?
3. Why muscles are cramped after heavy exercise ?
4. Define bronchioles and alveoli ?
5. How do lungs function ?

6. How do earthworms respire ?
7. How do leaves respire ?
8. How do fish respire ?

**B. Fill in the blanks :**

1. Taking in oxygen and giving out carbon dioxide is called \_\_\_\_\_.
2. A large muscular sheet is called \_\_\_\_\_.
3. Leaves respire through \_\_\_\_\_.
4. Cellular respiration that does not use oxygen is called \_\_\_\_\_.
5. The widepipe branches into two smaller tubes called the \_\_\_\_\_.
6. During heavy exercise, muscles respire anaerobically so glucose produce \_\_\_\_\_.
7. The breaking down of glucose into carbon dioxide and water occurs in \_\_\_\_\_ respiration.
8. In a cell glucose is broken down into \_\_\_\_\_ and \_\_\_\_\_.

**C. Match the following :**

**Column 'A'**

1. Diaphragm
2. Leaves
3. Skin
4. Fish
5. Frog

**Column 'B'**

- (i) Gills
- (ii) Earthworms
- (iii) Chest cavity
- (iv) Gills and lungs
- (v) Stomata

**D. Write 'T' for true and 'F' for false statement :**

1. Fishes respire through their lungs.
2. Earthworms respire through their skin.
3. Leaves respire through stomata.
4. Respiration is essential to release energy from food.
5. Cellular respiration is a fast process.

**E. Tick (✓) the correct option :**

1. All living oraganisms respire to get :  
(i) oxygen  (ii) carbon  (iii) energy

2. The aerobic respiration is carried out in the bodies of almost all :

- (i) human beings  (ii) birds  (iii) animals

3. The partial breakdown of glucose produces :

- (i) hydrochloric acid  (ii) lactic acid  (iii) none of them

4. Combustion occurs at temperature :

- (i) high  (ii) low  (iii) normal

5. When we breathe in air the diaphragm goes :

- (i) up  (ii) low  (iii) down

6. During heavy exercise or running the breathing rate can increase upto :

- (i) 50 times  (ii) 15 times  (iii) 25 times



## Creative Work

- **Take a graduated plastic bottle and fill it completely with water. Turn it upside down in a bucket of water in such a way that no air bubbles enter the bottle. Take a rubber tube and insert one end of it inside the mouth of the bottle and hold the other in your hand.**

**Now, take a deep breathe and blow forcefully into the rubber tube. The blow should be single and as forceful as possible. You will observe that the air blown through the tube will displace the water in the bottle.**

**The amount of the water displayed in your lung capacity.**

- **Find your lung capacity and that of your friends.**