

RESPIRATION IN ORGANISMS

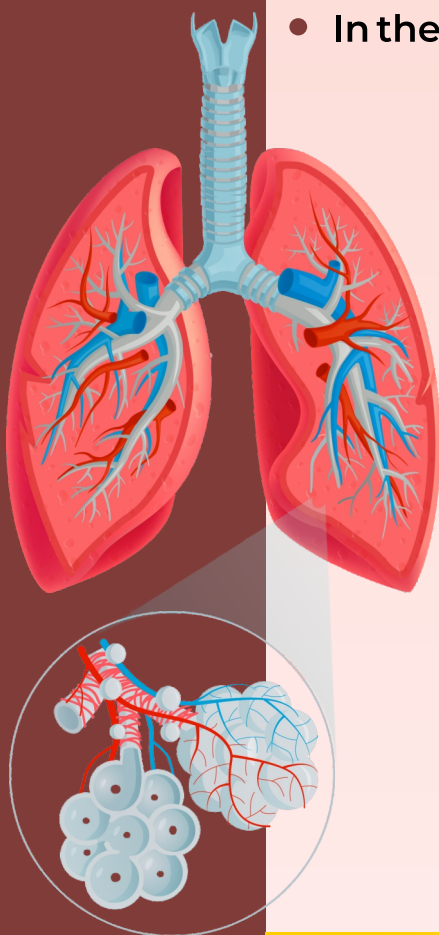
Key Points

Respiration

- The process of releasing energy from food is called respiration.”
- The metabolic process by which organisms obtain energy from oxidation of food.
- In the cells, oxygen helps in the breakdown.

Note

- Respiratory substrates are the organic compounds which are used in respiration to provide energy. Most common respiratory substrate is glucose.



Cellular respiration

- It is an intracellular process in which glucose is oxidized and the energy is used to make ATP (adenosine triphosphate).
- It consists of many separate enzymatic reactions.

Types of Cellular Respiration

Aerobic Respiration

O₂ required.

Complete breakdown of glucose takes place.

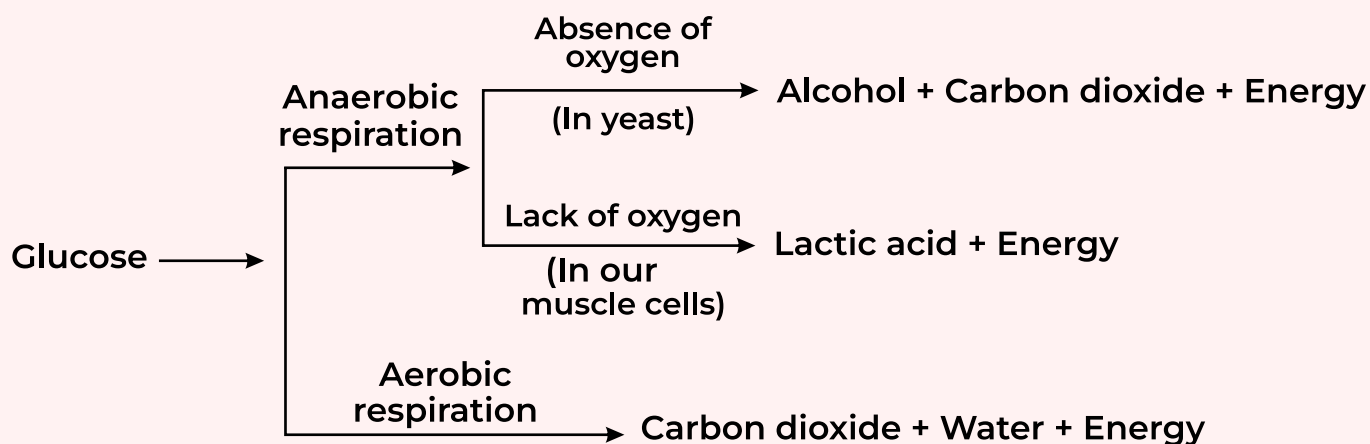
End Products-CO₂ and H₂O and energy.

Anaerobic Respiration

O₂ not required.

