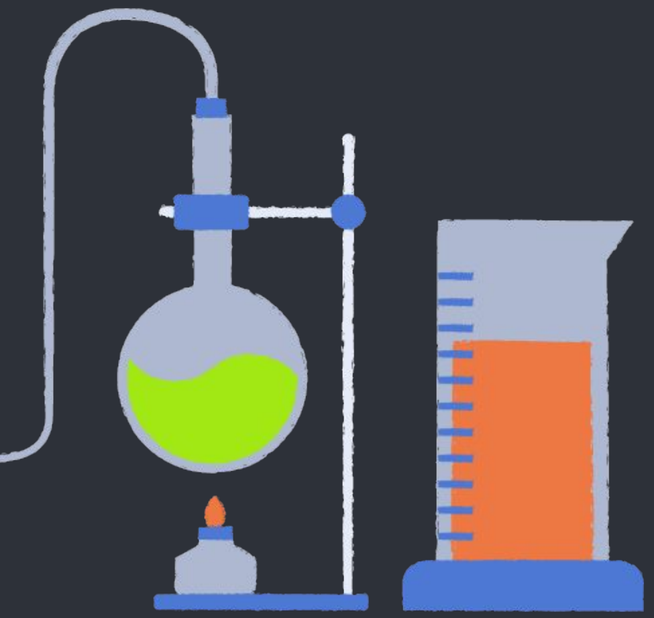
Class 10th One -Shot series

LIFE PROCESSES

BIOLOGY



Topics to be Covered

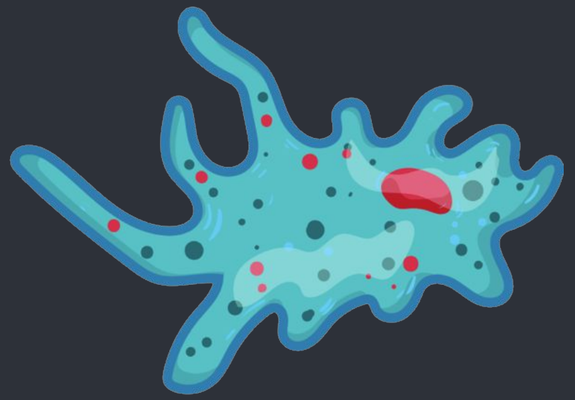
1. Nutrition
2. Respiration
3. Transportation
4. Excretion

What are Life Processes

The various basic functions performed by living organisms to maintain their life on this earth are called life processes.

The basic life processes common to all living organisms are are as follows:

1. Nutrition
2. Respiration
3. Transportation
4. Excretion



Amoeba - Unicellular

Human - Multicellular

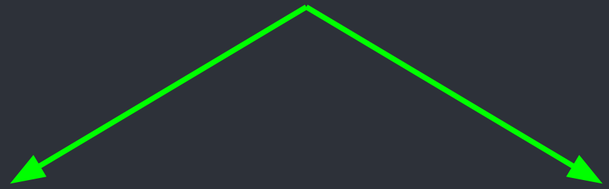
Plant - Multicellular

NUTRITION

The process by which a living organism obtain and utilise food is called Nutrition.

- Energy
- Growth and Development
- Repair of damaged tissue

Types of Nutrition



Autotrophic Nutrition

Organisms prepare their own food.

Heterotrophic Nutrition

Organisms are dependent on other organisms for their food.

Autotrophic Nutrition

1. Photosynthetic Autotrophic Nutrition

Ex - Green Plants

↓

Chlorophyll

(Blue - green algae)

Cyanobacteria

Photosynthesis

↓

Food

↓

Glucose

Autotrophic Nutrition

2. Chemosynthetic Autotrophic Nutrition

↓

Chemicals

Purple - Sulfur Bacteria

NH_4
NO_2
NO_3 → Chemical energy → Food

Heterotrophic Nutrition

1. Holozoic
2. Saprotrophic
3. Parasite

Holozoic nutrition

The organism feed by ingesting solid organic matter which is then digested and absorbed into their bodies.

They can be classified as:

- Herbivores
- Carnivores
- Omnivores

Saprotrophic nutrition

Feed on dead and decaying matter. Include bacteria and fungi which digest the food externally before the nutrients are absorbed.

e.g. Yeast, Bread mould, Mushroom, etc.

Parasite nutrition

Obtains nutrients from living organisms. The parasite obtains nutrients by living on (External parasite) or in (internal parasite) the body of the host.

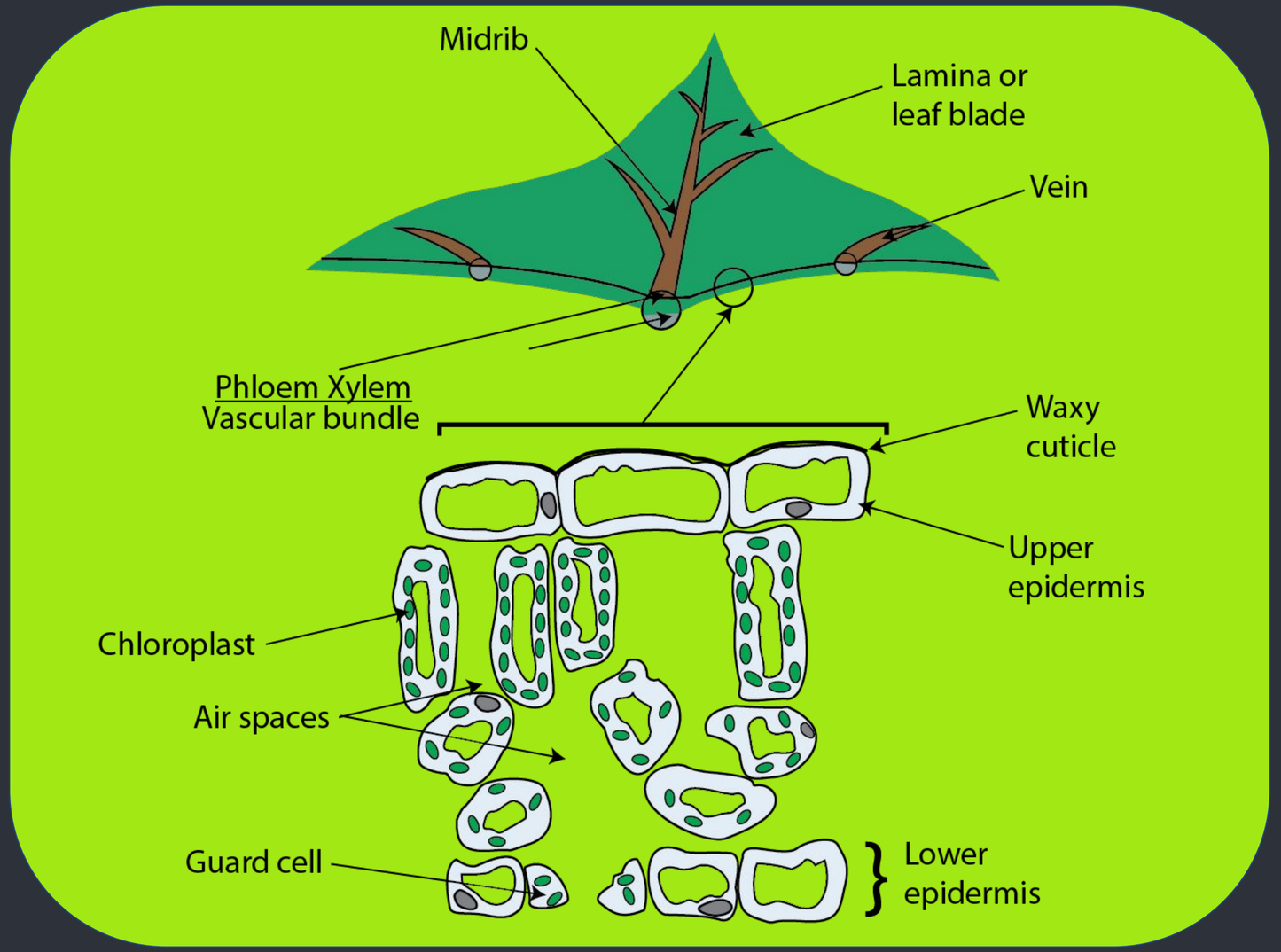
e.g. Lice, TIcIs, Leech, Tapeworm

Note - “Cuscuta” is a Parasitic plant because it lacks chlorophyll.

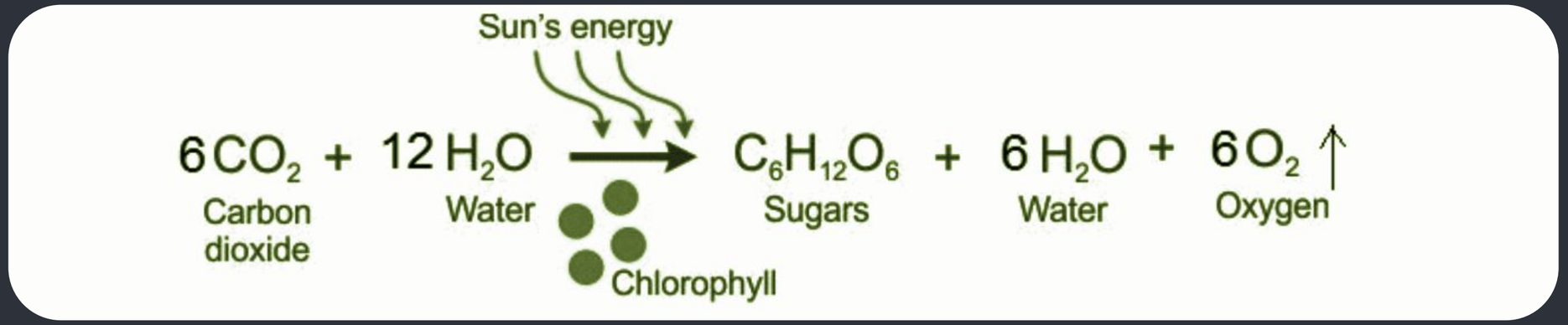
Autotrophic nutrition in Plants

1. Carbon dioxide (air)
2. Water (soil)
3. Light (sunlight)
4. Chlorophyll (chloroplast)

Cross-section of a leaf



Photosynthesis reaction



- Plants store glucose in form of Starch
- Humans store glucose in form of Glycogen

Photosynthesis reaction

1. Absorption of light energy by chlorophyll.

2. Conversion of light energy to chemical energy and splitting of water molecule into hydrogen and oxygen.

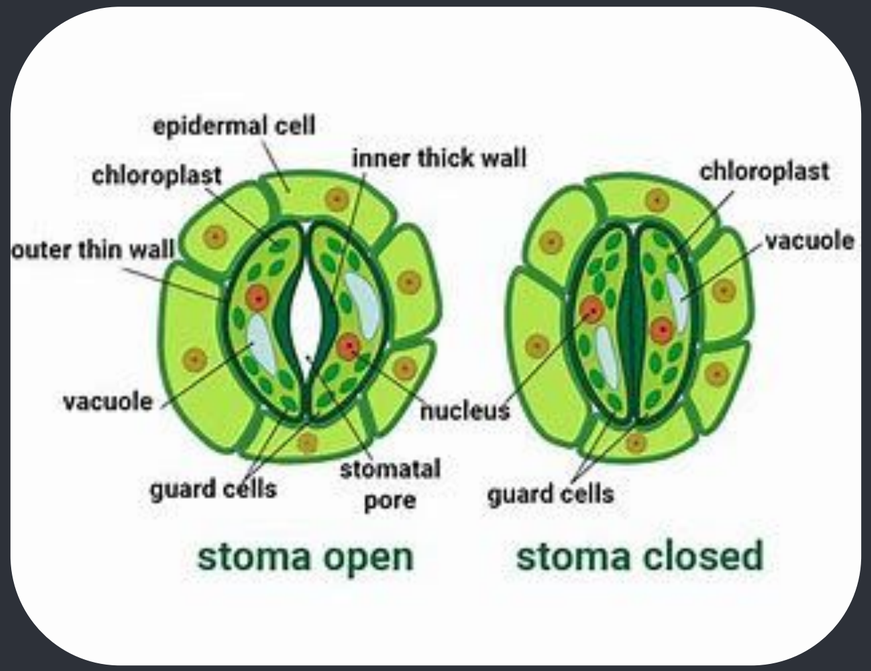
3. Reduction of carbon dioxide to carbohydrates.

Stomatal Pore

Stomata are tiny pore like structures present on surface of leaves.

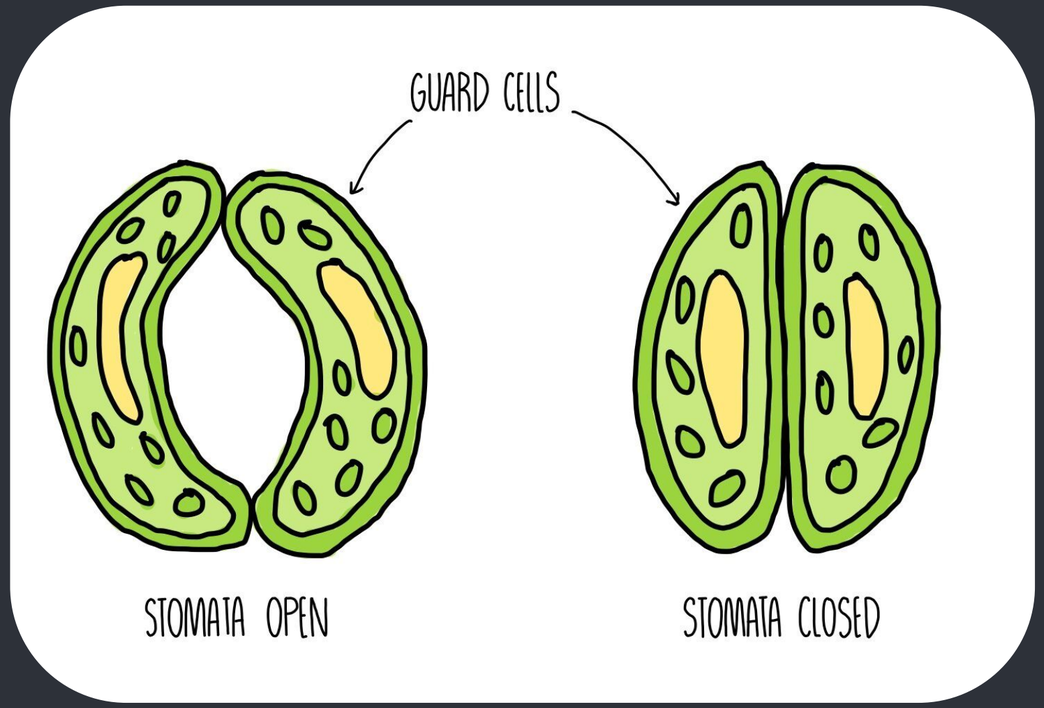
Functions of Stomata:

1. Transpiration
2. Exchange of gases during photosynthesis and respiration.



Opening and closing of Stomata

- Stomata opens on swelling (H_2O enters) of guard cells.
- Stomata closes on shrinking (H_2O Moves out) of guard cells.



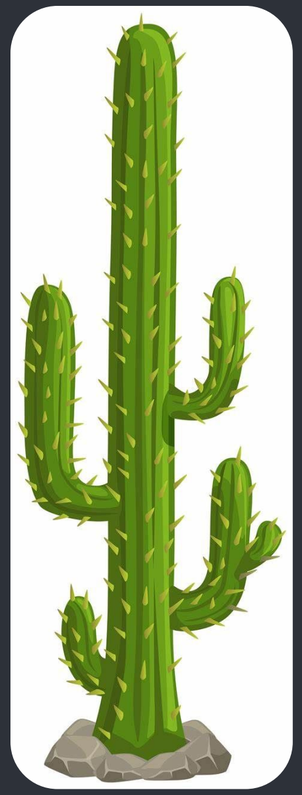
Photosynthesis in Desert plants

Night

Stomata opens

CO_2

H_2O



Day

Stomata closes

Food

Glucose

What happens to the food we eat?

