CH- 6, LIFE PROCESS

CLASS NOTES

What is Life Processes

- **Certain vital processes that maintain homeostasis and proper functioning of the body, they are called life processes.**
- **These processes continue to occur even when we are sleeping or not performing any action.**
- **These processes are essential for all living organisms including plants and animals.**
- **These life processes are nutrition, photosynthesis, transportation, metabolism, respiration, reproduction and excretion**

Nutrition

- **Food contains different kinds of substances.**
- **The process of acquiring food that is needed for nourishment and sustenance of the organism is called nutrition.**
- **Nutrition is of two types-**
  - Autotrophic
  - Heterotrophic

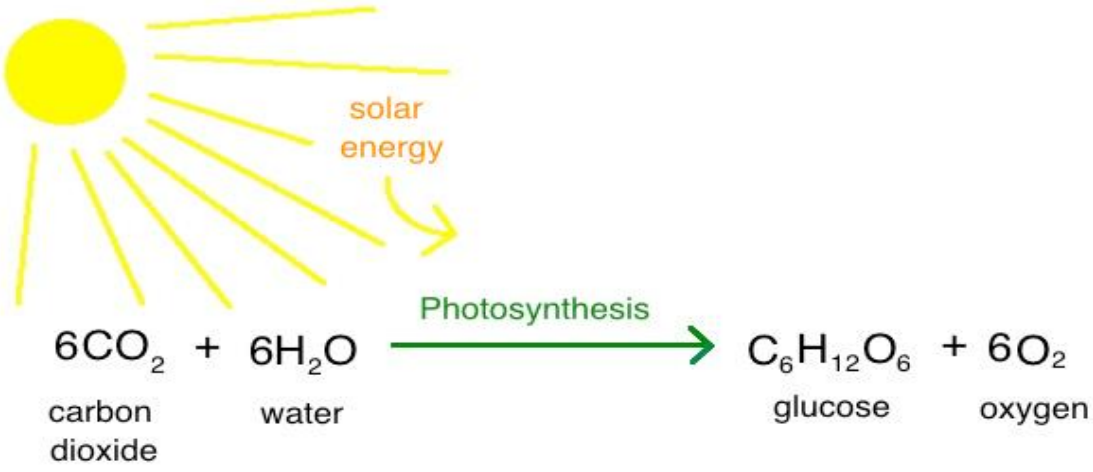
Autotrophic Nutrition

❖ **If an organism can nourish itself by making its own food using sunlight or chemicals such mode of nutrition is called as autotrophic nutrition.**

- **Plants photosynthesize (use light energy) and are called photoautotrophs.**
- **Few bacteria use chemicals to derive energy and are called chemoautotrophs.**

❖ Photosynthesis

- **Photosynthesis is an important process by which food is formed.**
- **The plants make food using sunlight and water, which provides nourishment to other organism and themselves.**
- **Chlorophyll present in the green parts absorbs light energy.**
- **This light energy is used to split water into hydrogen and oxygen.**
- **Hydrogen is then used to reduce carbon dioxide into carbohydrates, typically glucose.**
- **So The Reaction Will be….**



➢

❑ Process?

(i) **Absorption of light energy by chlorophyll.**

(ii) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.

(ii) Reduction of carbon dioxide to carbohydrates.

❑ Stomata

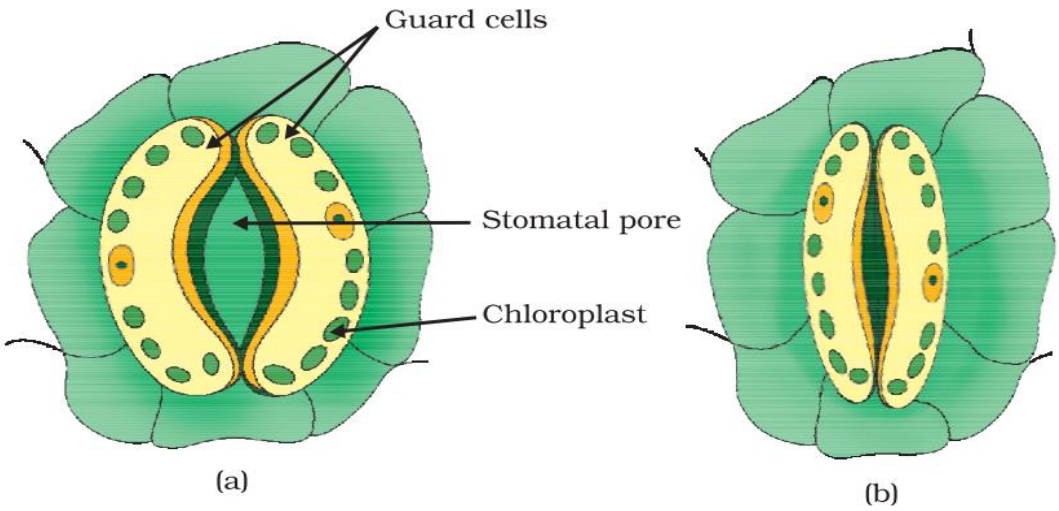


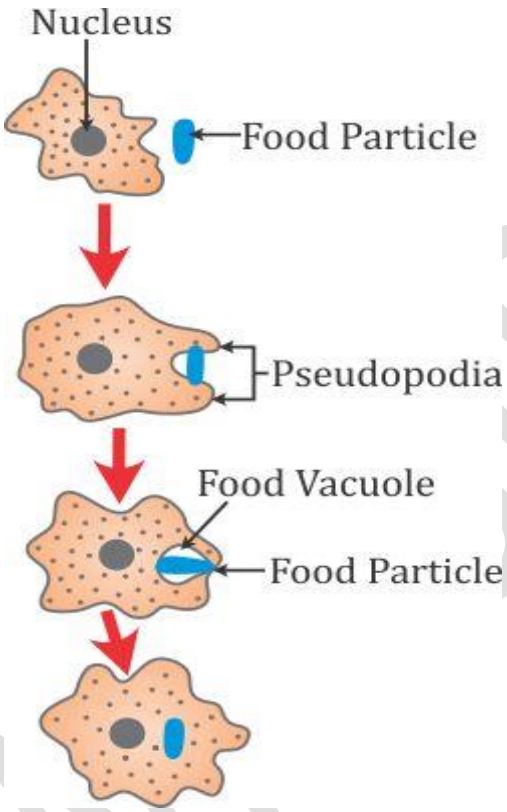
Figure 6.3 *(a) Open and (b) closed stomatal pore*

- **Stomata are pores on the leaves that help in the exchange of gases.**
- **They are mostly found on the underside of the leaf.**
- **Each stoma is guarded by guard cells, which control the opening and closing of the pore.**
- **The water content of the guard cells is responsible for their function.**

Heterotrophic Nutrition

❑ Mode of Nutrition in Amoeba

- **Amoeba feeds by holozoic mode of nutrition.**
- **It involves the ingestion, digestion and egestion of food material.**



❖ Process?