Incomplete breakdown of glucose takes place

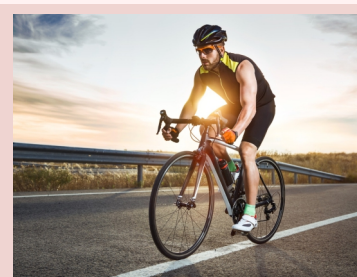
End Products- Ethyl alcohol or lactic acid, CO₂ and energy.



Note

ATP is Adenosine triphosphate which function as energy currency in various cellular activities.

- The cramps occur when muscle cells respire anaerobically. The partial breakdown of glucose produces lactic acid. The accumulation of lactic acid causes muscle cramps produce energy.
- During heavy exercise, fast running, cycling, walking for many hours or heavy weightlifting, the demand for energy is high but the supply of oxygen to produce the energy is limited.



Note

Yeasts are single- celled organisms. They respire anaerobically and during this process yield alcohol. They are, therefore, used to make wine and beer.

Breathing

- It means taking in air rich in oxygen and giving out air rich in carbon dioxide with the help of respiratory organs.
- It is a continuous process which goes on all the time and throughout the life of an organism.
- Breathing includes inhalation and exhalation.

Inhalation: The process of taking in air rich in oxygen into the body is called inhalation.

Exhalation: The process of giving out of air rich in carbon dioxide is known as exhalation.

On an average an adult breathes - 15-18 times/minute.

During heavy Exercise, Breathing Rate can increase upto 25 times/minute.

Breathing rate

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

A breath means one inhalation and one exhalation.

Note

When we feel drowsy our breathing rate slow down so a person yawns to bring more oxygen into the blood and move more carbon dioxide out of the blood.

Breathing organs in animals

Animals have special organs for exchange of gases.

- | | | |
|---|-----------------------|---|
| » Insects
(Cockroach and grasshopper) | - Trachea (spiracles) | |
| » Earthworms | - Moist Skin |  |
| » Human
(Rat, Lizard and Frog, Birds, Lions, Cows & Goats) | - Lungs | |

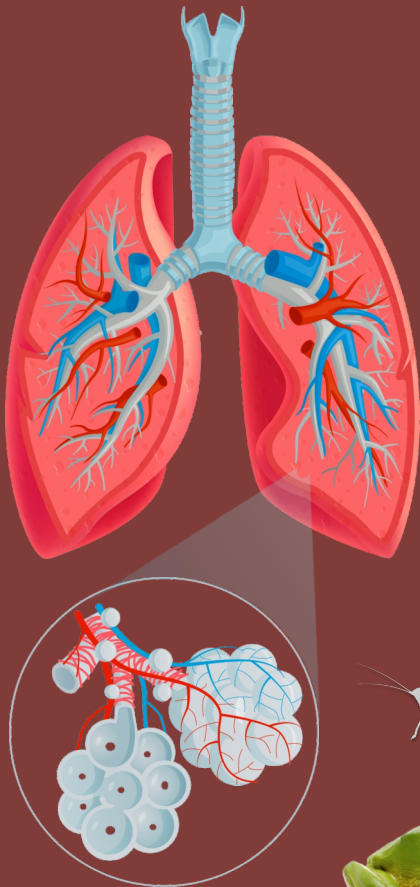
Note

Alveoli are structural and functional units of lungs as these are actual site of gaseous exchange.

Fish takes dissolved oxygen from water. Breathing organs of fish are gills.



Fish



The rate of breathing

Aquatic organisms



Terrestrial organisms

Because water has low content of oxygen than air.