Ingestion

↓

Digestion

↓

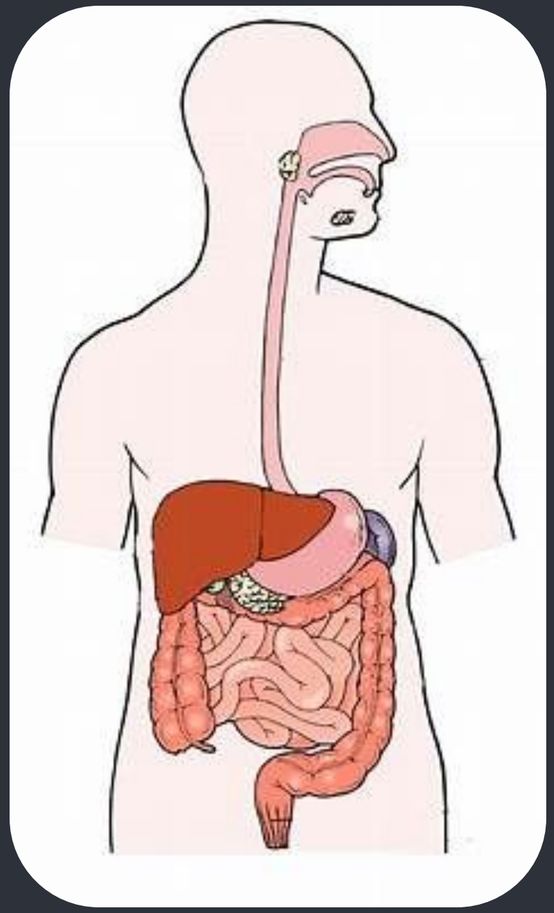
Absorption

↓

Assimilation

↓

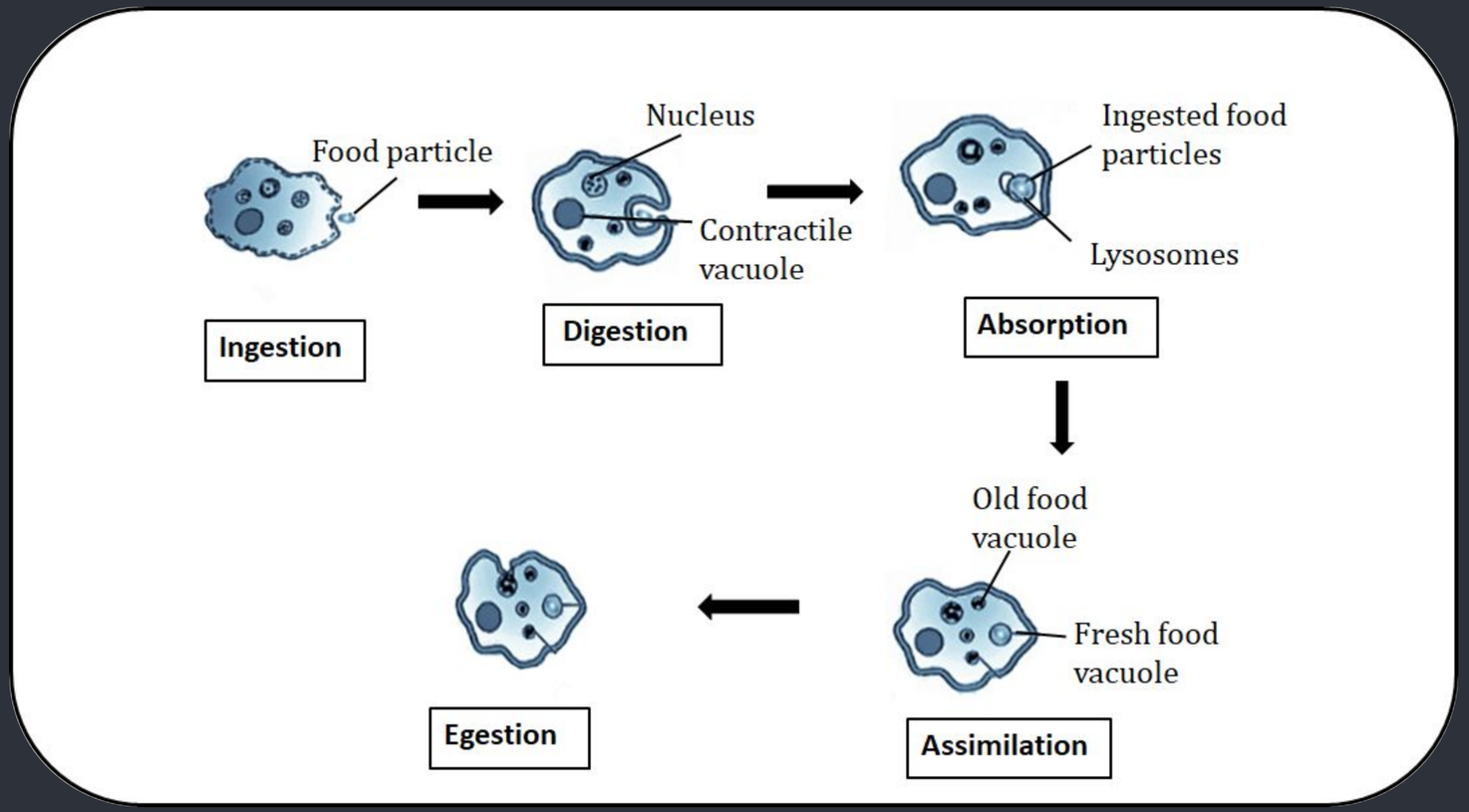
Egestion



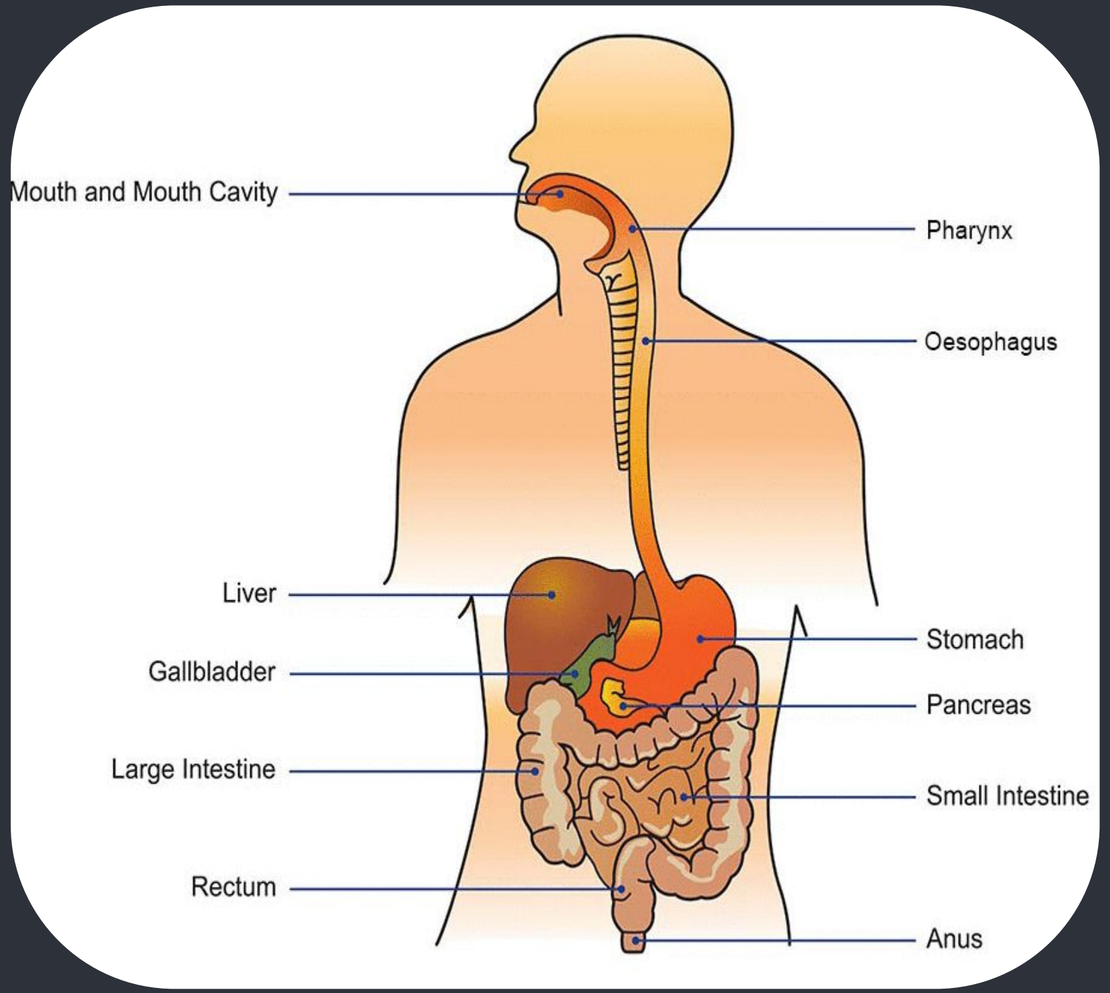
What happens to the food we eat?

- **Ingestion -** The process of taking in the food.
- **Digestion -** Breakdown of food into smaller components that can be absorbed into the bloodstream.
- **Absorption -** The process of absorption of digested food.
- **Assimilation -** Utilization of digested food for energy and for growth and repair.
- **Egestion -** Removing undigested food from the body.

Nutrition in Amoeba



Nutrition in Humans



Digestive System

- Alimentary Canal
- Associated Organs

- Alimentary Canal : A long hollow tube which contains organs through which the food actually passes (Oesophagus, stomach, small intestine, large intestine, etc.).

- Accessory Organs : Organs that helps in digestion but no food passes through them (liver, pancreas, salivary glands, etc.).

Mouth (Buccal cavity)

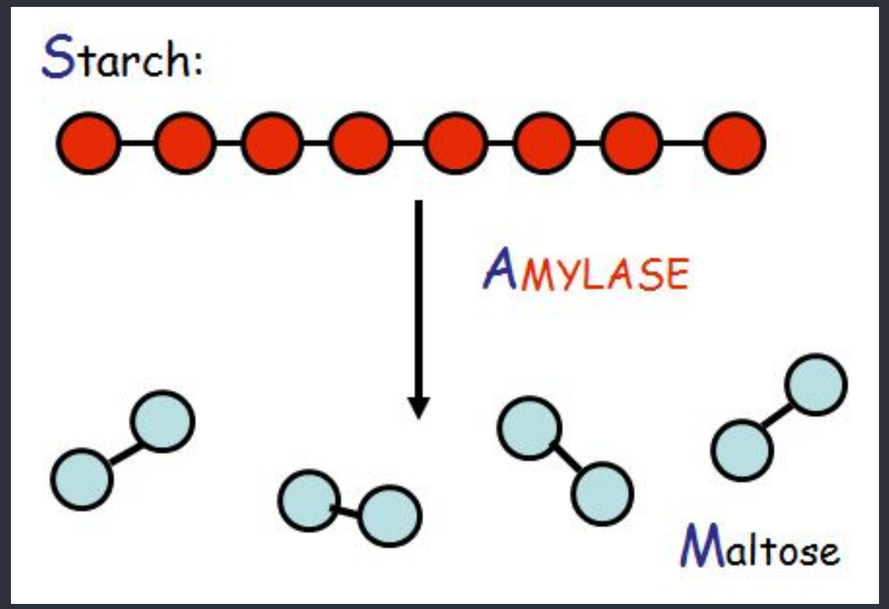
- Food is ingested.
- Crushed and chewed with the help of teeth.
- Food is wetted with saliva to make its passage smooth.
- Food is mixed with saliva with the help of muscular tongue.

Mouth (Buccal cavity)

Mouth → Salivary gland

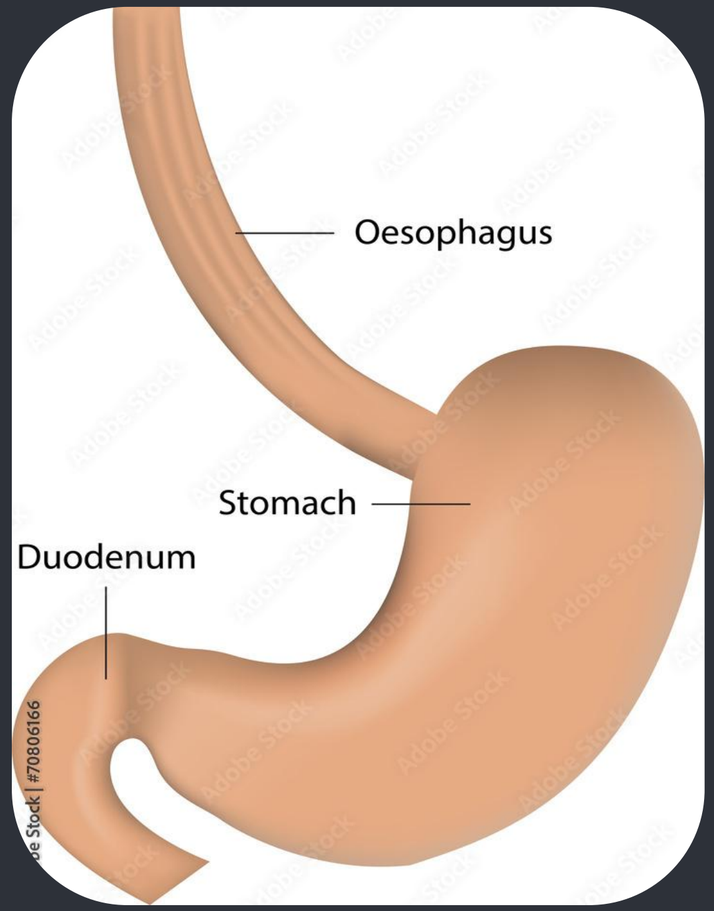
Saliva → Watery fluid

Complex sugar ←



→ Simple sugar

Oesophagus (Food pipe)



- Food is pushed downwards due to rhythmic contraction and relaxation of muscles and is known as peristaltic (involuntary) movements.

Stomach

- J-shaped organ
- Widest part of alimentary canal

• **Gastric juice composition and function:**

- **Water, electrolytes,**

- **hydrochloric acid**
- conversion of pepsinogen to pepsine
- bacteriostatic effect / antiseptic : kills bacteria

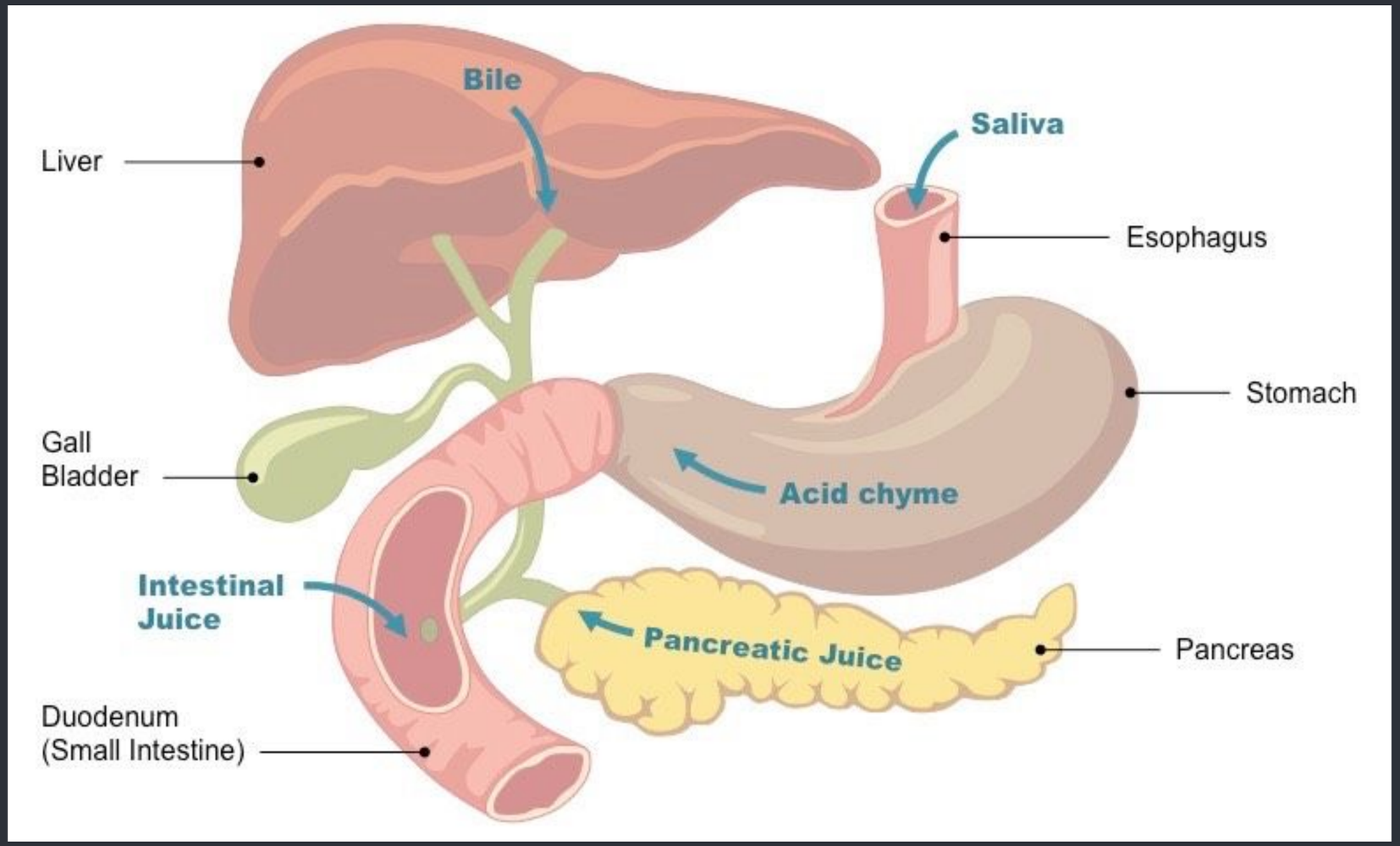
- **pepsin**
- protein digestion

- **mucus**

protective coating, lubricant. Protects from HCL and pepsin part of gastric mucosa