- **It engulfs the food particle using pseudopodia, the process is called phagocytosis.**
- **The engulfed food gets enclosed in a food vacuole.**
- **As the food vacuole passes through the cytoplasm, digestion, absorption and assimilation take place.**
- **When the food vacuole opens to outside, the egestion of undigested food takes place.**

❑ Saprophytic Nutrition

- **A mode of nutrition in which organisms obtain nutrition from dead and decaying matters is called the Saprotrophic Nutrition.**
- **Eg. Fungus**

❑ Parasitic Nutrition

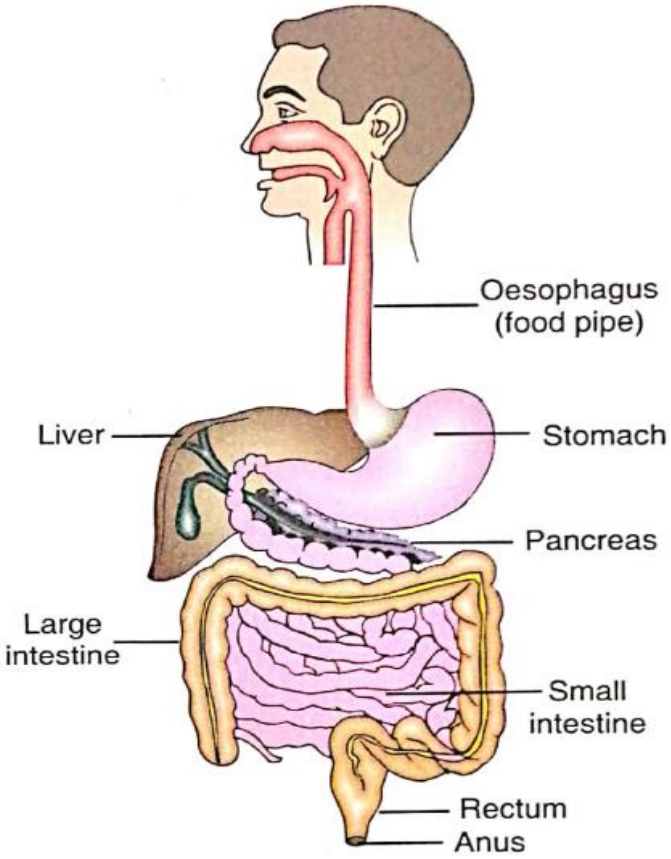
- **Parasitic Nutrition refers to heterotrophic nutrition, in which parasites depend on other living organisms for their food and may herm them in the process. Eg- Cuscuta**

❑ Nutrition in Paramoecium

- **Paramoecium also exhibits holozoic nutrition**
- **However, they have cilia that help them to engulf the food through the oral groove.**

Digestion along Alimentary Canal

- **Food contains different kinds of substances. These substances are not in the same form as needed by our body. They need to be converted into soluble particles.**
- **The process of breaking down, or conversion, of food into very fine and soluble particles, is called digestion.**



Digestive System

The Mouth (Oral cavity).

- **It contains teeth, tongue and salivary glands. The process of digestion begins in the mouth.**

❖ The Teeth

- **Teeth are used to bite off large pieces of food. They then crush, and grind, the food into smaller pieces.**

❖ The Salivary Glands

- **There are three pairs of salivary glands in our mouth.**
- **They produce a watery fluid, called the saliva.**

- **It helps to moisten and soften the food so that it can be easily swallowed.**
- **The saliva contains an enzyme called salivary amylase that breaks down starch which is a complex molecule to give simple sugar.**

❖ Tongue

- **The tongue helps us—**
  - **to know the taste of food (salty, bitter, sour or sweet).**
  - **in swallowing the food.**
  - **in mixing the food with the saliva produced by salivary glands.**
    - **in our speech.**

The Food Pipe(oesophagus)

- **It is the connecting tube between the mouth, and the stomach.**
- **It acts as a passage for the food to slide down from the mouth, to a stomach.**
- **The contraction of its muscles is responsible for pushing the food down into the stomach this process is called peristaltic movements.**

The Stomach

- **In Stomach, the food is churned and changed into a paste-like substance.**

- **In the stomach, the food gets mixed with the gastric juice, secreted by the gastric glands of the stomach.**
- **Gastric juice helps in the digestion of food.**

❑ The Gastric Juice

- **The juice is secreted by the gastric glands present in the wall of the stomach.**
- **These are the combination of Hydrochloric acid (HCl), a protein digesting enzyme called Pepsin, and Mucus.**
- **The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin.**
- **Pepsin digests Protein**
- **The mucus protects the inner lining of the stomach from the action of the acid under normal conditions.**

How Small Intestine works

- **The small intestine is the longest part of the digestive system.**
- **The food gets mixed, with the bile juice and the pancreatic juice, in the small intestine. Both these juices help in digestion. The small intestine absorbs nutrients from the digested food and takes them to all the cells of the body, through the blood capillaries.**

How ?

- **With the help of finger like structure called villi.**
- **All the digested nutrients are absorbed by the long finger-like projections present in the ileum of the small intestine.**

- Villi increase the internal surface area of the intestinal walls making available a greater surface area for absorption.
- The villi are richly supplied with blood vessels which take the absorbed food to each and every cell of the body.

Liver

- The liver is our body's largest gland.
- It secretes a brownish-green fluid, called the bile juice.

Pancreas

- The pancreas secretes the pancreatic juice
- It contains certain enzymes that help in the digestion of food.