Note

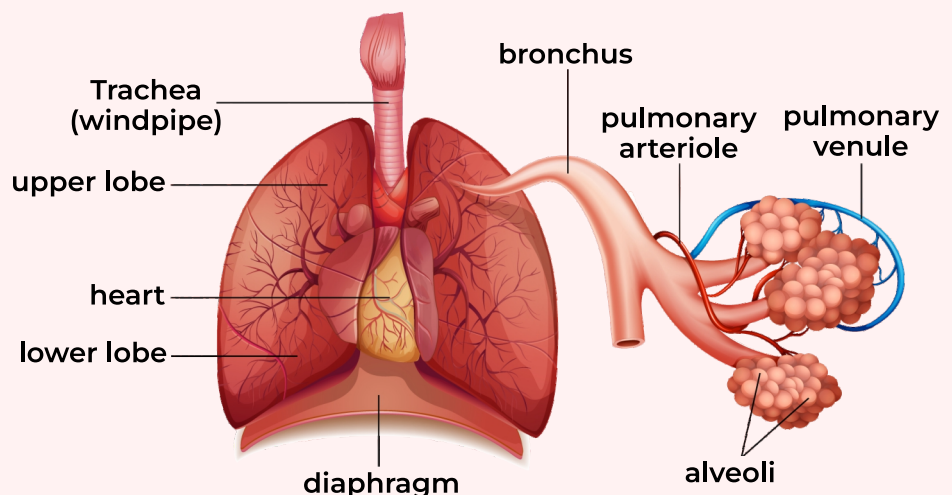
Whales and Dolphins are mammals. They have lungs so they come up to the water surface to get air. They let all the water out of their blowholes in the form of a fountain.

Human Respiratory system

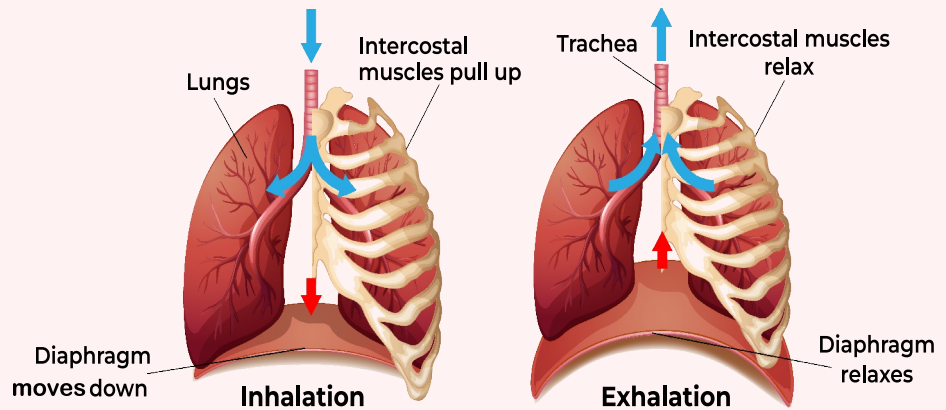
- We take in air through our nostrils it passes through our nostrils into the nasal cavity.
- From the nasal cavity, the air reaches our lungs through the windpipe.
- Lungs are present in the chest cavity which is surrounded by ribs on the sides.
- A large, muscular sheet called diaphragm forms the floor of the chest cavity.
- Breathing involves the movement of the diaphragm and the rib cage.

Smoking damages lungs. Excessive smoking may sometimes leads to cancer. It must be avoided.

External nostrils → Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli.



Mechanism of Breathing

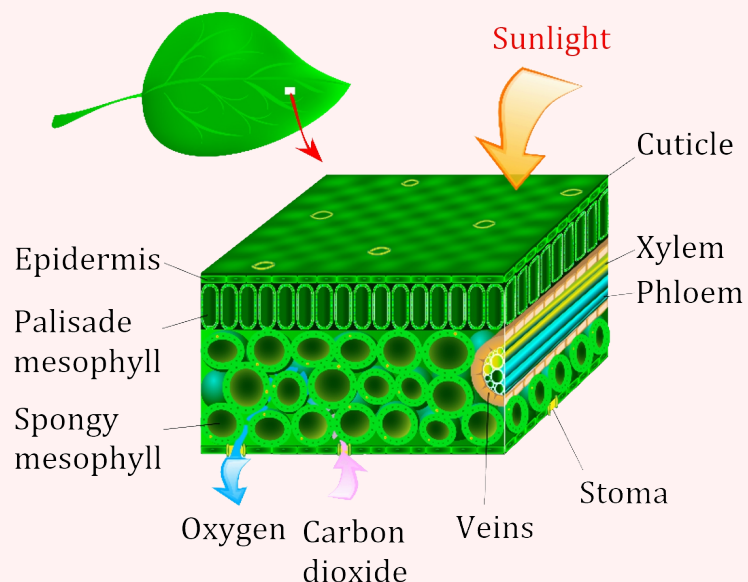


- Diaphragm flat
- Ribs move upward and outward
- Air pressure in lungs decreases
- increases space in chest cavity