Imbalance between hydrochloric and mucus: hyperacidity, gastric

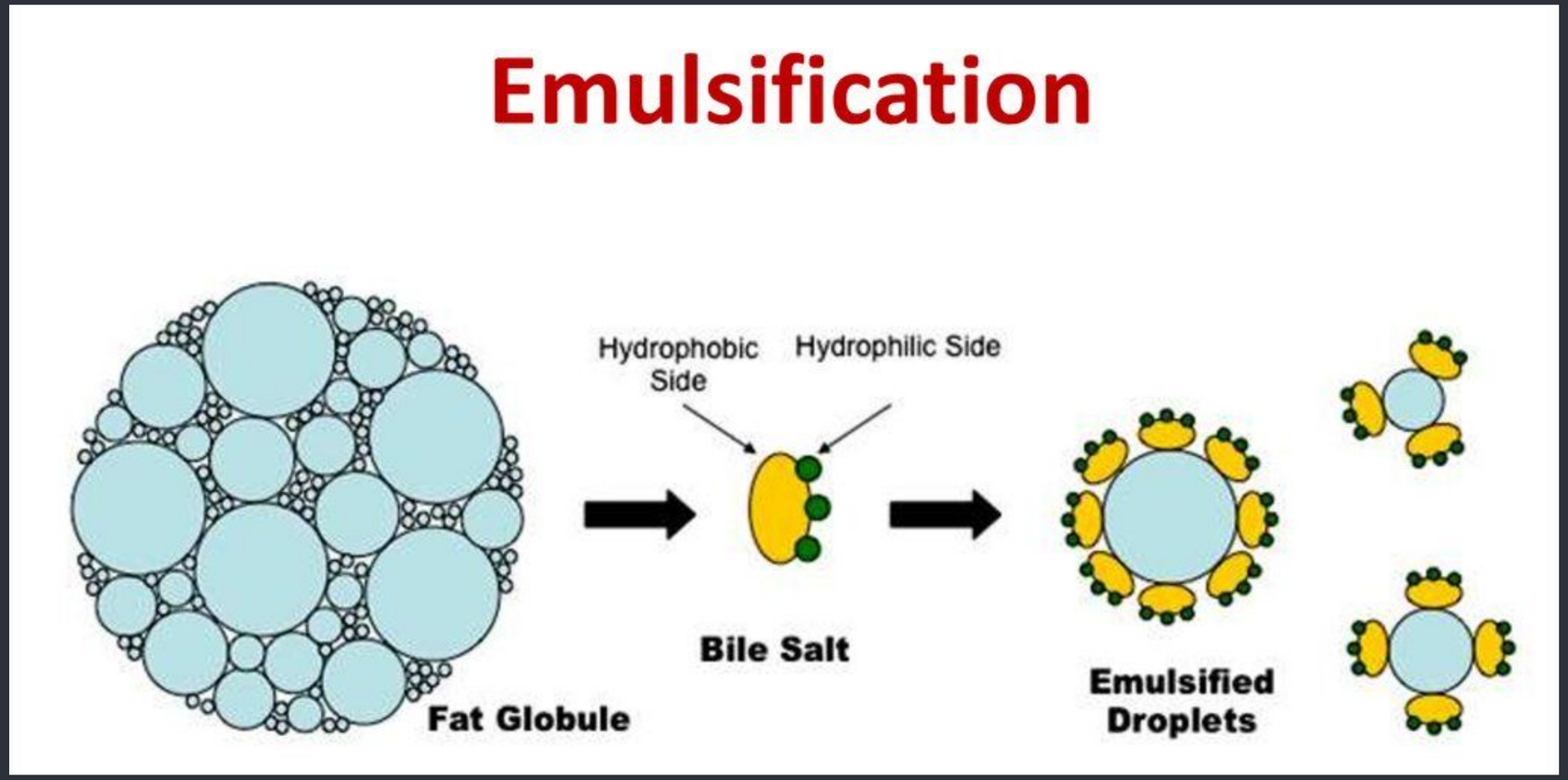
Liver


Bile
Saliva
Liver
Esophagus
Stomach
Gall
Bladder
Acid chyme
Intestinal
Juice
Pancreatic Juice
Pancreas
Duodenum
(Small Intestine)

Liver

- Secretes Bile Juice.
- Bile juice is stored in gallbladder.
- Bile juice makes food alkaline.
- Bile juice helps in emulsification of fats.

Liver


Emulsification
Hydrophobic Side
Hydrophilic Side
Fat Globule
Bile Salt
Emulsified Droplets

Pancreas

Secretes pancreatic juice which contains enzymes like :

1. Trypsin : helps in digestion of proteins
2. Lipase : helps in breaking down of emulsified fats.
3. Pancreatic amylase : helps in digestion of carbohydrates.

Small intestine

- 5-7 metres long
- Site of final digestion of food
- Secretes intestinal juice

Small intestine

Enzymes present in intestinal juice

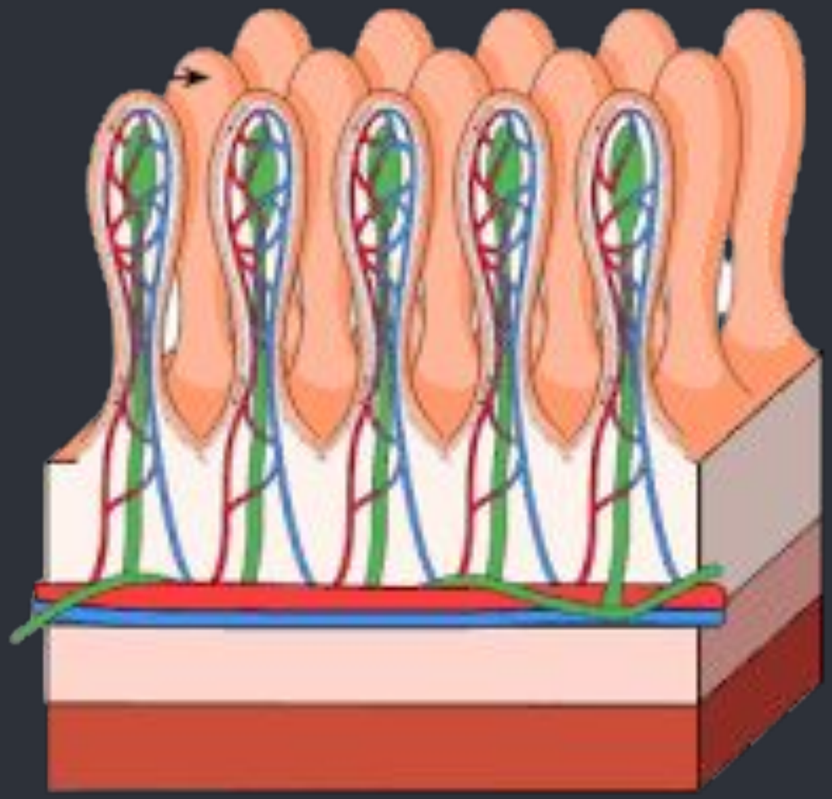
- The walls of the small intestine secrete digestive enzymes to digest food.
- Peptidases to split small peptides into amino acids.
- Maltase acts on maltose and converts it into glucose.
- Sucrase acts on sucrose and converts it into glucose and fructose.
- Lactase acts on lactose and converts it into glucose and galactose.
- Lipases acts on lipids and convert it into fatty acid and glycerol.

Absorption of food in Small intestine

- Villi are finger-like projections.
- Increases the surface area for absorption.

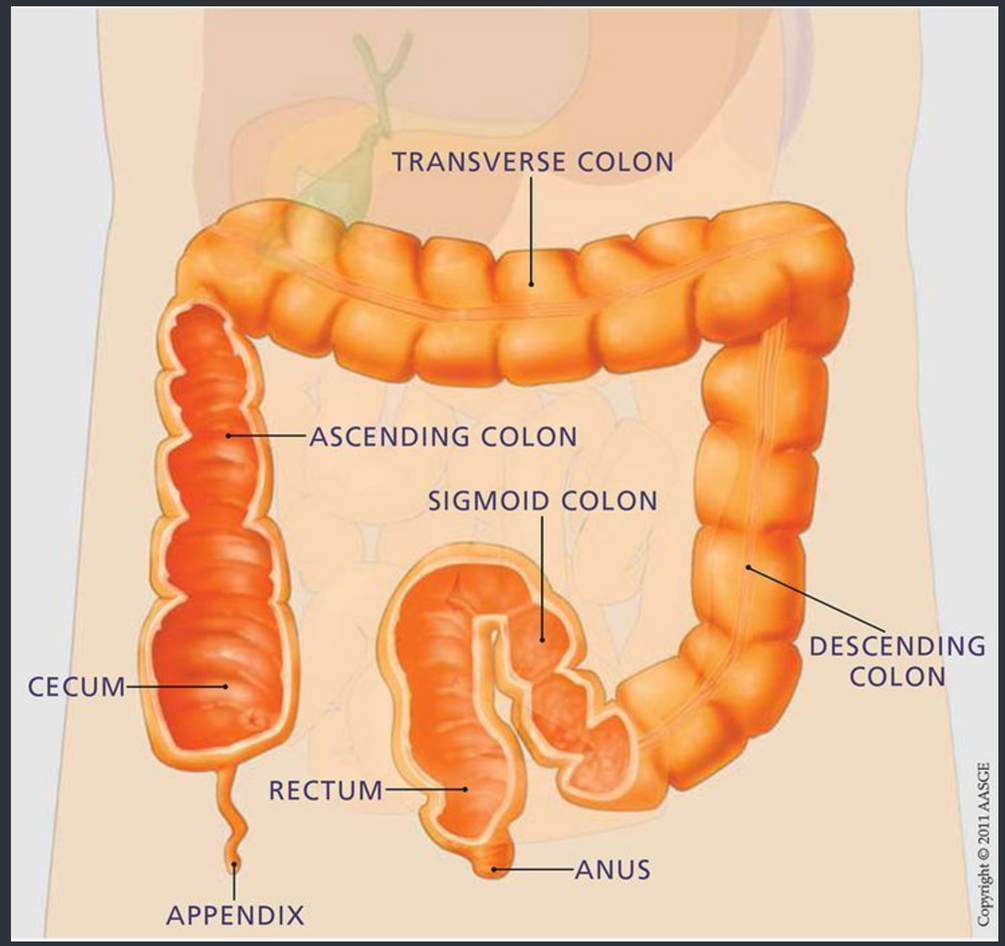
- Richly supplied with blood vessels which take the absorbed food to each and every cell of the body.

- Food is utilised for obtaining energy, building up new tissues and the repair of old tissues and and the repair of old tissues.



Large intestine (Colon)

Absorption of Water

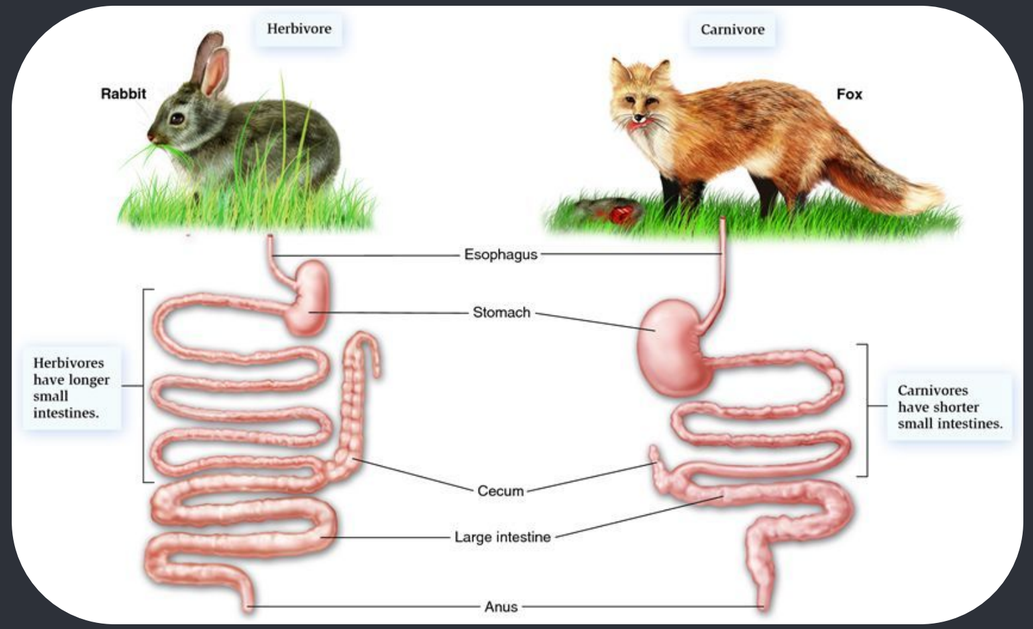


Anus

Removal of undigested and unabsorbed food

Why do herbivores have longer intestine than carnivores?

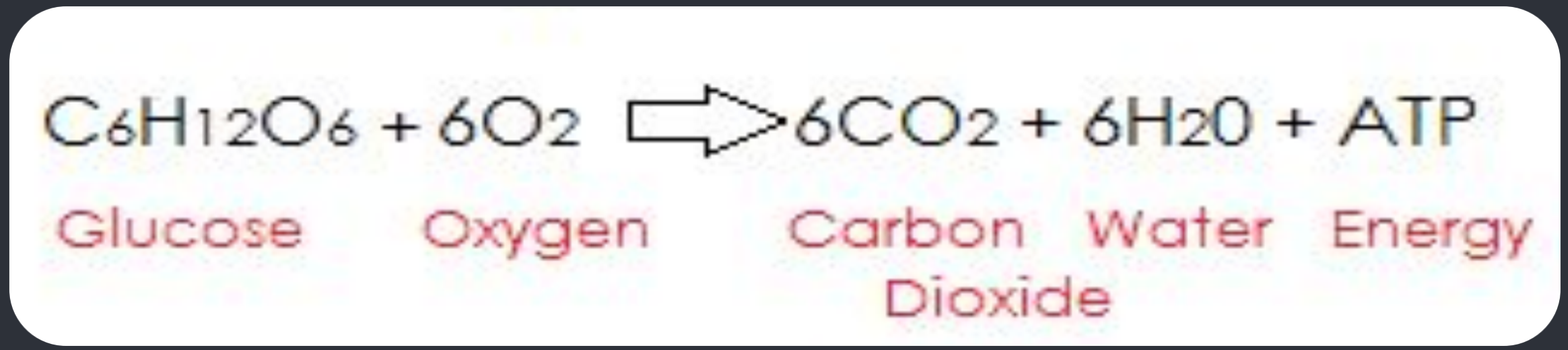
Herbivores consume producers like plants which contain **cellulose** in the cell wall of their cells.
Digestion of cellulose in the gut takes a longer time and hence, the gut of herbivores is longer than gut of carnivores.



