LIFE PROCESSES

CLASS X | BIOLOGY

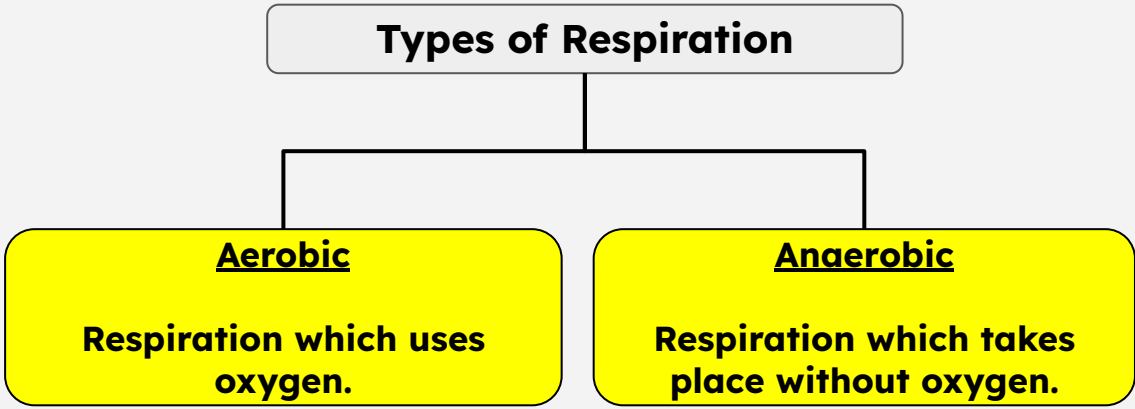
What are we going to study?

- Types of Respiration
- Respiration in plants
- Respiration in Aquatic Animals
- Respiration in Human Beings

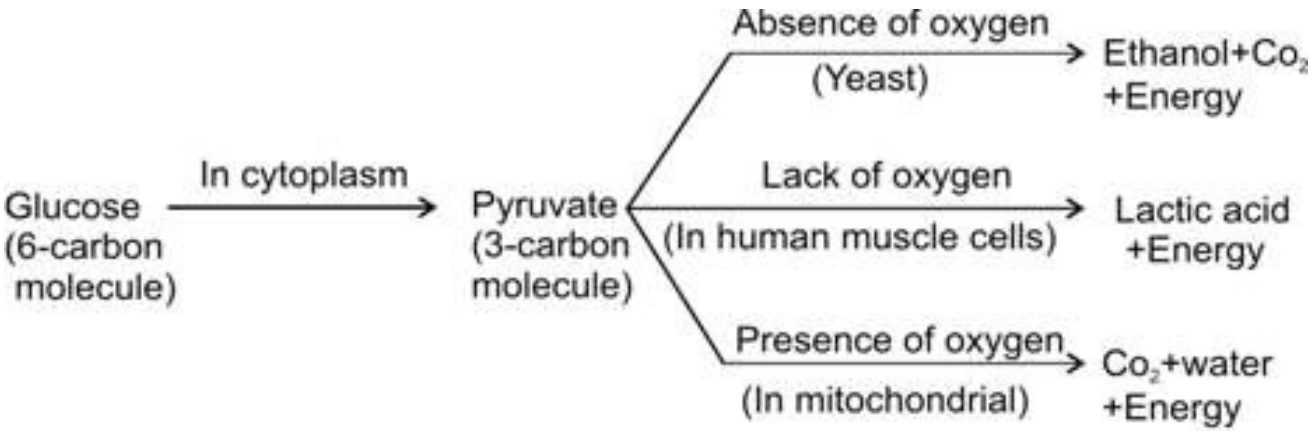
What is Respiration?

The process in which the FOOD is broken down in the cells with the help of oxygen to release energy is known as RESPIRATION.

IS IT CATABOLIC OR ANABOLIC IN NATURE?


Types of Respiration
Aerobic
Respiration which uses oxygen.
Anaerobic
Respiration which takes place without oxygen.