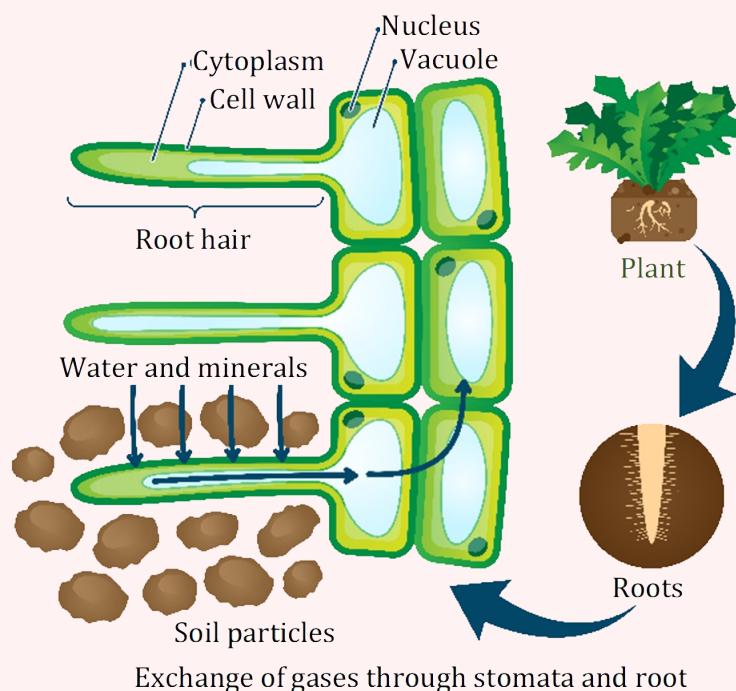
- Diaphragm dome shaped
- Ribs move downward and inward
- Air pressure in lungs increases
- Reduces the size of chest cavity

Gaseous Exchange in Plants

- » In plants, specific organs for breathing are absent. The exchange of gases, however, occurs by the process of diffusion.
- » Diffusion of gases (oxygen and carbon dioxide) occurs through three sources.



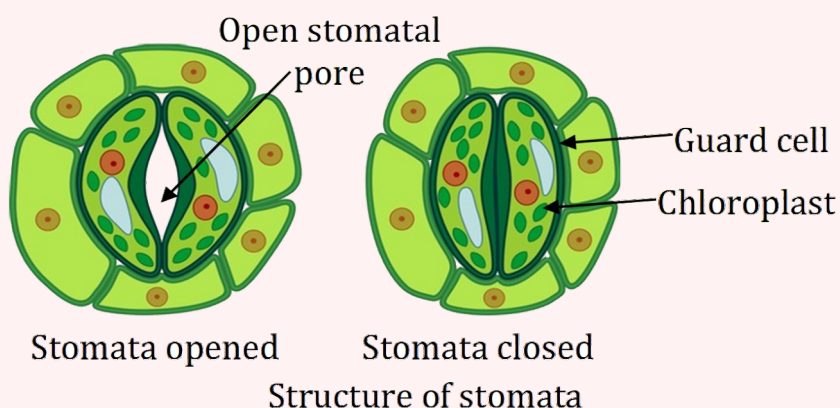
Exchange of gases through stomata and root



Note

Roots, stems and leaves respire far lower than animals do.

- Through stomata (singular stoma), the minute openings on the surface of leaves.
- During day, CO_2 generated during respiration is used up for photosynthesis hence there is no CO_2 release instead oxygen release in the atmosphere is the major event.
- Rate of photosynthesis is more as compared to respiration during day time.
- During night, stomata is closed and photosynthesis does not occur. CO_2 elimination is the major exchange activity going on because CO_2 is liberated during respiration is not used in photosynthesis.



- Through general surface of the roots. The roots take up oxygen from the air spaces present between the soil particles. In aquatic plants, gases diffuse through the body surface.
- In stems, the living cells are organised in a thin layer inside and beneath the bark. They also have opening called lenticels.

Note

If a potted plant is overwatered the air spaces present between the soil particles is filled with water due to this roots unable to respire and ultimately dies.