Digestive Juices

- Pancreatic juice, bile and intestinal juice (succus entericus) are collectively called digestive juices.

Bile Juice

- In the duodenum, the acidity of chyme is turned to alkalinity by the action of bile coming from the liver. This is necessary for pancreatic enzyme action.
- Bile also emulsifies the fats into smaller globules.

Pancreatic Juice

- Pancreatic juice which contains enzymes like trypsin for digesting proteins and lipase for breaking down emulsified fats.

❑ Intestinal juice

- The walls of the small intestine contain glands which secrete intestinal juice.
- The enzymes present in it finally convert the

  Proteins ---- Amino acids,

  Complex Carbohydrates ---- Glucose

  Fats --- Fatty acids and Glycerol.

Mouth	Salivary Amylase	Starch
Gastric Juice	HCl & Pepsin	Protein Digestion
Bile Juice		Fats
Pancreatic Juice	Trypsin & Lipase	Proteins & Fat
Intestinal juice		Proteins Carbohydrates Fats

Large Intestine

- It is usually one and a half meter long and 7 cm in diameter. Unlike the small intestine, the large intestine is wider and shorter,

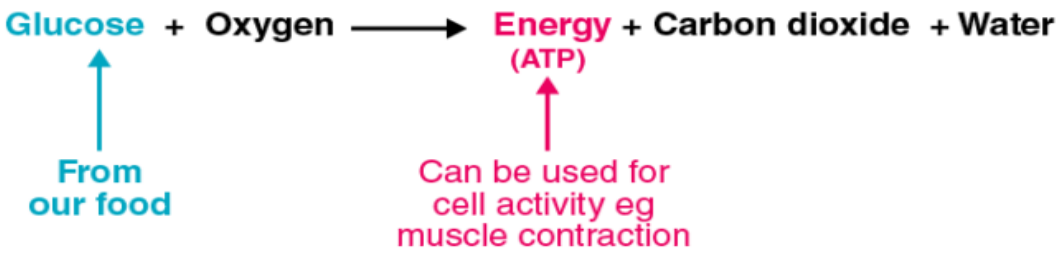
  The large intestine helps in absorption of water from the undigested food which is then pushed out as waste.

What roll does the anus play in the digestive system?

- **Through Anus the undigested, semi-solid waste product, is eliminated from the body.**

The Respiration

- **During this process energy is release.**
- **How?**



Steps of Cellular respiration:

- **Breaking down of glucose into pyruvate:** This step happens in the cytoplasm. Glucose molecule is broken down into pyruvic acid. Glucose molecule is composed of 6 carbon atoms, while pyruvic acid is composed of 3 carbon atoms.
- **Glucose (6 carbon molecule) → Pyruvate (3 carbon molecules) + Energy**
- **Fate of Pyruvic Acid:** Further breaking down of pyruvic acid takes place in mitochondria and the molecules formed depend on the type of respiration in a particular organism. Respiration is of two types, viz. aerobic respiration and anaerobic respiration.

- **Pyruvate (In yeast, lack of O2) → Ethyl alcohol + Carbon dioxide + Energy**
- **Pyruvate (In mitochondria; the presence of O2) → Carbon dioxide + Water + Energy**

Respiration involves

- Gaseous exchange: Intake of oxygen from the atmosphere and release of CO_2 → Breathing.
- **Breakdown of simple food in order to release energy inside the cell → Cellular respiration**