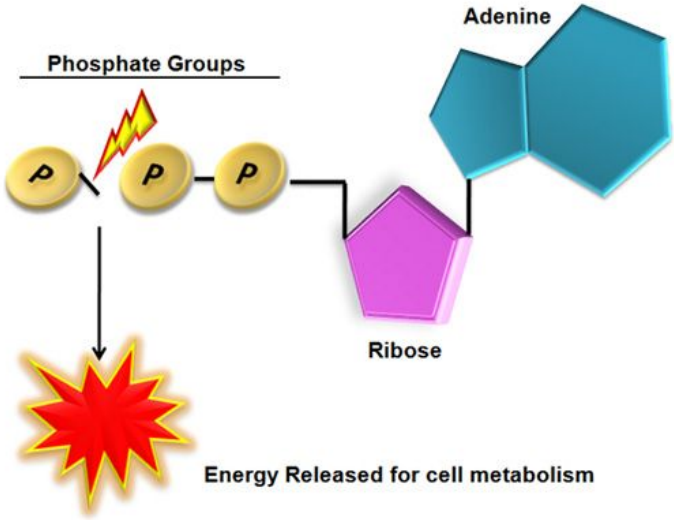
Steps in Respiration



HOW IS ENERGY STORED IN HUMAN BODY?

ATP: Adenosine Triphosphate

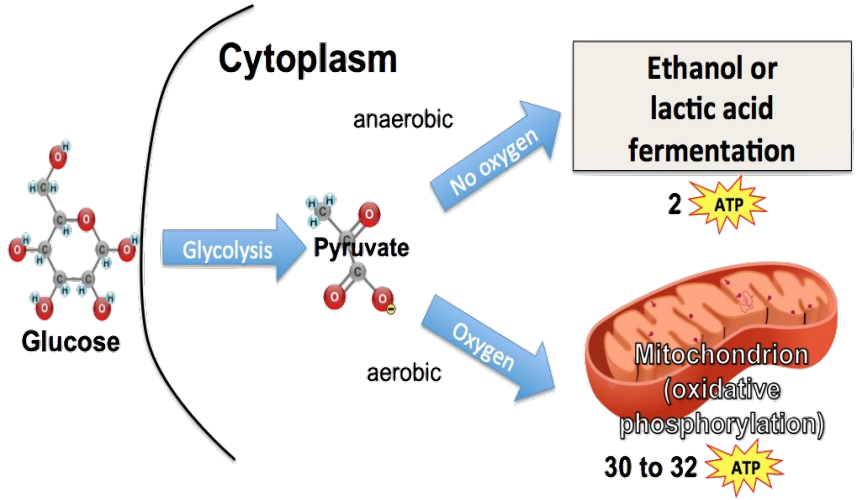
- Known as energy currency of cell.
- The energy released during the process of respiration is used to build-up an ATP molecule from ADP and inorganic phosphate (Pi).
- The energy equivalent to 30.5kJ/mol is released, when the terminal phosphate linkage in ATP is broken down.
- It is this energy which is utilized by the cells for the contraction of muscles, protein synthesis, conduction of nervous impulses and many other activities.


Adenine
Phosphate Groups
P
P
P
Ribose
Energy Released for cell metabolism

(i) Alcoholic Fermentation

Fermentation is another anaerobic (non-oxygen-requiring) pathway for breaking down glucose.

This process occurs mainly in YEAST.
Fermentation in yeast is thus used to making cheese, beer, wine, etc (by brewing).



(i) Lactic Acid Fermentation

It happens in Human Beings during exercising.

When we exercise, our energy requirements increase. As we lack to get sufficient oxygen from the surrounding, our body has to fulfil the energy requirement through Anaerobic Respiration.

Lactic acid produced in muscle cells is transported through the bloodstream to the liver, where it's converted back to pyruvate and processed normally in the remaining reactions of cellular respiration

	Anaerobic	Aerobic
Reactants	Glucose	Glucose **and** oxygen
Combustion	Incomplete	Complete
Energy Yield	Low (2 ATP)	High (36 – 38 ATP)
Products	**Animals:** Lactic acid **Yeast:** Ethanol + CO_2	CO_2 and H_2O
Location	Cytoplasm	Cytoplasm **and** mitochondrion
Stages	Glycolysis Fermentation	Glycolysis Link reaction Krebs cycle Electron transport chain

RESPIRATION IN PLANTS VS THAT IN ANIMALS

All parts of the plant perform respiration individually. While, an animal performs respiration as a single unit.