M - Movement
R - Respiration
S - Sensitivity
G - Growth
R - Reproduction
E - Excretion
N - Nutrition

Respiration

The process by which a living organism obtain energy(ATP) by breakdown of food in cells.



Note - ATP (Adenosine triphosphate) is the energy currency of the cell.

Breathing v/s Respiration

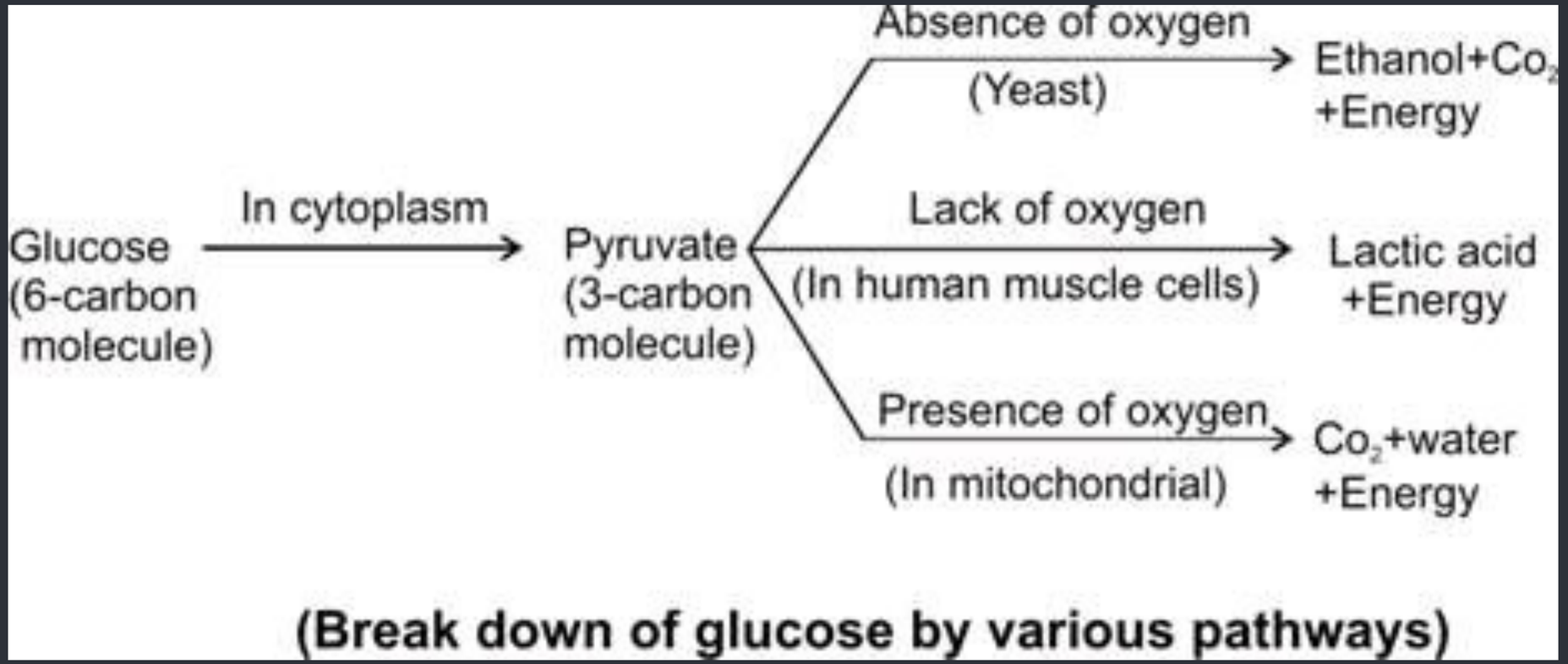
Breathing	Respiration
Breathing is a continuous process that involves both inhalation and exhalation.	The process in which food is broken down in the cells to release energy is known as respiration.
It is a physical process.	It is a biochemical process.
Breathing is a part of respiration.	It involves the release of energy.

Respiration

Types of Respiration

AEROBIC RESPIRATION	ANAEROBIC RESPIRATION
Respiration takes place in the presence of oxygen.	Respiration takes place in the absence of oxygen.
It occurs in the cytoplasm and mitochondria.	It occurs only in the cytoplasm.
Usually, glucose is broken down into carbon dioxide and water.	Glucose is broken down into ethanol (ethyl alcohol).
Aerobic respiration occurs in mammals, including humans.	Anaerobic respration occurs in yeast, some types of bacteria and also in some plants.

Important Concept



(Break down of glucose by various pathways)

Exchange of gases in plants

Leaves - Stomata

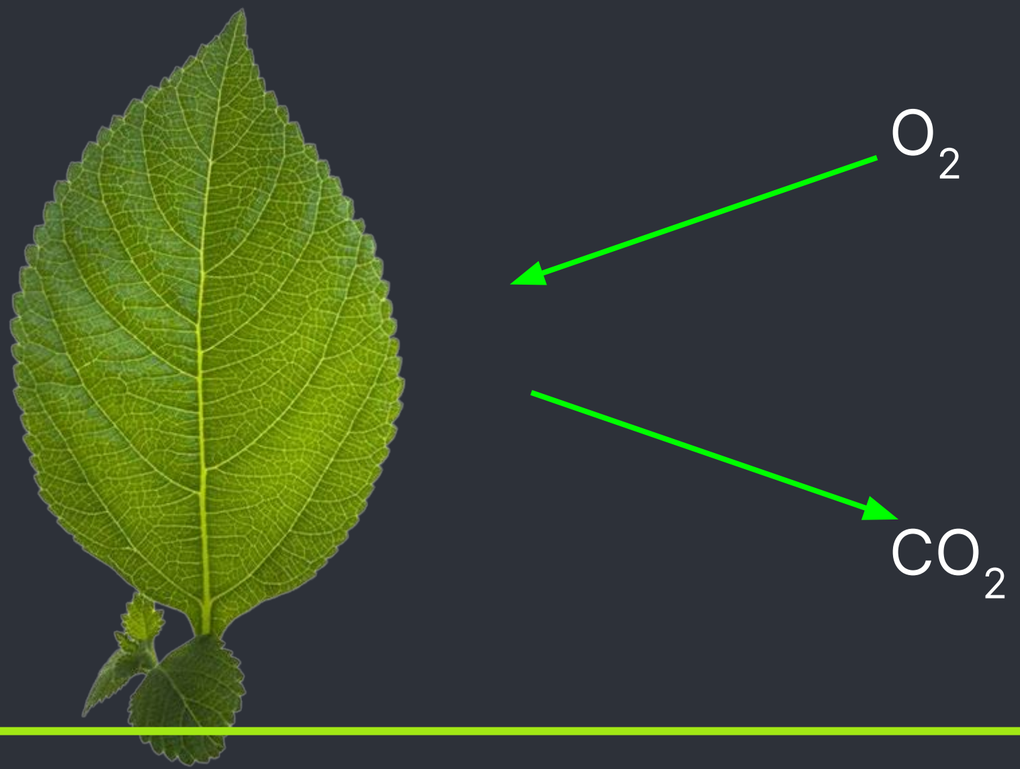
O_2

CO_2

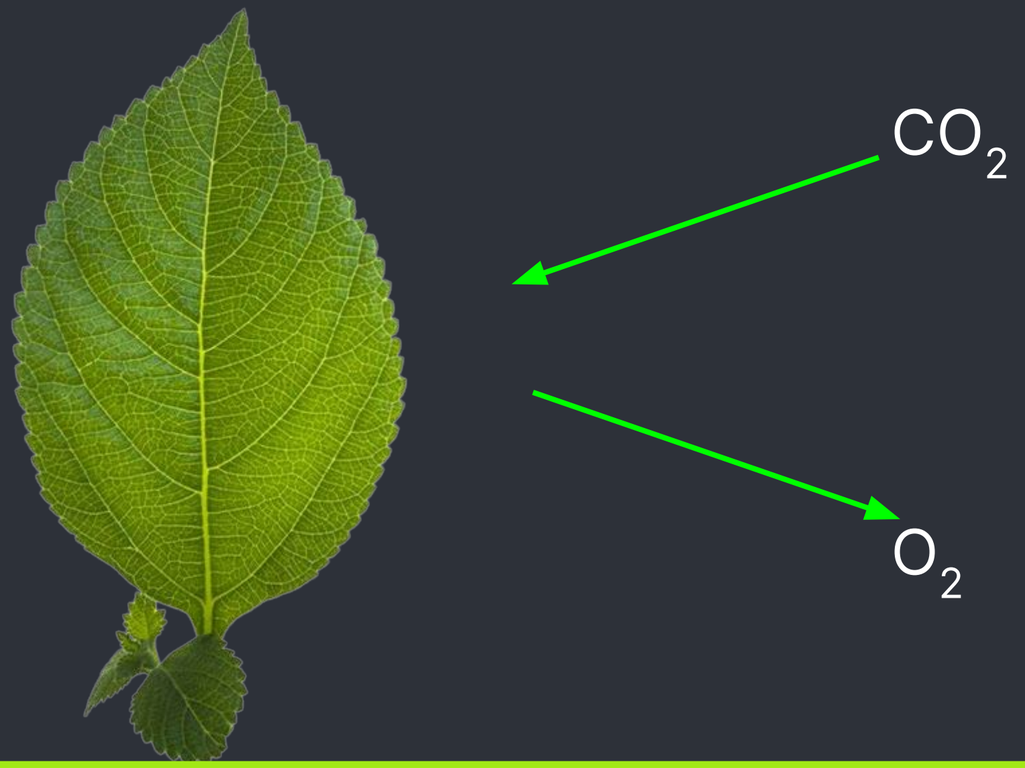
Exchange of gases in plants

The major processes which involve exchange of gases in plants are:

Photosynthesis



Respiration

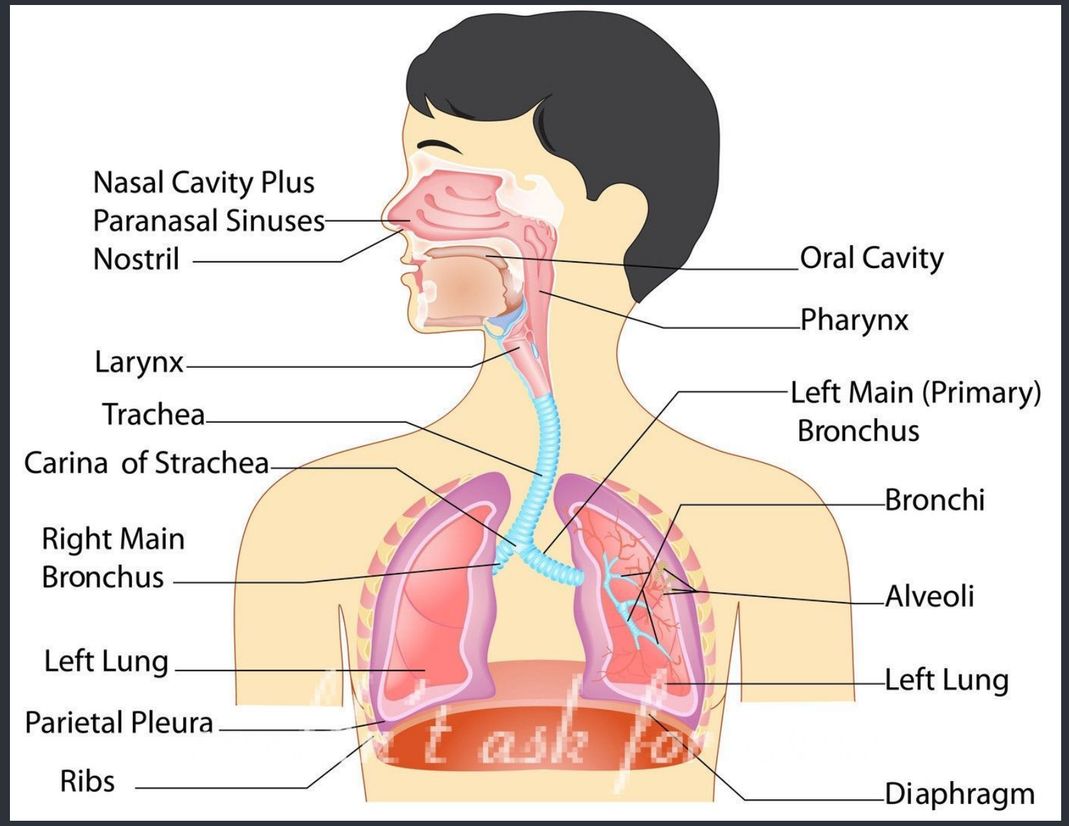


Points to Remember!

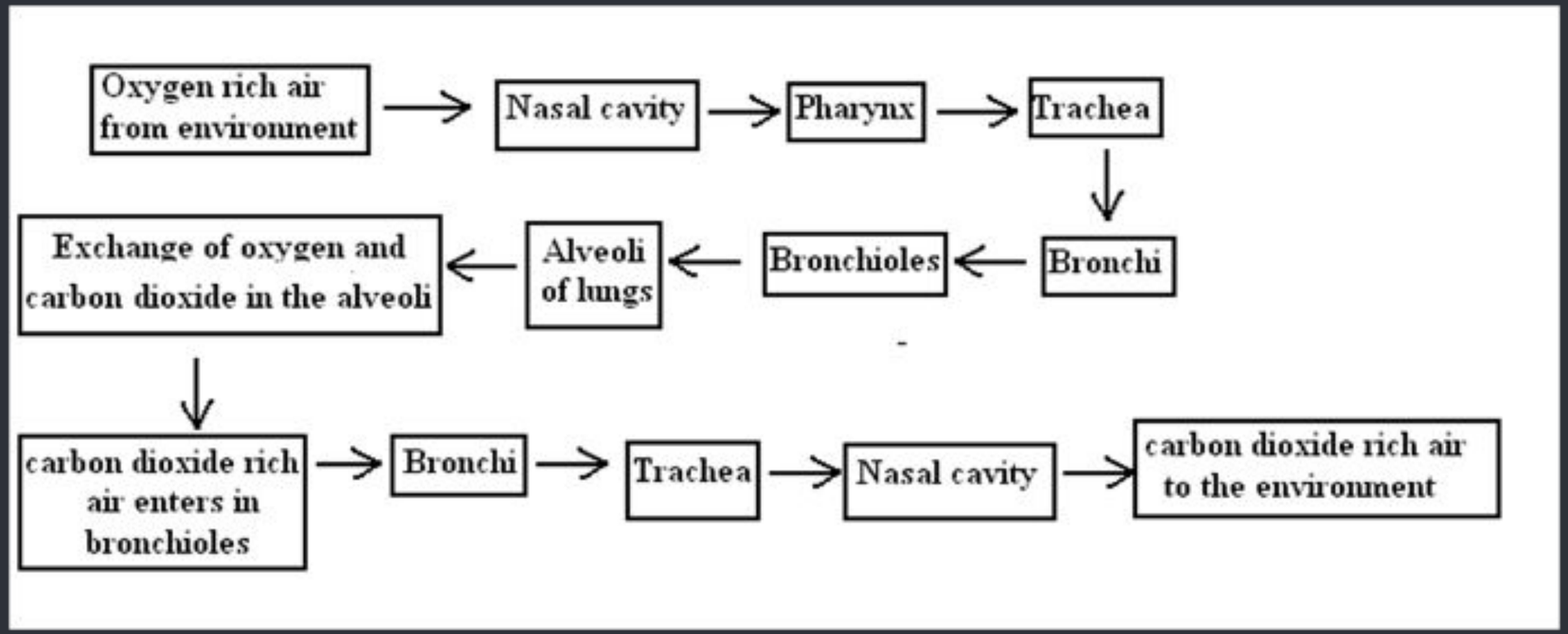
- Exchange gases through stomata and lenticels.
- The large intercellular spaces ensure that all cells are in contact with air.
- Carbon dioxide and oxygen are exchanged by diffusion here.
- The direction of diffusion depends upon environmental conditions and the requirement of the plant.