$C_6H_{12}O_6$ → Pyruvate ^{O2} → $Co_2 + H_2O$ + Energy

Types of Respiration

- Aerobic respiration
- Anaerobic respiration

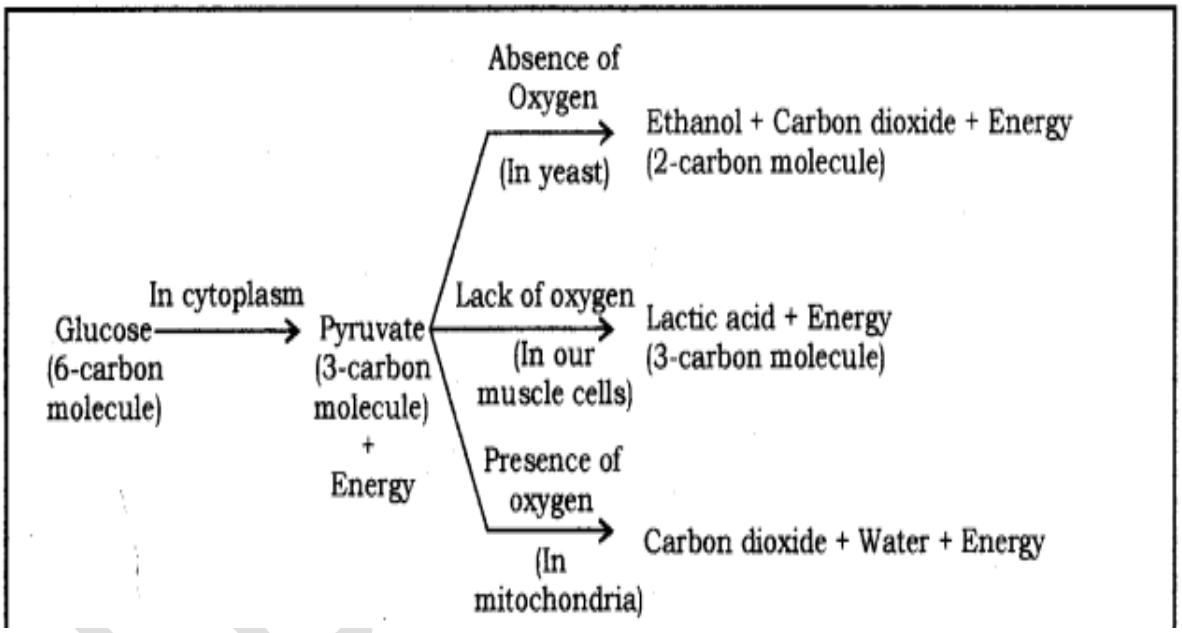
❖ Aerobic respiration

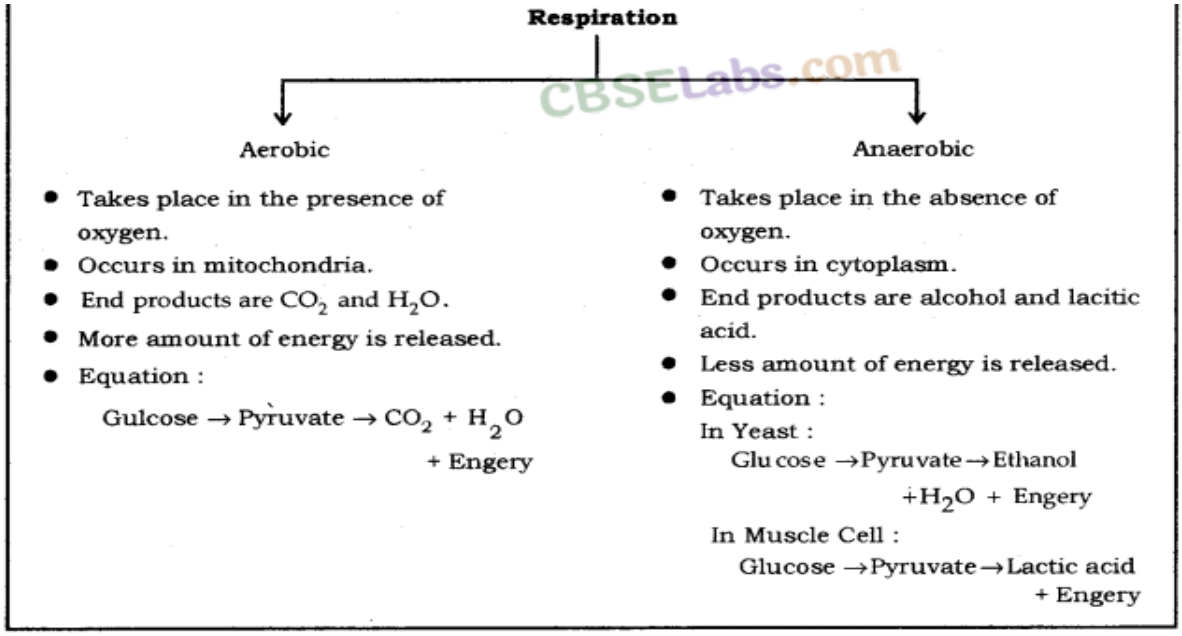
- The type of respiration happens in the presence of oxygen.
- Pyruvic acid is converted into carbon dioxide. Energy is released and water molecule is also formed at the end of this process.
- **Glucose → Pyruvate ^{O2} → $Co_2 + H_2O$ + Energy**

❖ Anaerobic Respiration

- This type of respiration happens in the absence of oxygen.

- Pyruvic acid is either converted into ethyl alcohol or lactic acid.
- Ethyl alcohol is usually formed in case of anaerobic respiration in microbes, like yeast or bacteria.
- **Pyruvate (In yeast, lack of O2) → Ethyl alcohol + Carbon dioxide + Energy**
- **Lactic acid is formed in some microbes as well as in the muscle cells.**
- **Pyruvate (In muscles, lack of O2) → Lactic Acid + Energy.**

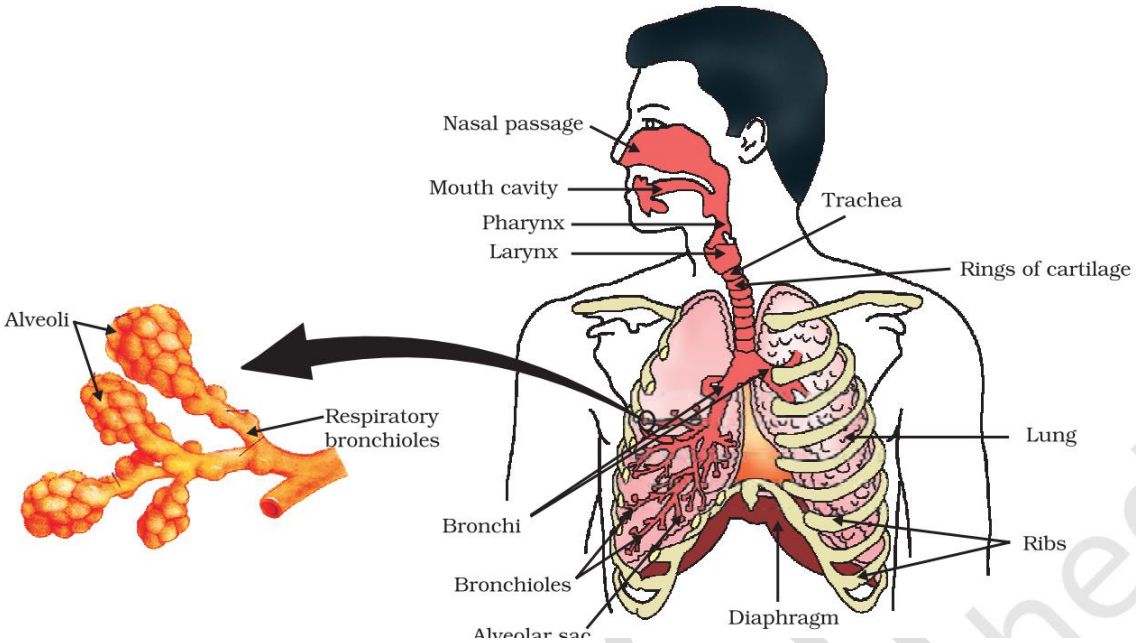




❑ Why Pain in leg muscles while running or working too much?

- **This happens because of anaerobic respiration taking place in the muscles.**
- **During running, the energy demand from the muscle cells increases. This is compensated by anaerobic respiration and lactic acid is formed in the process.**
- **The deposition of lactic acid causes pain in the leg muscles. The pain subsides after taking rest for some time.**

The Human Respiratory System



Nasal Cavity helps

- Air enters the nostrils through the nasal cavity.
- The hair, present in the nostrils, stop the dust and germs, from entering the respiratory system thus it also helps in filtration of the inhaled air.

Pharynx

- The air from nasal cavity leads into an organ called the pharynx.

Larynx

- The larynx produces sound and is also called the voice box

Epiglottis

- The opening of pharynx, into the larynx, is guarded by epiglottis.

- This valve closes this opening when we take in the food; it keeps it open during breathing.