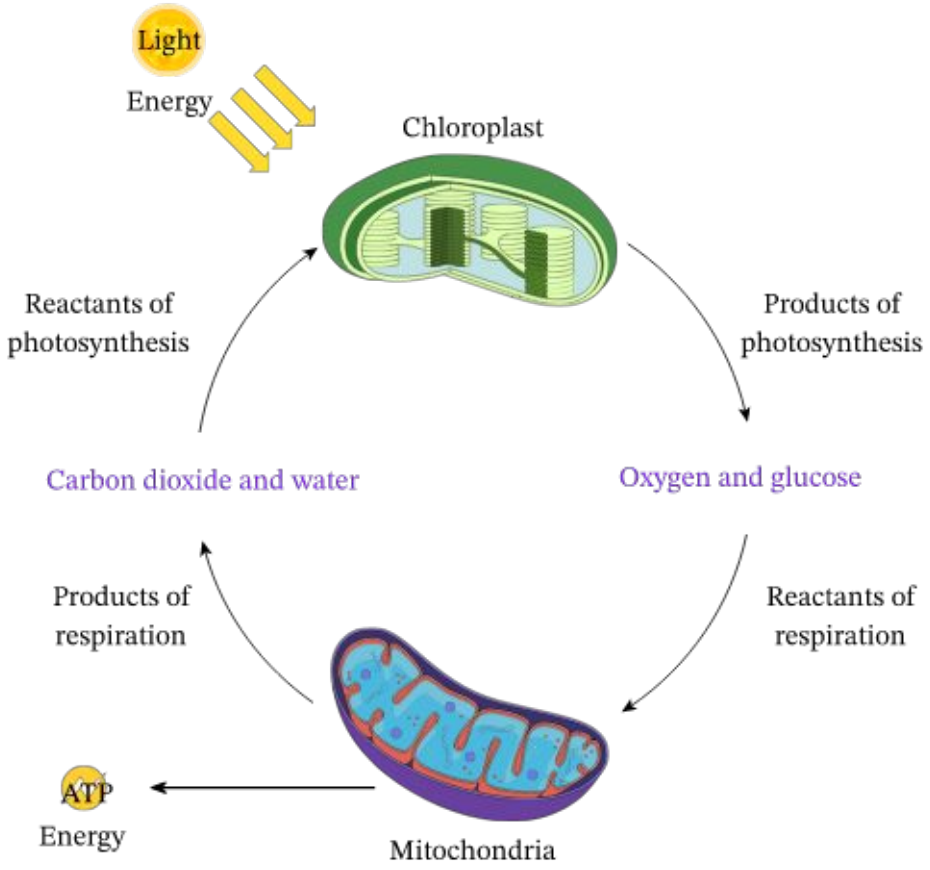
During respiration in plants, there is a little transport of respiratory gases from one part to other. While, respiratory gases transport over long distances inside an animal during respiration.

Respiration in plants occurs at a slow time. While, the respiration in animals occurs at a much faster rate.

RESPIRATION IN PLANTS

Plants exchange gases through stomata, and the large intercellular spaces ensure that all cells are in contact with air. Carbon dioxide and oxygen are exchanged by Simple diffusion here.

The direction AND INTENSITY of diffusion depends upon the environmental conditions


Light
Energy
Chloroplast
Reactants of photosynthesis
Products of photosynthesis
Carbon dioxide and water
Oxygen and glucose
Products of respiration
Reactants of respiration
ATP
Energy
Mitochondria

During the day, CO_2 generated during respiration is used up for photosynthesis, hence there is no CO_2 release. Instead, oxygen release is the major event at this time.

At night, when there is no photosynthesis occurring, CO_2 elimination is the major exchange activity going on.