Respiration in Human

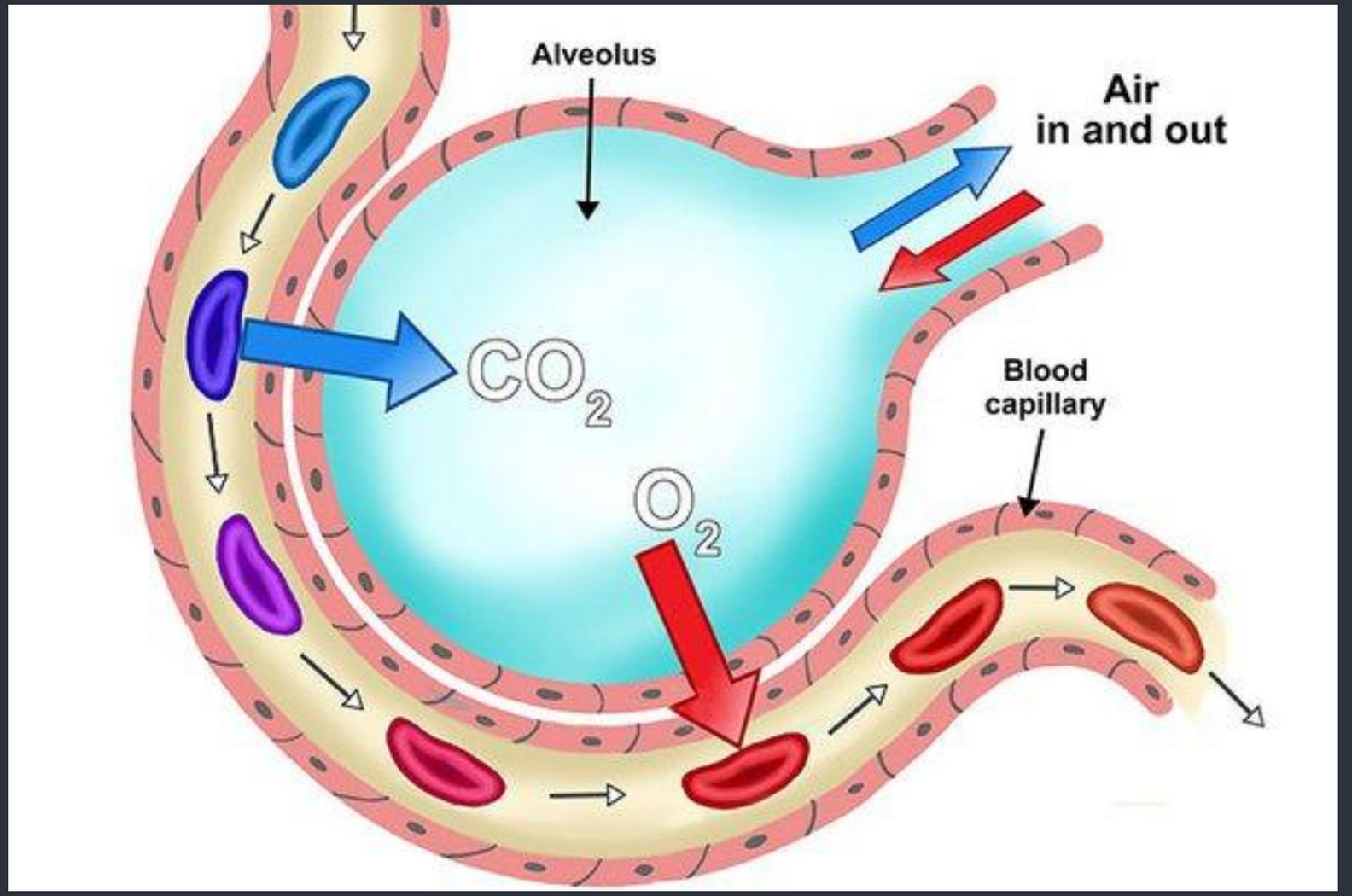
Passage of air through the respiratory system.



How does exchange of gases occurs in human body?



Alveolus Gas Exchange



Red blood cell

Hemoglobin (Iron containing protein)

- Binds with O_2 and helps in O_2 transport.
- CO_2 is transported in dissolved form.

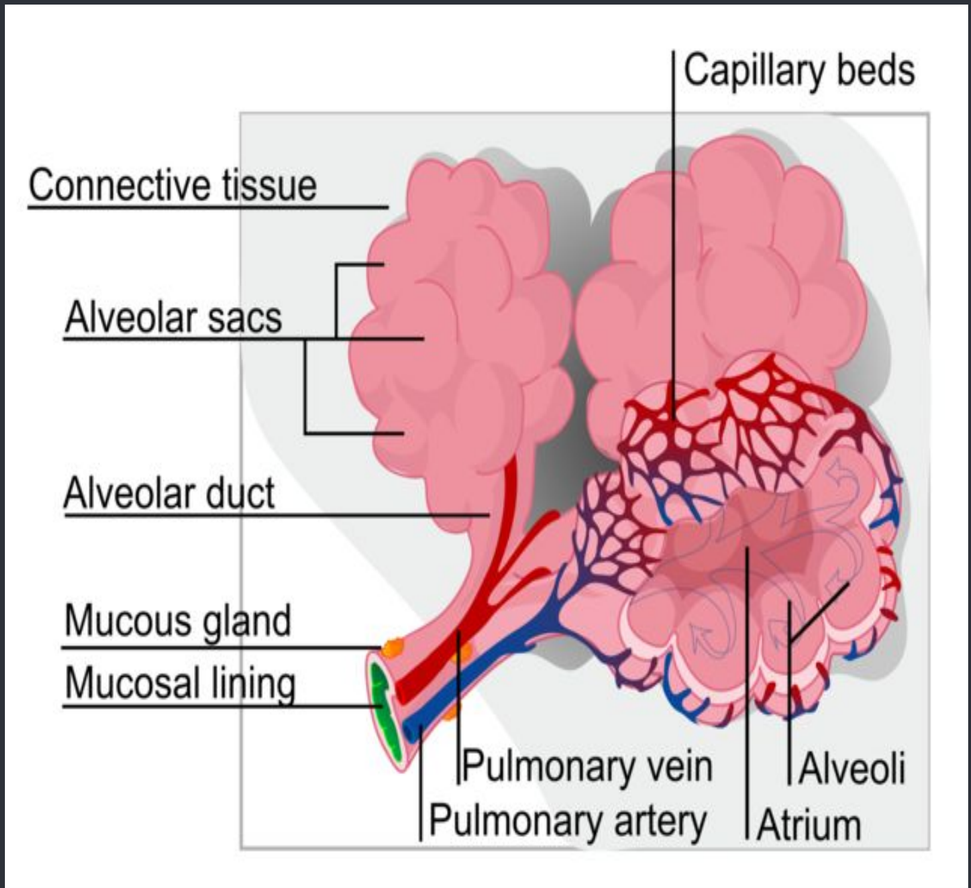
Affinity of haemoglobin to bind:

$$CO > O_2 > CO_2$$

Residual Volume
Volume of air remained inside lungs after forceful exhalation. (1100 -1200 ml)

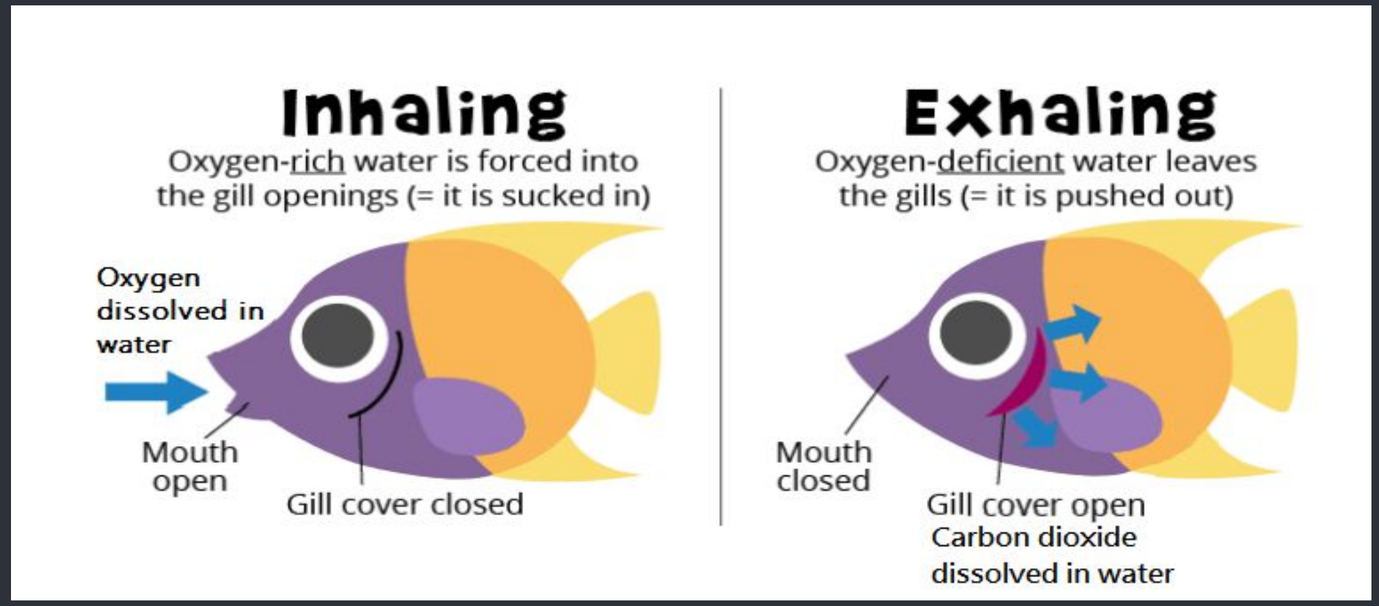
Inhalation	Exhalation
•Diaphragm muscles contract. •Diaphragm flattens out	•Diaphragm muscles relax. •Diaphragm arches upwards
•Intercostal muscles contract.	•Intercostal muscles relax.
•Ribcage moves upwards and outwards.	•Ribcage moves downwards and inwards.
•Volume of thoracic cavity increases	•Volume of thoracic cavity decreases.
•Air pressure surrounding the lungs decreases.	•Air pressure surrounding the lungs increases.
•Air flows into the lungs	•Air is forced out of the lungs.

Respiration



1. Balloon-like or sac like structure.
2. Walls of alveoli are only one celled thick and provide a surface where the exchange of gases can take place.
3. Contain an extensive network of blood-vessels which helps in exchange of gases.

- **Gills** are the respiratory organs for fishes. Fishes take in oxygen which is dissolved in water through gills.
- Since, availability of oxygen is less in the aquatic environment, so the breathing rate of aquatic organisms is faster.



- Insects have a system of **spiracles and tracheae** which is used for taking in oxygen.

Transportation

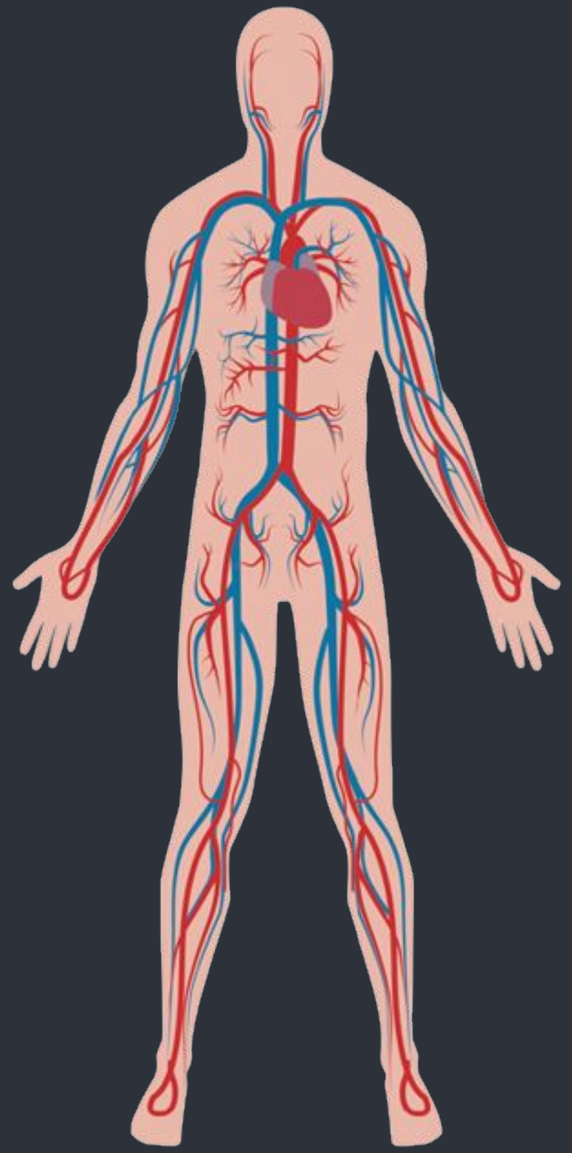
Transportation is a life process where substances synthesized or absorbed in one part of the body are carried to other parts of the body.

Food
CO_2, O_2
Metabolic waste
Hormones

Blood

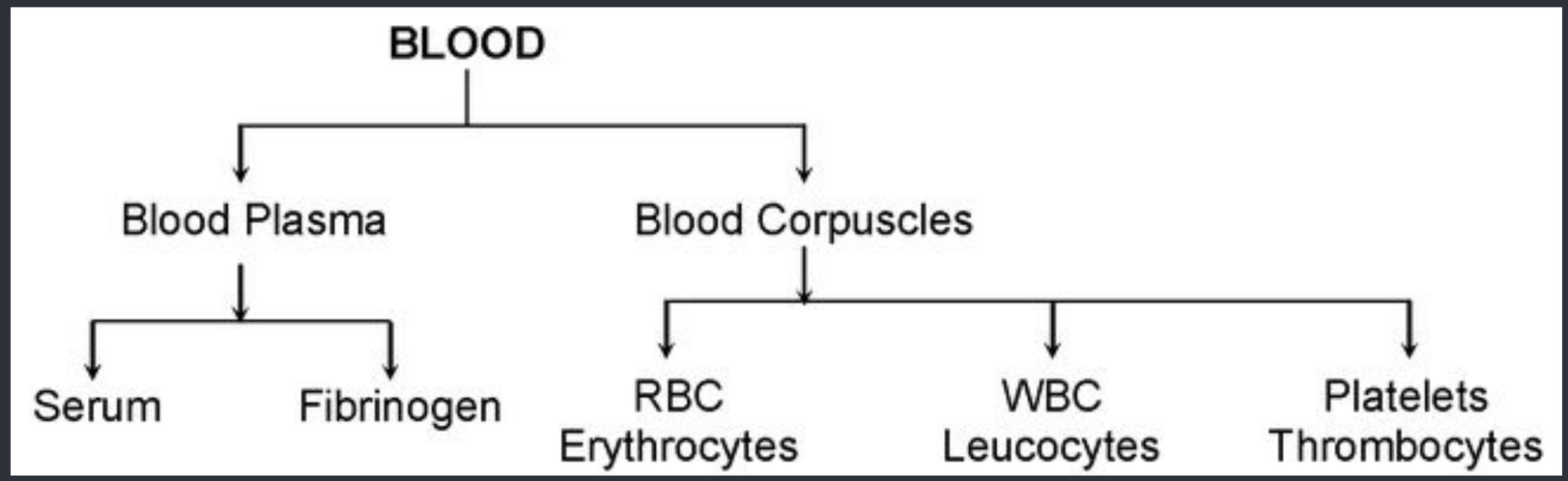
Circulatory System

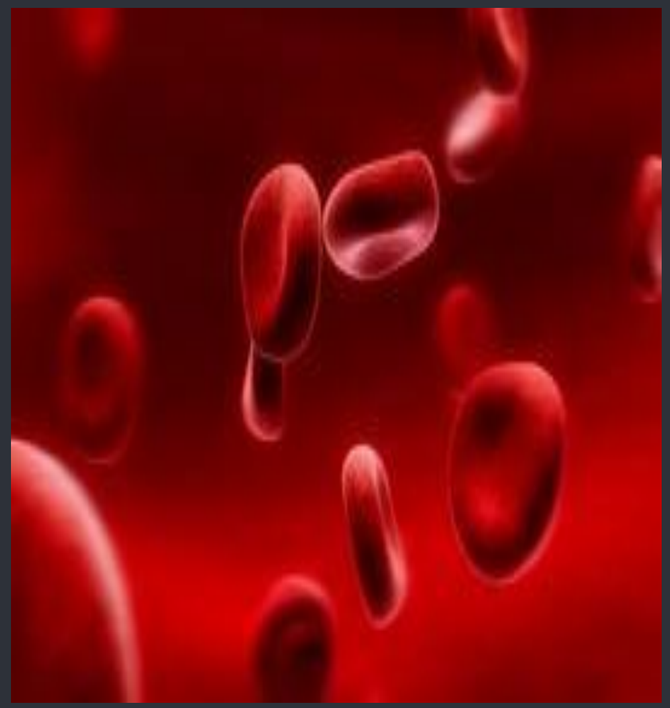
1. Blood - Fluid Connective tissue
2. Blood Vessels - Tubes
3. Heart - Pumping Organ



Blood

Blood is a liquid connective tissue which circulates throughout the body by pumping action of heart.