Trachea

- The Trachea is a delicate muscular tube, situated in front of the food pipe, in the neck.
- It is about 12 cm in length and 2.5 cm in diameter.
- The Trachea gets divided into two parts, called bronchi, as it enters the lungs, in the chest cavity.

Bronchi

- A pair of bronchi comes out from the trachea, with one bronchus going to each lung.

Bronchioles

- A bronchus divides into branches and sub-branches inside the lung.

How does our lungs functions?

Alveoli

- Lungs contain a number of air sacs called alveoli and blood vessels.
- When air enters the lungs, the blood vessels, around the alveoli, take in oxygen and give out carbon dioxide and.
- Oxygen is carried by the blood to different parts of the body.
- In return, carbon dioxide enter the lungs and are thrown out through the nose.

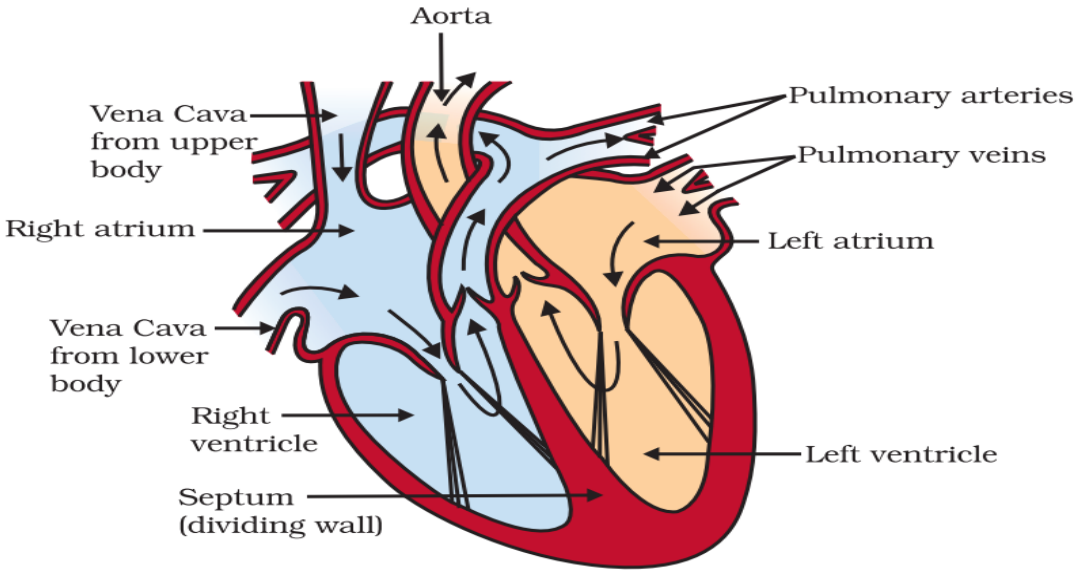
Diaphragm

- Lungs cannot move by themselves.
- Movement of a diaphragm, and the muscles, between the ribs of the chest wall, that causes the expansion and contraction of the lungs. Thus, breathing takes place.

Transportation in Human Beings

Heart

- Structure
- The heart is located, slightly towards the left, in the chest.
- The heart is divided into two equal halves—left half and right half and they are further divided into two chambers.
- Thus heart has four chambers in all.