Flatworms : Simple Diffusion over body surface

Earthworms : Moist Cuticle of Skin

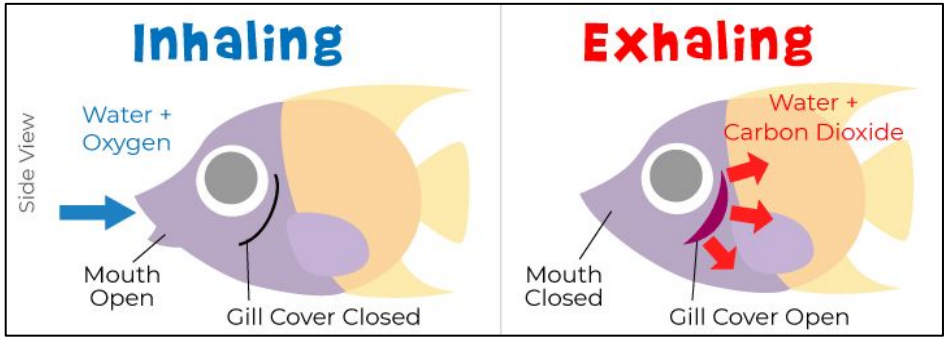
Insects : Network of tubules (tracheal tubules)

Fishes : Gills

Reptiles and Birds : Lungs

Amphibians like frog : can respire through moist skin too

RESPIRATION IN AQUATIC ANIMALS



Since the amount of dissolved oxygen is fairly low compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms

RESPIRATION IN HUMAN BEINGS

Mechanism of Respiration in Humans

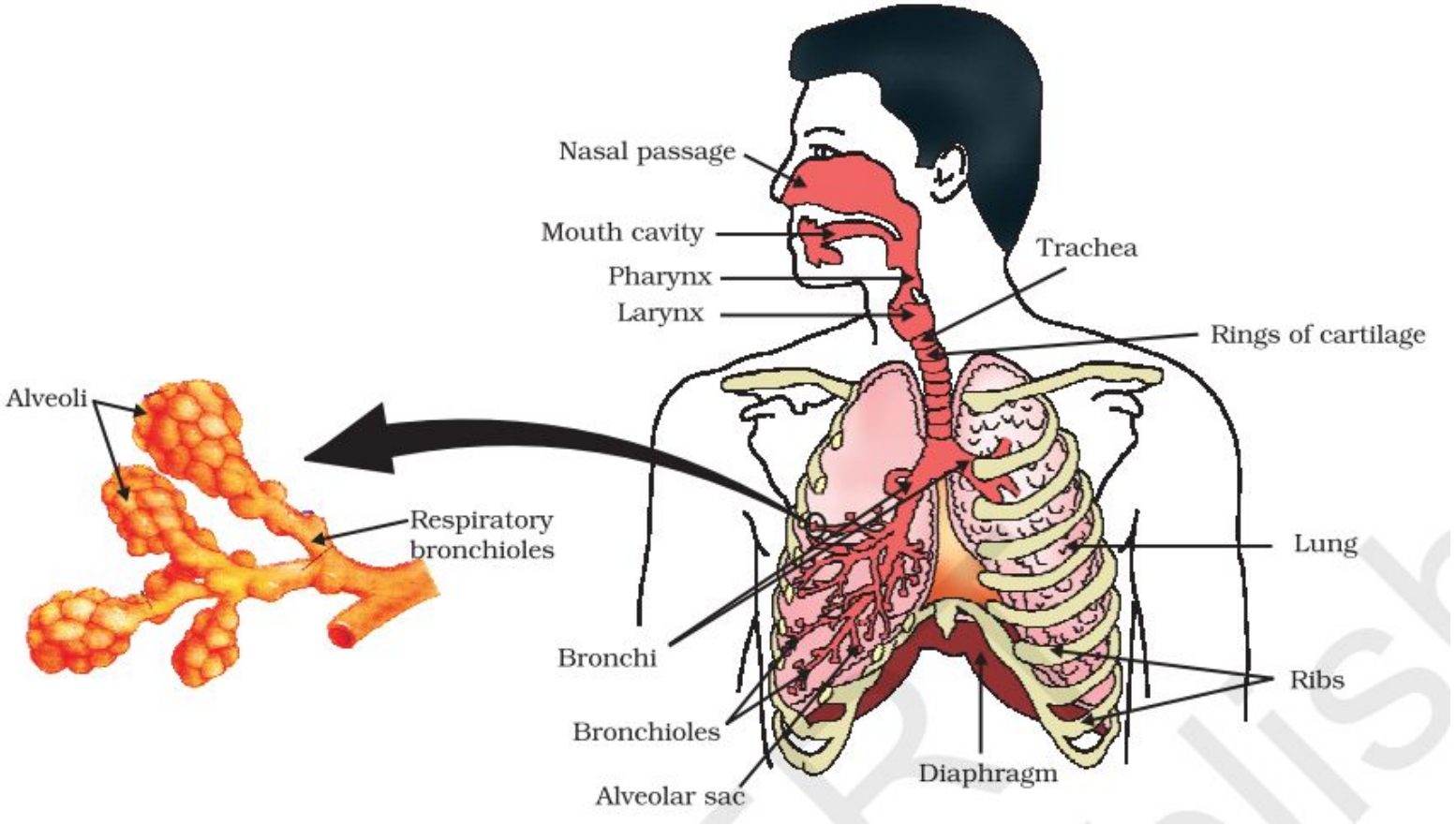
- Breathing
- Transport & Exchange of Gases