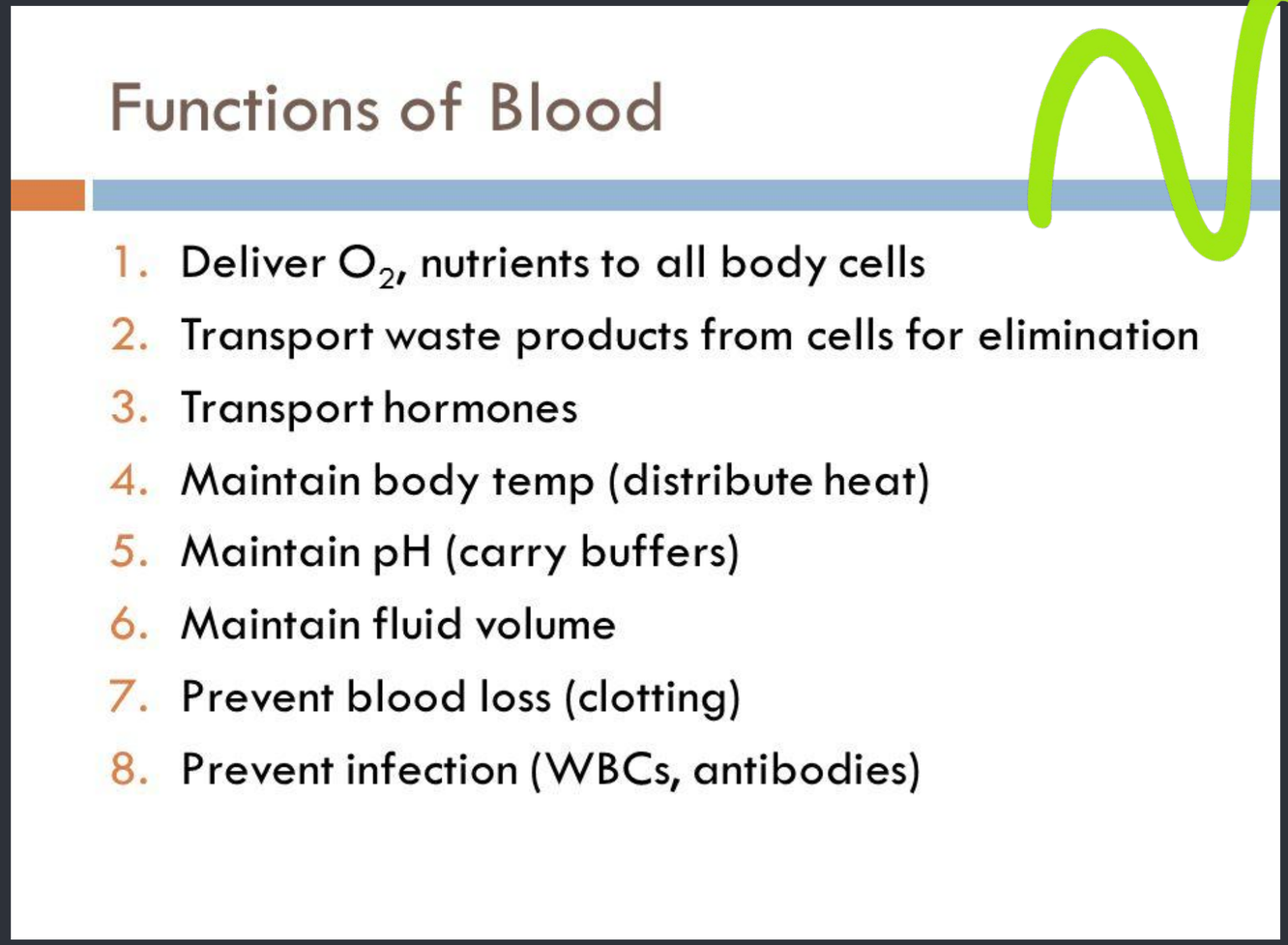




Red Blood Cells - Circular, biconcave and disc shaped. Appear red due to the presence of Haemoglobin.

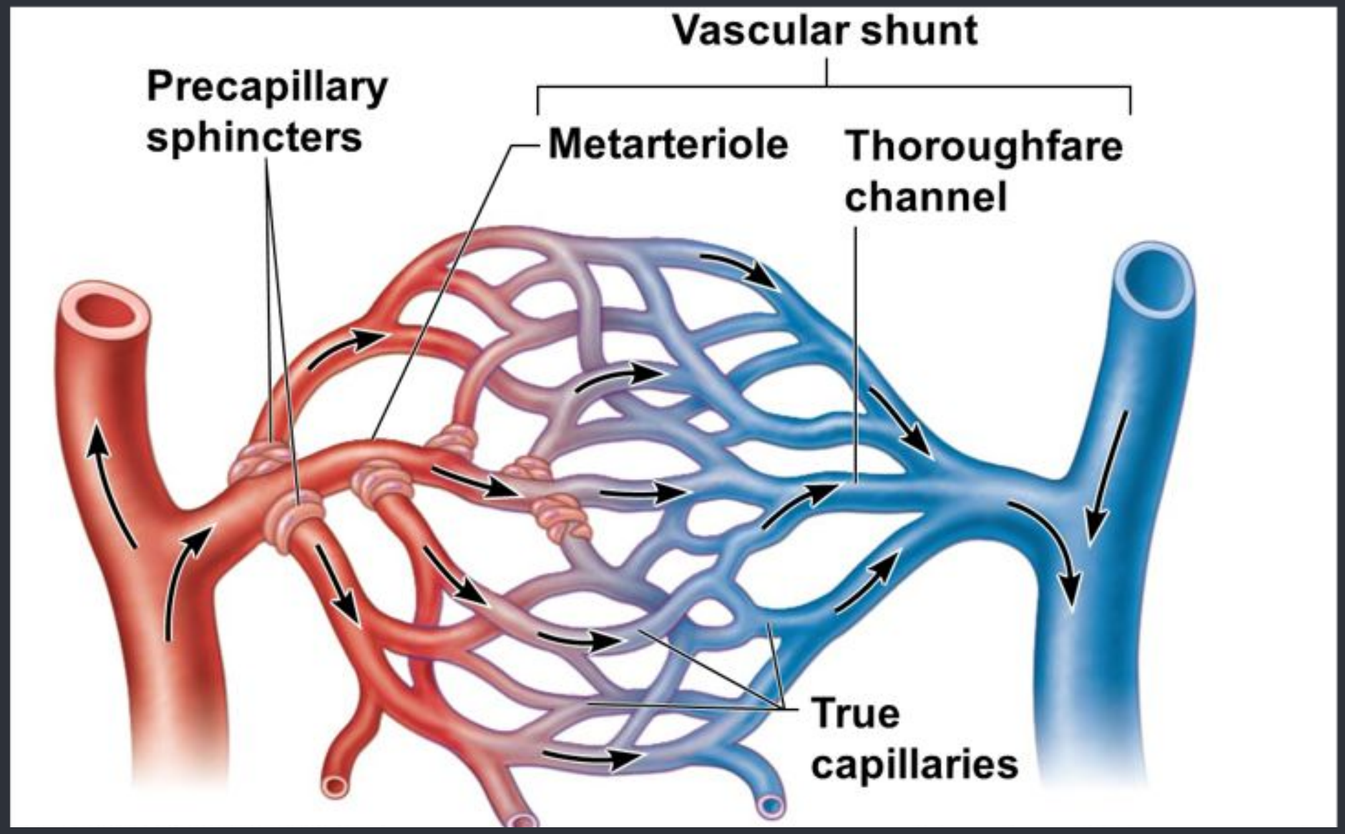
White Blood Cells - Large, nucleated and colourless.

Platelets - Cell fragments. Function in blood clotting.



Types of Blood Vessels

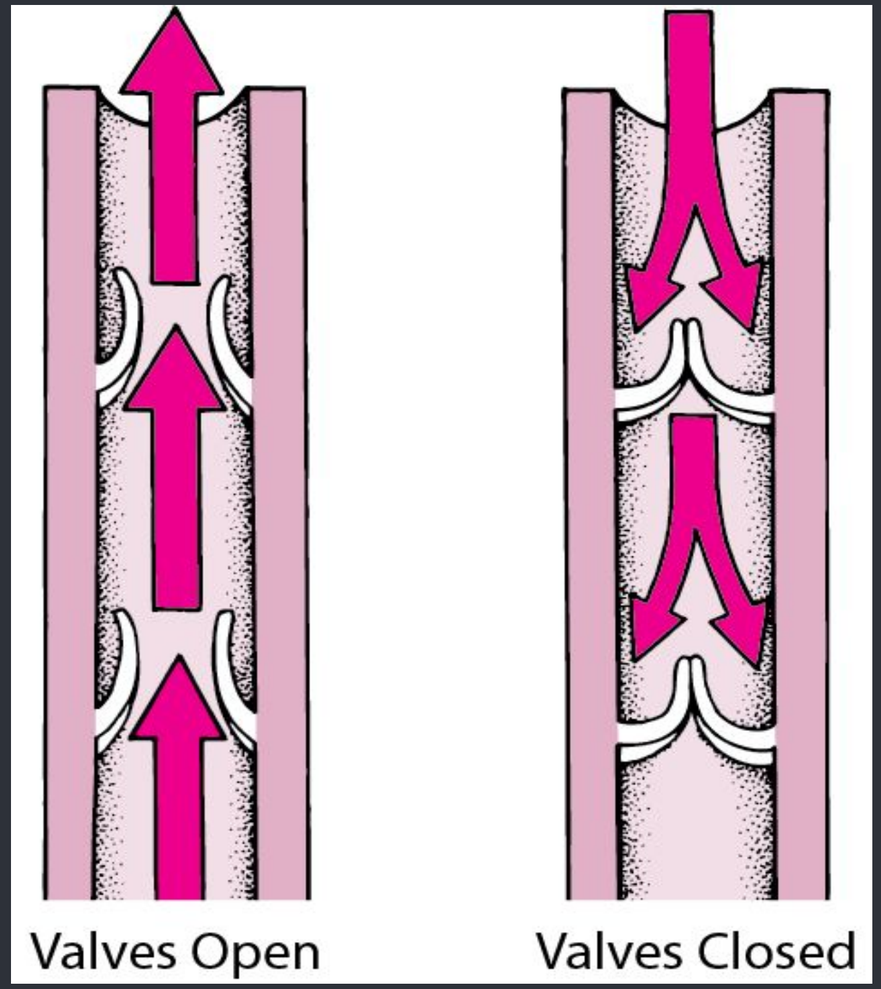
Transportation is a life process where substances synthesized or absorbed in one part of the body are carried to other parts of the body.



Arteries	Veins	Capillaries
1. Carry blood away from heart.	1. Carry blood towards the heart.	1. Link-artery to Vein.
2. Outer coat is thin middle coat is thick.	2. Outer coat is thick middle coat is thin.	2. Outer and middle coats are absent.
3. Lumen is small.	3. Lumen is large in veins.	3. Lumen is small in capillary.
4. Pure oxygenated blood is passed except pulmonary artery.	4. Impure deoxygenated blood passed except pulmonary vain.	4. First part of the capillary contains oxygenated blood and last part contains deoxygenated blood
5. Semi lunar valves are absent.	5. Semi lunar valves are present to prevent back flow of Blood.	Semi lunar valves are absent.
6. Pressure of blood is high.	6. Pressure of blood is low.	6. Pressure is falling.
7. Blood flow is rapid through artery.	7. Blood flow is slow through veins.	Blood flow is slow through capillary.

Valves in Veins

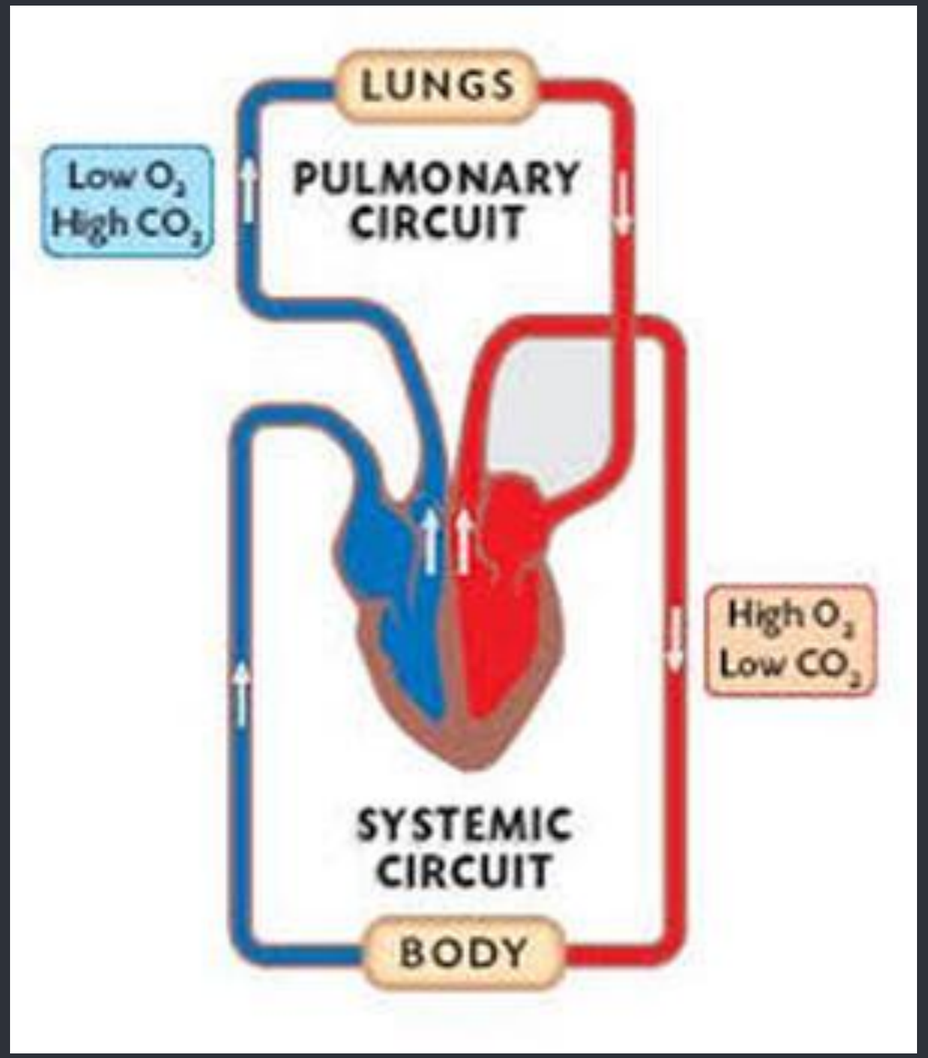
- Prevent backflow of the blood.
- Blood is under low pressure in veins.