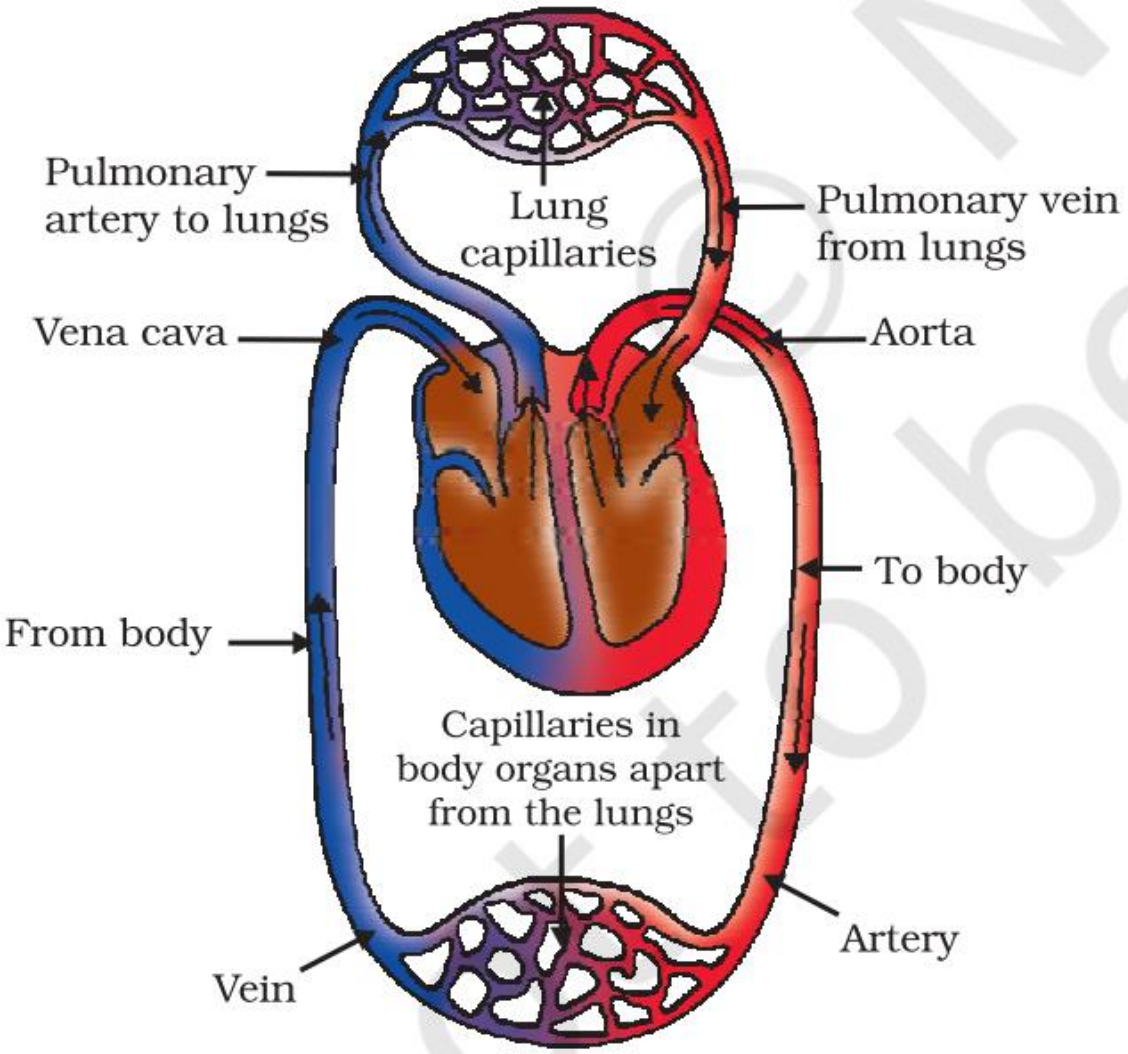


- The upper two chambers are called auricles, or atriums and the lower two chambers are called ventricles.
- Function

- **Left atrium, and left ventricle, contain oxygen rich blood. The right auricle (atrium), and the right ventricle, contain blood having carbon dioxide in it.**
- **The main function of the heart is to pump blood and keep it moving in the blood .**

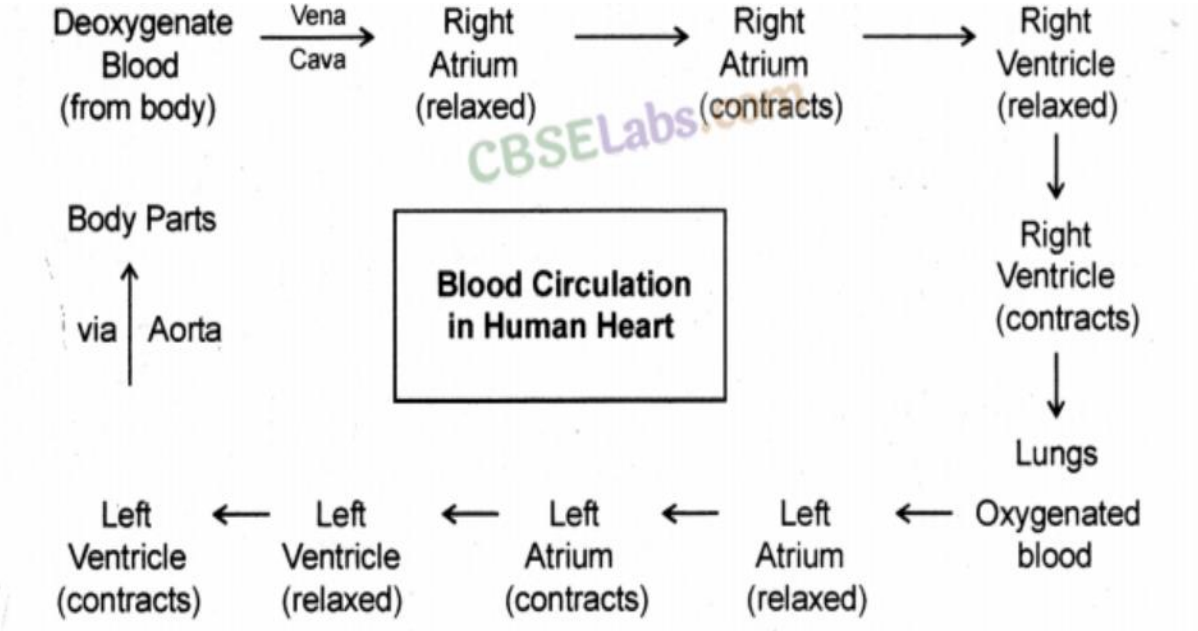
Double Circulation

- **Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium.**
- **The left atrium relaxes when it is collecting this blood**
- **It then contracts, while the next chamber, the left ventricle, relaxes, so that the blood is transferred to it.**
- **When the left ventricle contracts in its turn, the blood is pumped out to the body.**
- **De-oxygenated blood comes from the body to the upper chamber on the right, the right atrium, as it relaxes.**
- **As the right atrium contracts, the corresponding lower chamber, the right ventricle, dilates.**
- **This transfers blood to the right ventricle, which in turn pumps it to the lungs for oxygenation.**



❑ So what is double circulation?

- **In the human heart, blood passes through the heart twice in one cardiac cycle. This type of circulation is called double circulation. One complete heartbeat in which all the chambers of the heart contract and relax once is called cardiac cycle.**



Blood Vessels

- **Blood vessels are the system of tubes through which the Blood moves around, in the body**

Arteries

- **The vessels, which take blood away from the heart, to various parts of the body, are called arteries**
- **Generally, arteries carry oxygen-rich blood**
- **Arteries are elastic and thick-walled and are deep-seated.**

veins

- **The vessels, bringing blood back to the heart, from different parts of the body are called veins.**
- **the veins carry blood having carbon dioxide in it.**
- **The veins are thin-walled and superficial as they are located just under the skin.**

the Capillaries.

- These tiny blood vessels have thin walls. Oxygen and nutrients from the blood can move through the walls.

Explain Blood and how it is important to us?

- Blood is a thick red fluid containing Red Blood Cells (RBCs), White Blood Cells (WBCs), plasma and blood platelets.
- The functions of the blood are to:
- transport oxygen, food materials and hormones to all parts of the body.
- take back carbon dioxide, from all parts of the body, to the lungs.
- protect the body from diseases and other infections.
- help to maintain the body at a constant temperature

Blood Pressure

- The force that blood exerts against the wall of a vessel is called blood pressure.

Differences between arteries and veins

Artery	Vein
Carries blood away from heart	Carries blood toward heart
Blood under high pressure	Blood under low pressure
Thick walls	Thin walls
Pulse flow	Smooth flow
Narrow lumen	Large lumen
No valves	Valves present
Blood rich in oxygen (except pulmonary artery)	Blood poor in oxygen (except pulmonary veins)

Maintenance by platelets.

- When the injury happens to stop the continuous blood flow the blood has platelet cells which circulate around the body and plug these leaks by helping to clot the blood at these points of injury.