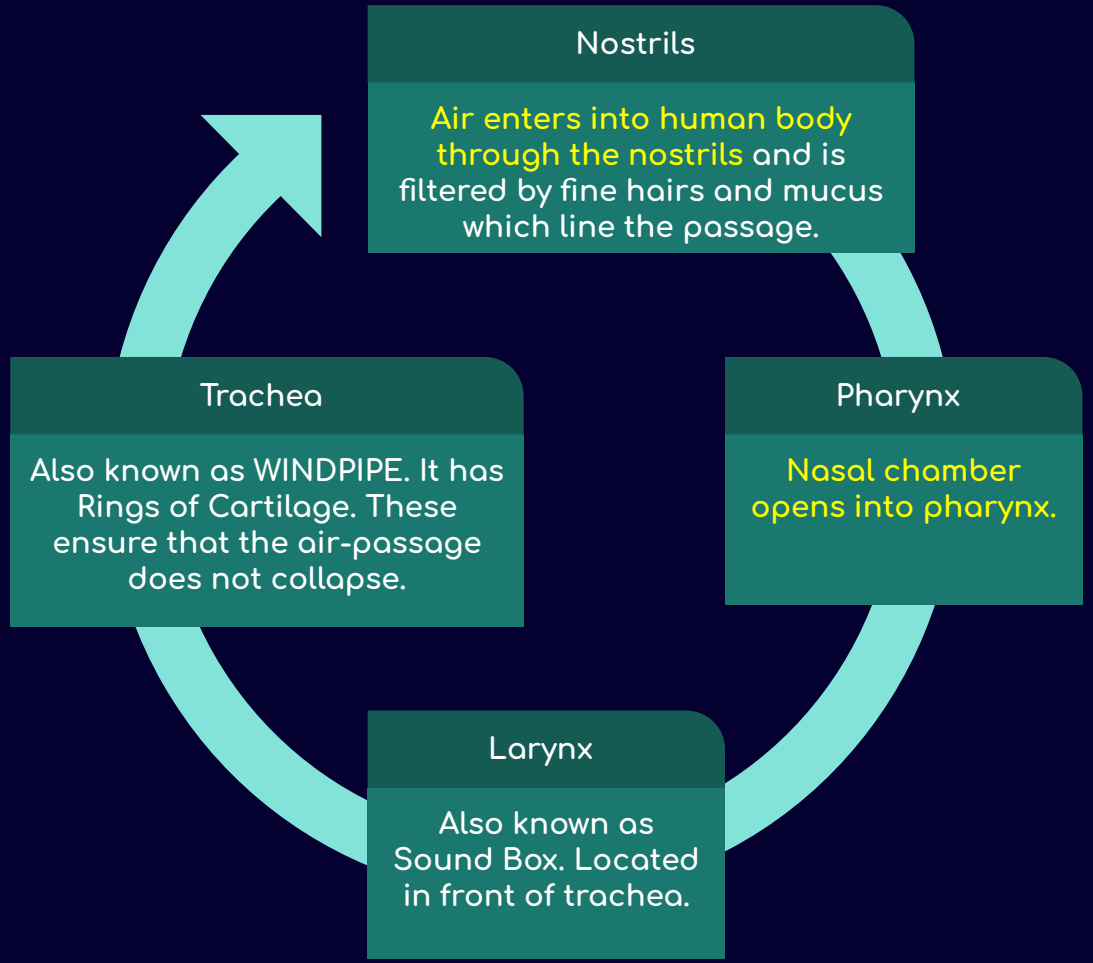
Breathing:

It is the movement of air into and out of the lungs.

In one breathing cycle, following processes happen:

1. Inhalation
2. Exhalation


Nasal passage
Mouth cavity
Pharynx
Larynx
Trachea
Rings of cartilage
Alveoli
Respiratory bronchioles
Lung
Bronchi
Ribs
Bronchioles
Alveolar sac
Diaphragm


Nostrils
Air enters into human body through the nostrils and is filtered by fine hairs and mucus which line the passage.
Pharynx
Nasal chamber opens into pharynx.
Larynx
Also known as Sound Box. Located in front of trachea.
Trachea
Also known as WINDPIPE. It has Rings of Cartilage. These ensure that the air-passage does not collapse.

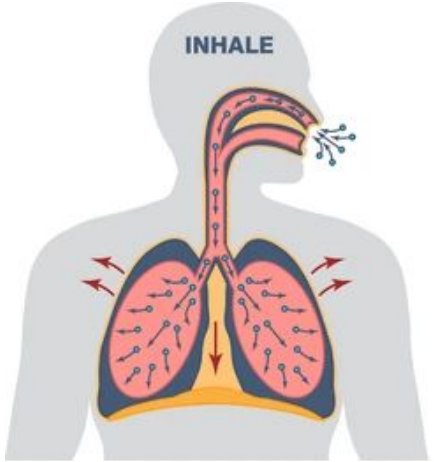
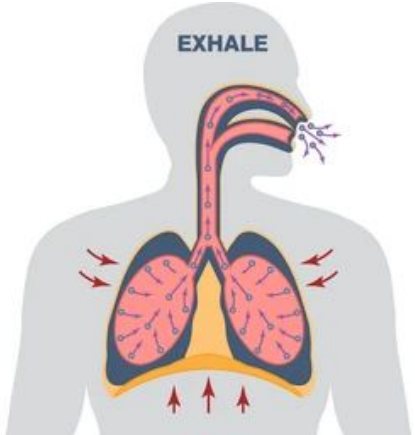


Diagram flattens due to contraction of muscle fibres and thoracic cavity increases



Diaphragm relaxes and thus the volume of the thoracic cavity decreases.

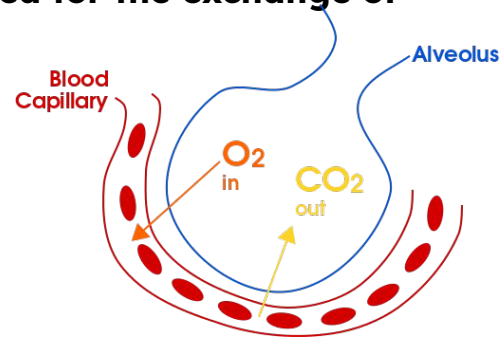
WHERE DOES EXCHANGE OF GASES HAPPEN?

- Each bronchus divides in the lungs to form a large number of still smaller tubes called ‘bronchioles’ which have pouch like structures at the end known as ALVEOLI.