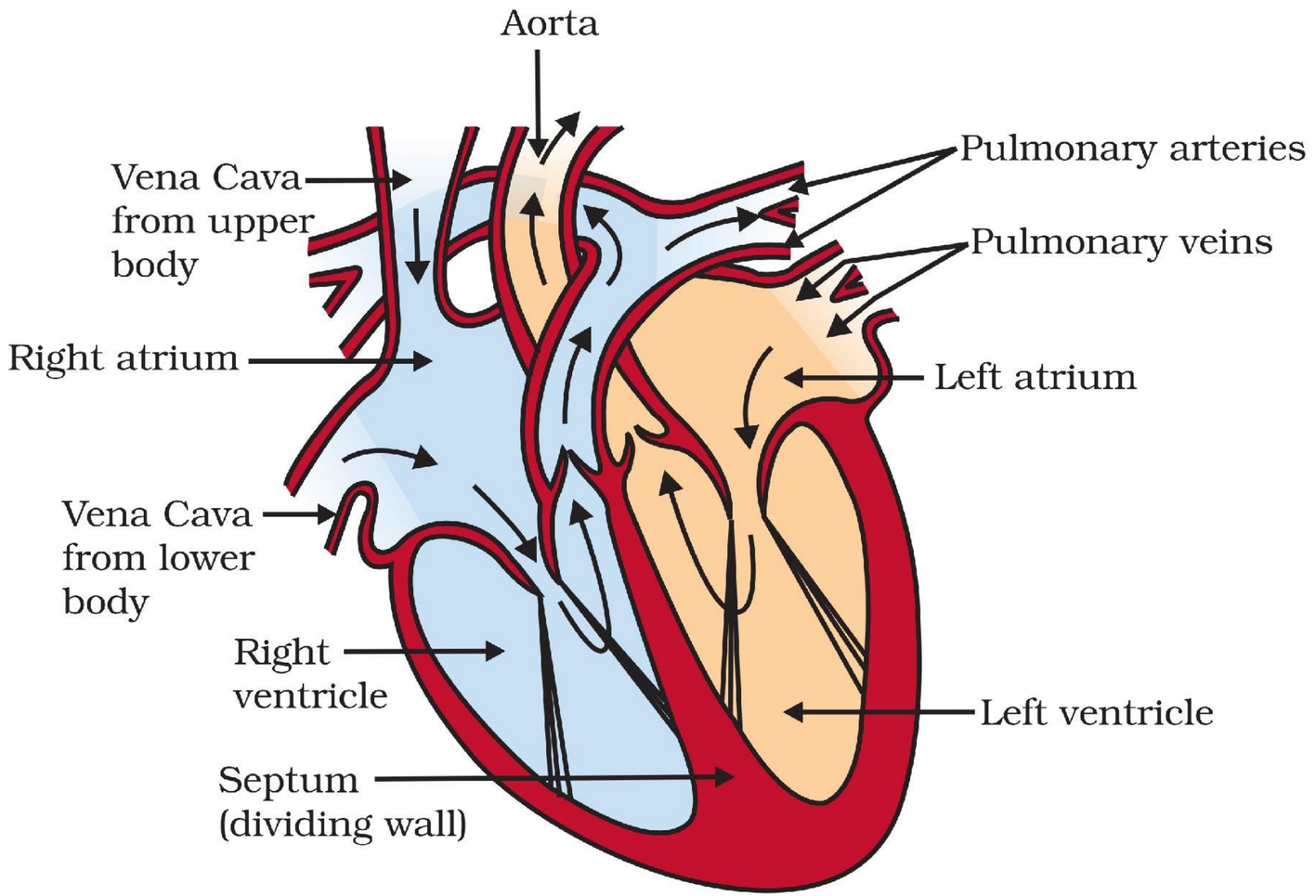
Blood Vessels - Tubes in which blood flows.

1. Artery - Away from the heart
   Oxygenated blood
   Pressure is high.
2. Veins - Towards the heart.
   Deoxygenated blood.
   Pressure is low.
3. Capillaries - Exchange of substances.

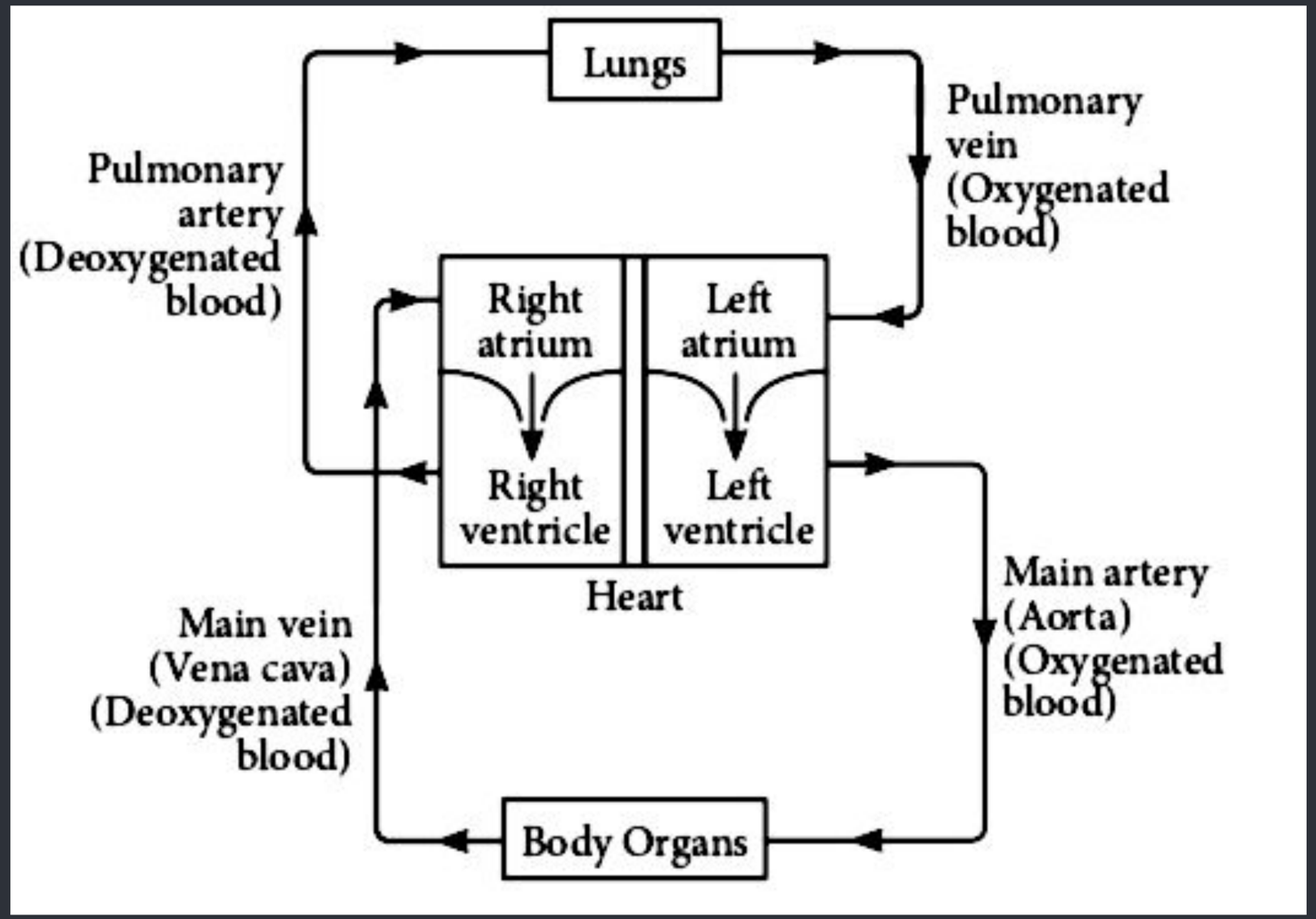
- Largest Artery: Aorta
- Only artery that carries deoxygenated blood: Pulmonary Artery
- Largest Vein: Vena Cava
- Only Vein that carries oxygenated blood: Pulmonary Vein



HUMAN HEART


Aorta
Vena Cava from upper body
Pulmonary arteries
Pulmonary veins
Right atrium
Left atrium
Vena Cava from lower body
Right ventricle
Left ventricle
Septum (dividing wall)

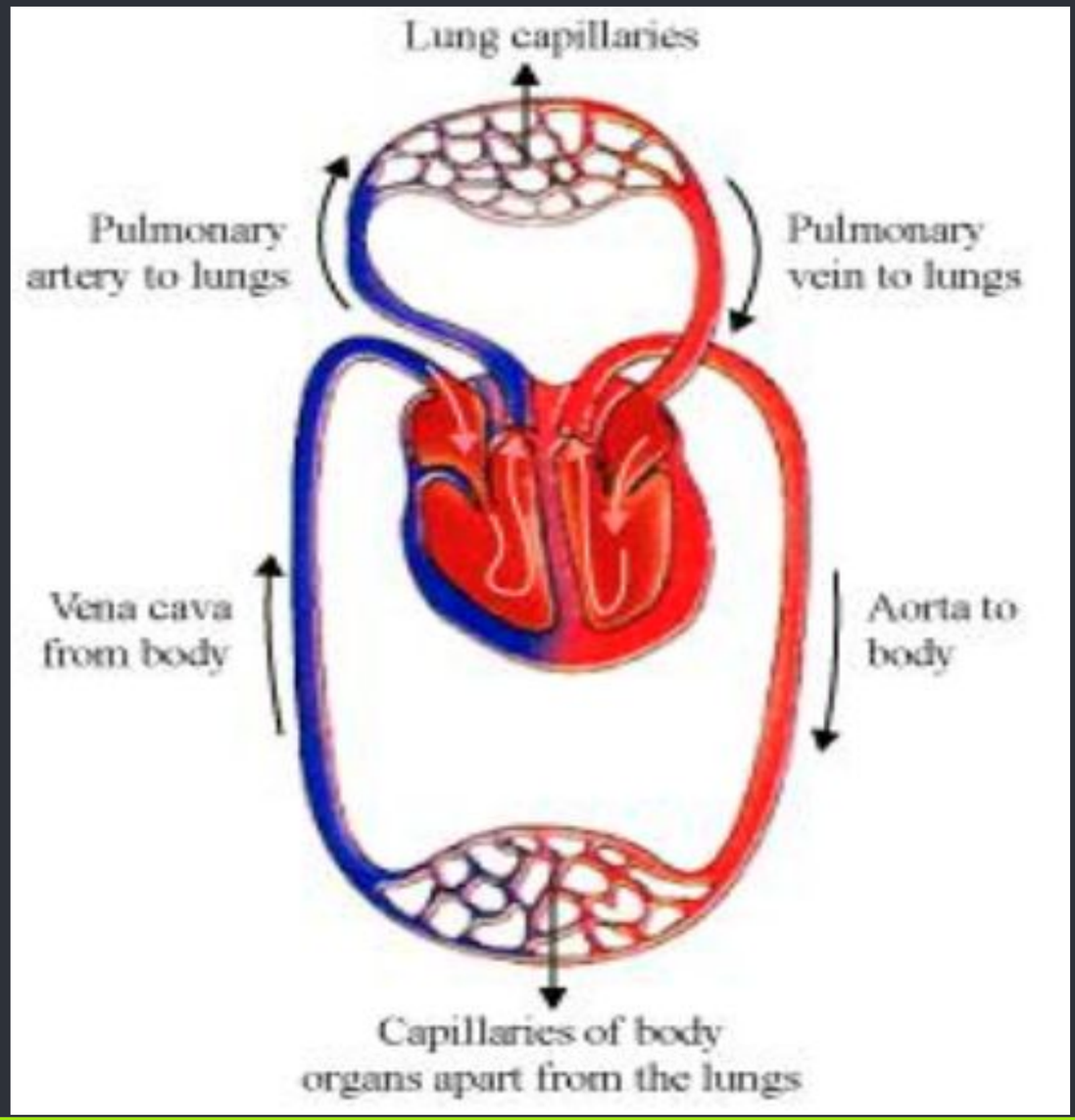
Working of heart:



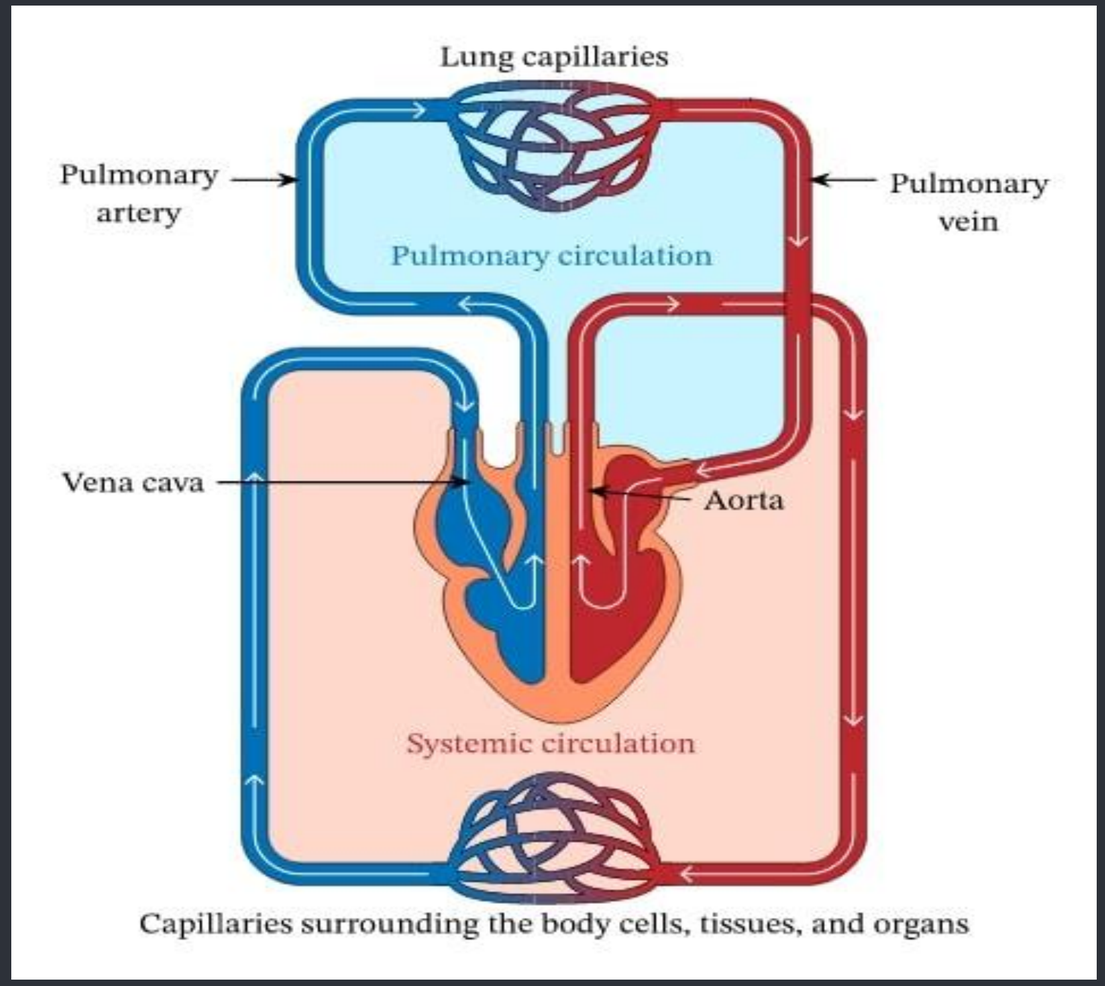
Single and Double Circulation

Double Circulation: In a single cycle, blood passes the heart twice. So, it is called Double Circulation and it is found in birds and mammals only.

Single Circulation: In fishes, the complete cycle of blood passes through heart only once. So, it is called Single Circulation.



Double Circulation



- Pisces: 2-chambered heart, Single circulation, Cold blooded
- Amphibians: 3-chambered heart, Incomplete double circulation, Cold blooded.
- Reptiles: 4-chambered heart, Incomplete double circulation, Cold blooded.
- Aves: 4-chambered heart, Complete double circulation, Warm blooded.
- Mammals: 4-chambered heart, Complete double circulation, Warm blooded.

Why we need chambers in the heart?

- To prevent mixing of oxygenated and deoxygenated blood.
- More oxygen will be supplied to body organs in better way.
- Highly efficient supply to oxygen to the body.
- More respiration leading to more energy production.

Blood pressure

Pressure exerted by blood in walls of blood vessel.