Lymph

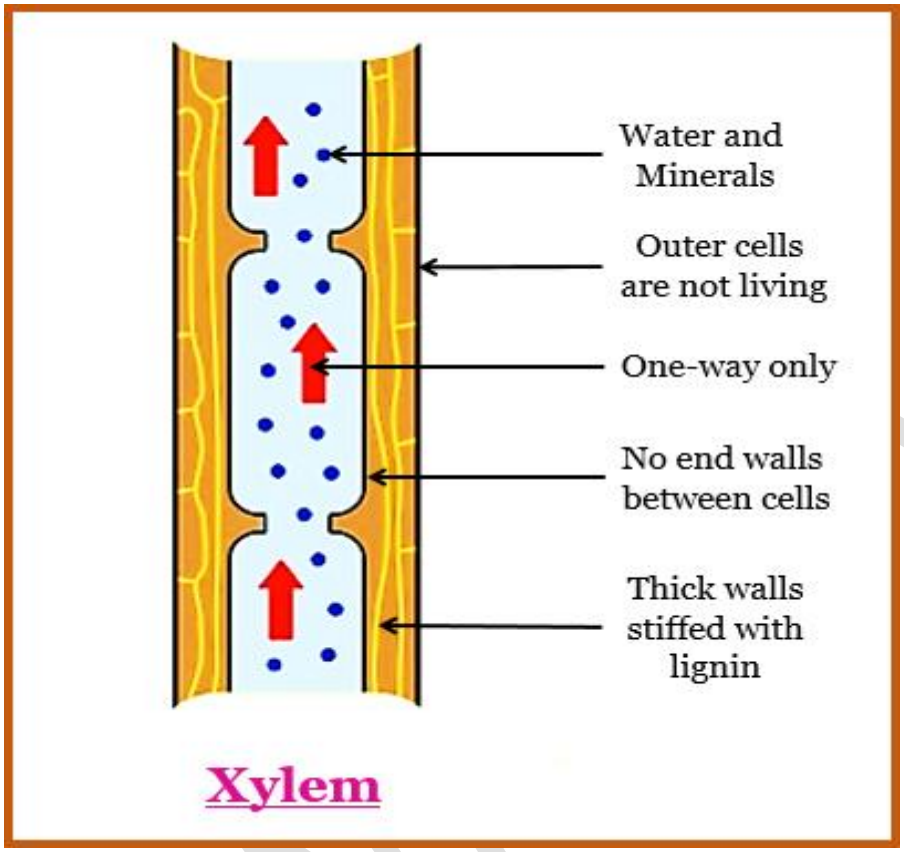
- Through the pores present in the walls of capillaries some amount of plasma, proteins and blood cells escape into intercellular spaces in the tissues to form the tissue fluid or lymph.
- Lymph drains into lymphatic capillaries from the intercellular spaces, which join to form large lymph vessels that finally open into larger veins.
- Lymph carries digested and absorbed fat from intestine and drains excess fluid from extra cellular space back into the blood.

Transportation in plants

Xylem

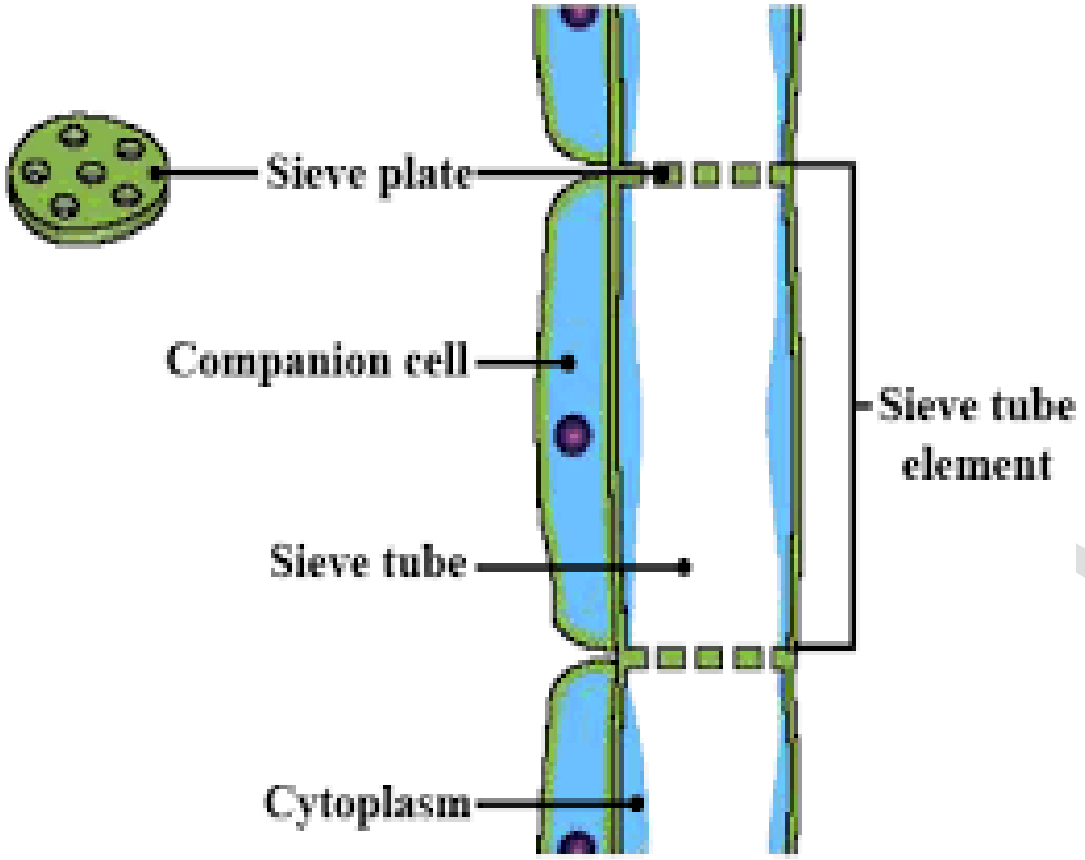
- Xylem is responsible for transportation of water and minerals.
- It is composed of trachids, xylem vessels. Tracheids and xylem vessels are the conducting elements.
- The xylem makes a continuous tube in plants which runs from roots to stem and right up to the veins of leaves.