- **ALVEOLI ARE THE SITES OF GASEOUS EXCHANGE**

- The walls of alveoli are very thin and they are surrounded by very thin blood capillaries.

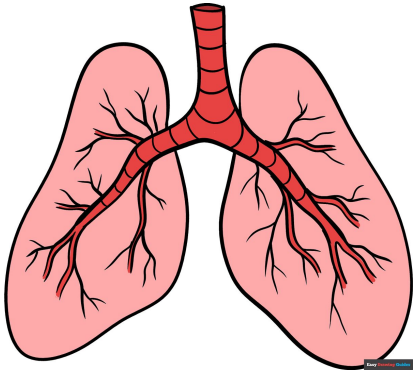
- There are millions of alveoli in the lungs. The presence of millions of alveoli in the lungs provides a very large area for the exchange of gases.

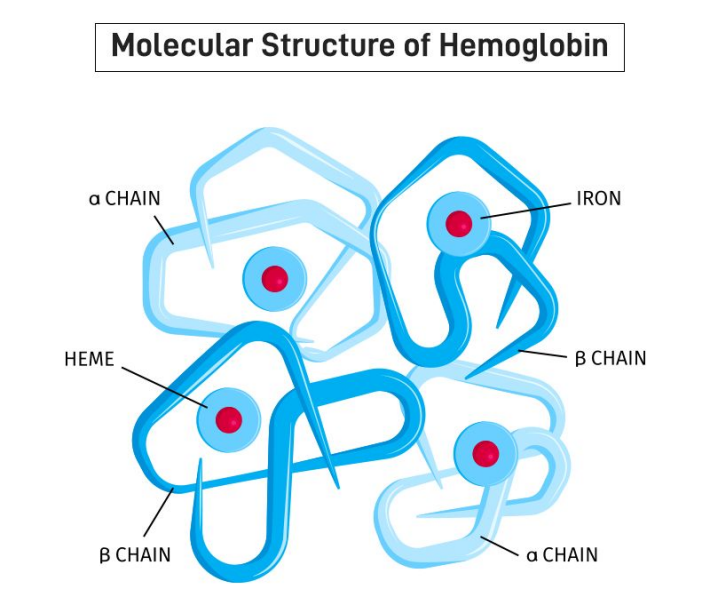


DO LUNGS EVER COLLAPSE?

Normally, no!

During the breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.

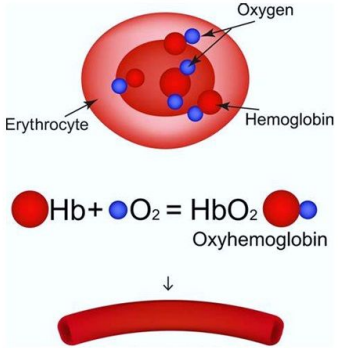


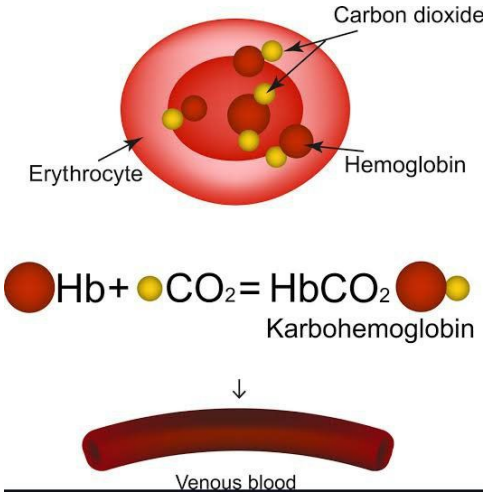


Haemoglobin

- When the body size of animals is large, the diffusion pressure alone cannot take care of oxygen delivery to all parts of the body.
- Instead, **respiratory pigments take up oxygen from the air in the lungs and carry it to tissues which are deficient in oxygen before releasing it.**
- In human beings, the respiratory pigment is haemoglobin which has a very high affinity for oxygen.
- This pigment is present in the red blood corpuscles. Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported in the dissolved form in our blood.

Hemoglobin carrying Oxygen in Blood






Thank You!