- **Carry water and minerals from the leaves to the other part of the plant.**



Phloem:

- **Phloem is responsible for transportation of food. Phloem is composed of sieve tubes, companion cells, phloem parenchyma and bast fibers.**
- **Sieve tubes are the conducting elements in phloem.**
- **Carries product of photosynthesis from leaves to other part of the plant.**



Transport of water

- Water is absorbed by the roots and is transported by xylem to the upper parts of the plant.
- At the roots, the cells take up ions by an active process and this results in the difference of concentration of these ions.
- It leads to movement of water, in the root cells, by osmosis.
- This creates a continuous column of water that gets pushed upwards. This is root pressure.

While Transpiration

- Transpiration contributes to the upward movement of water by creating a straw effect.

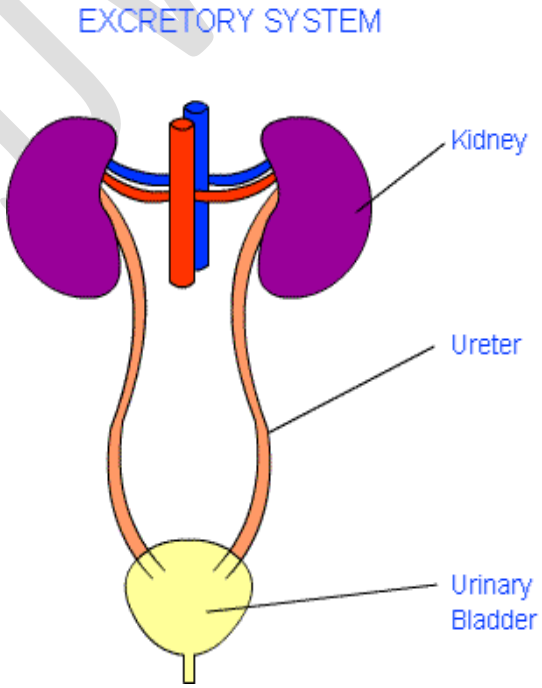
- It pulls the water column upwards as there is a continuous loss of water from leaves.

Transport of food and other substances

- Transport of food in the plant is through phloem.
- Material like sucrose is loaded from leaves to phloem using the energy of ATP.
- Due to this, movement of water from nearby cells into phloem tissue and the material gets transported through the phloem.

Human Excretory System

The excretory system is a combination of organs that helps to eliminate the Nitrogenous waste products of our body.



In unicellular organisms

- In unicellular organisms such as amoeba and bacteria, the waste product is removed by simple diffusion through the general body surface.

Excretory System of Humans

- Organisms like animals have an advanced and specialized system for excretion.

Kidneys

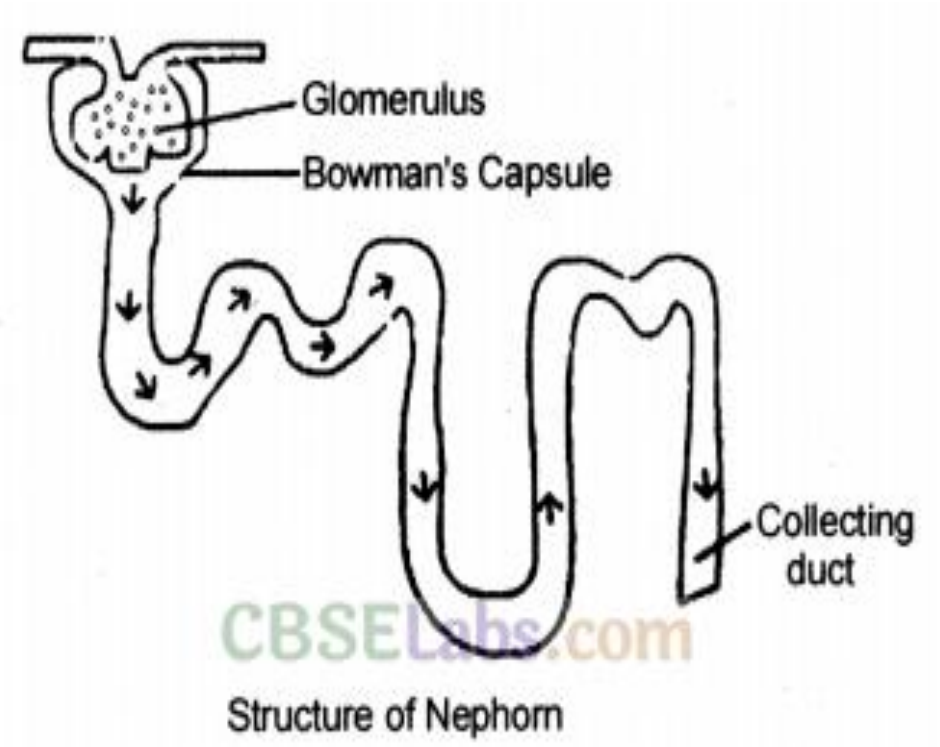
- Kidney is a bean-shaped organ which lies near the vertebral column in the abdominal cavity.
- They are basically the filtration units of the human body.
- Each kidney is made up of many tiny filtration units called nephrons.

Nephrons

- Each kidney has millions of nephrons and it forms the basic structural and functional unit of the kidney.

Structure

- It is made up of cup-like structure called Bowman's capsule which encloses a bunch of capillaries called glomerulus.
- Tubes from various nephrons converge into collecting duct, which finally goes to the ureter.



Structure of Nephorn

Function

- In Glomerular reason waste materials are filtered along with many other useful substances.
- In tubular reason useful substances from the filtrate are reabsorbed back by capillaries surrounding the nephron.
- Now finally Extra water, salts are secreted into the tubule which opens up into the collecting duct and then into the ureter.

Excretion in Plants

- Carbon dioxide, excess water produced during respiration and nitrogenous compounds produced during protein metabolism are the major excretory products in plants.

Through Stomata

- **Plants produce two gaseous waste products i.e. oxygen during photosynthesis and carbon dioxide during respiration.**
- **Excretion of gaseous waste in plants takes place through stomatal pores on leaves.**
- **Excess water is excreted by transpiration.**

Through barks, stems, leaves,

- **The gums, oils, latex, resins, etc. are some waste products stored in plant parts like barks, stems, leaves, etc.**
- **Eventually, plants shed off these parts.**