1. Systolic Pressure : The pressure of blood inside the artery during ventricular systole (contraction).

2. Diastolic Pressure : The pressure in artery during ventricular diastole (relaxation).

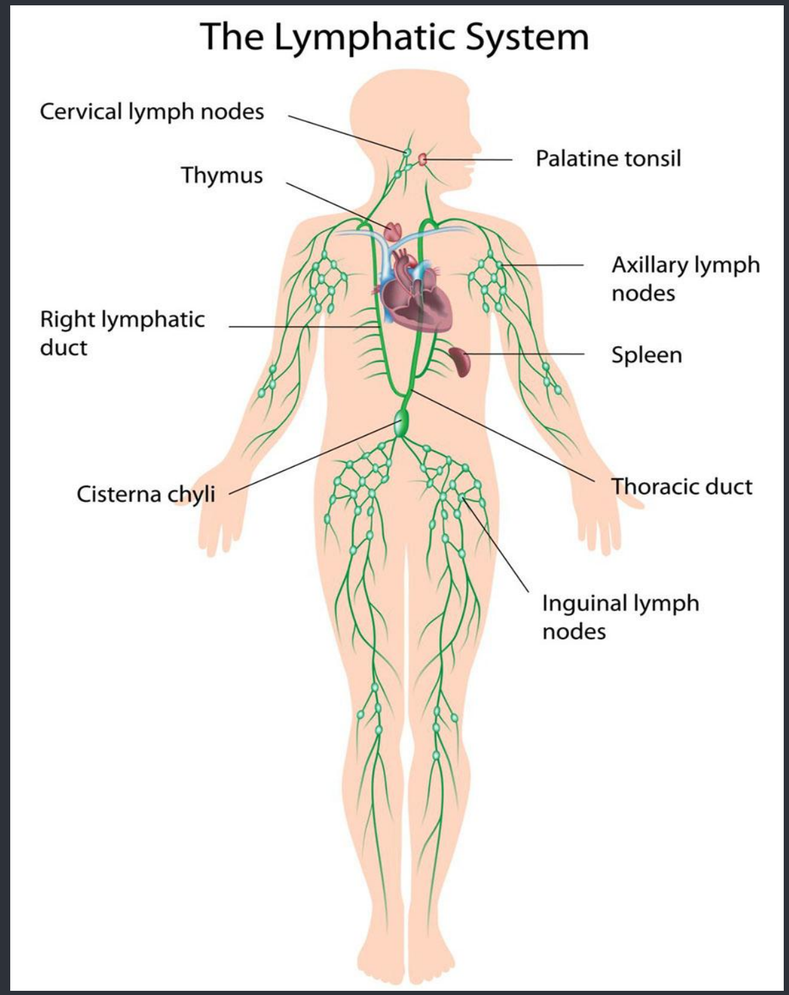
Hypertension - high blood pressure

(Construction of arterioles)

Lymph

Lymphatic System:

- Lymph Fluid
- Lymph Vessel
- Lymph Nodes



Functions of Lymph

- Fluid balance : Drains excess fluid from extracellular space back into the blood.
- Fat transport : Lymph carries digested and absorbed fat from intestine and transport to bloodstream.
- Immune System: Transports foreign material (ex-pathogen) to lymph nodes for disposal.

Transportation in Plants

- Transportation of water, minerals and food is necessary to carry out various biological activities.
- The water and minerals are absorbed from the soil by the roots of the plant and transported to various parts of plants like stem, leaves and flowers.
- Food is transported from leaves to developing parts of plants.
- In plants transportation is done by a specialised vascular system made up of: 1. Xylem 2. Phloem

Transportation in Plants

Xylem	Phloem
1. It conducts water and minerals from roots to leaves.	1. It conducts food from leaves to all parts of the plant.
2. It is composed of mainly dead elements.	2. It is composed of mainly living elements.
3. Transport is unidirectional.	3. Transport is bidirectional.
4. It has four types of cells: Tracheids, Vessels, Xylem parenchyma and Xylem fibres.	4. It has four types of cells: Phloem fibres, Sieve tubes, Companion cells and Phloem parenchyma.

Transportation in Plants

Ascent of Sap - Xylem

Transport of water and minerals from root to upward direction against gravity via xylem tissue.

(1) Tracheid

(2) Trachea or vessel

(3) Xylem parenchyma and

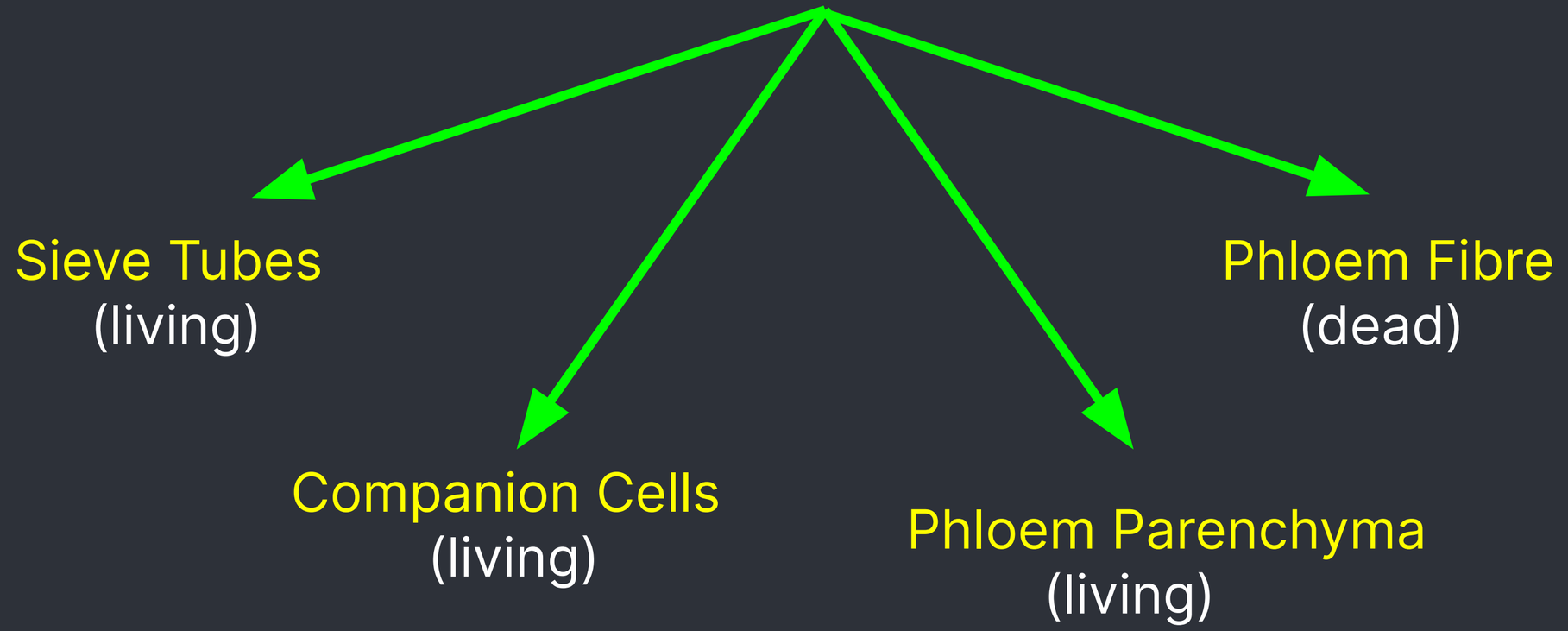
(4) Xylem sclerenchyma.

Functions of Transpiration:

1. Transpiration helps in the absorption and upward movement of water and minerals dissolved in it from roots to the leaves.
2. It also helps in temperature regulation.
3. Transpiration helps to get rid of excess water.

Translocation

- Upward and downward movements to food via phloem .
- Utilises ATP.



Excretion

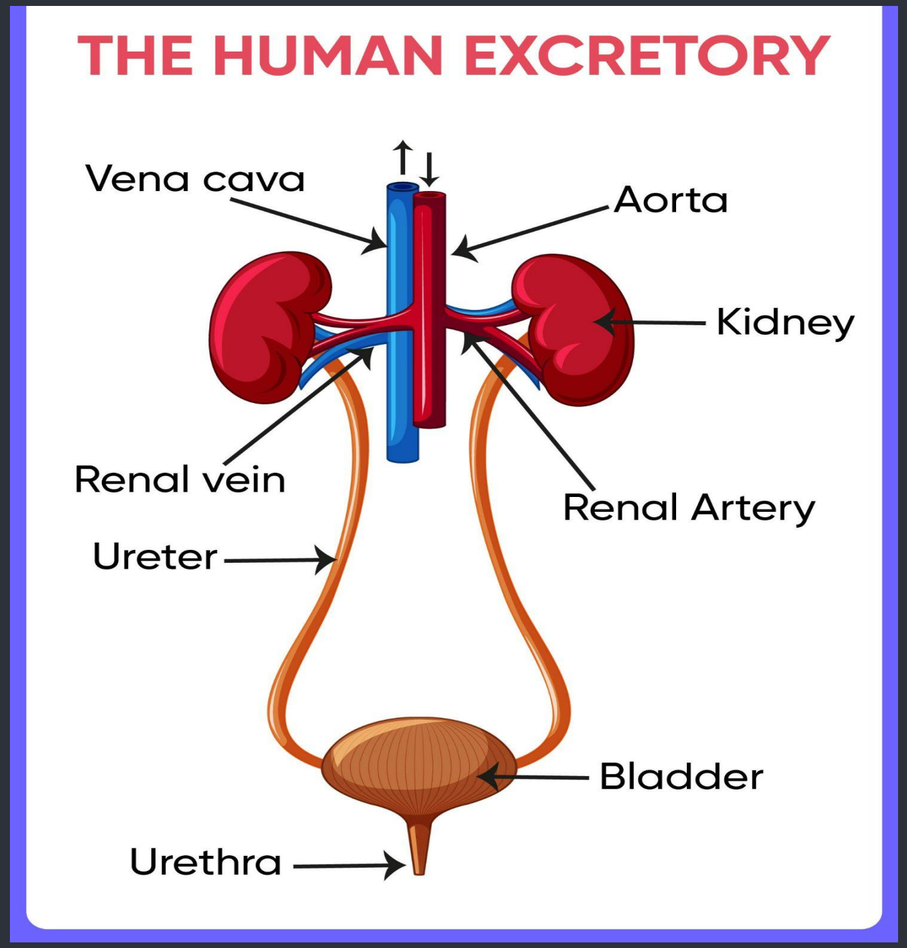
Excretion is the process by which organisms expel metabolic waste products and other toxic substances from their body.

Metabolic waste:

- Carbon dioxide
- Excess mineral salts
- Excess water
- Nitrogenous waste - nitrogen containing

Ammonia Urea Uric Acid

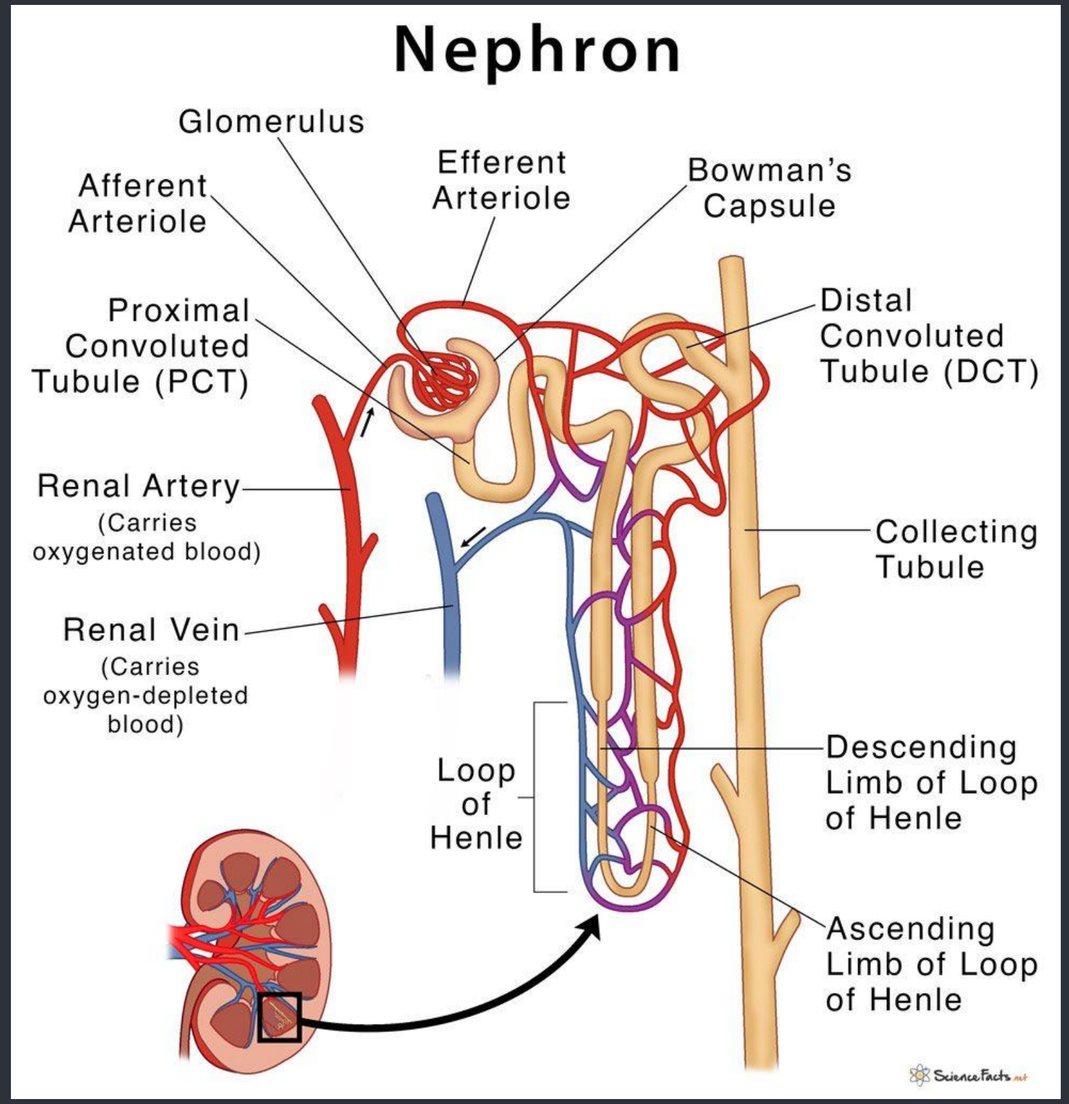
Excretory System



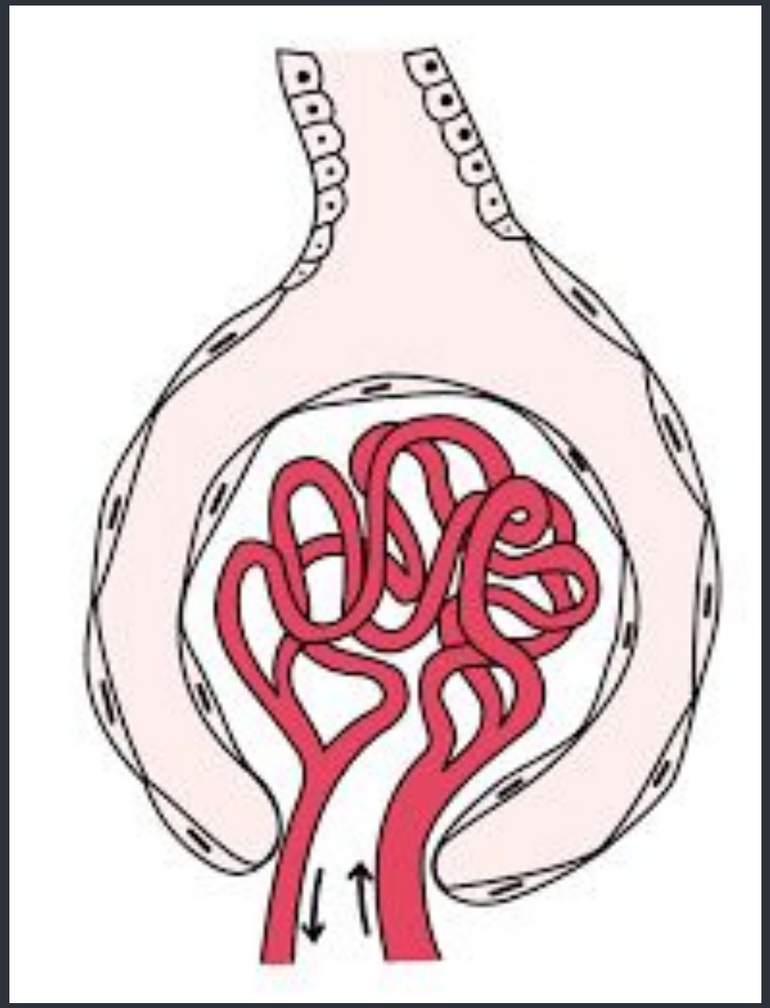
FUNCTIONS OF KIDNEY

- Excretion of wastes and other foreign substances.
- Regulation of blood ionic composition.
- Regulation of blood pH.
- Production of hormones.
- Regulation of blood pressure.
- Regulation of blood volume.
- Maintenance of blood osmolarity.
- Regulation of blood glucose level.

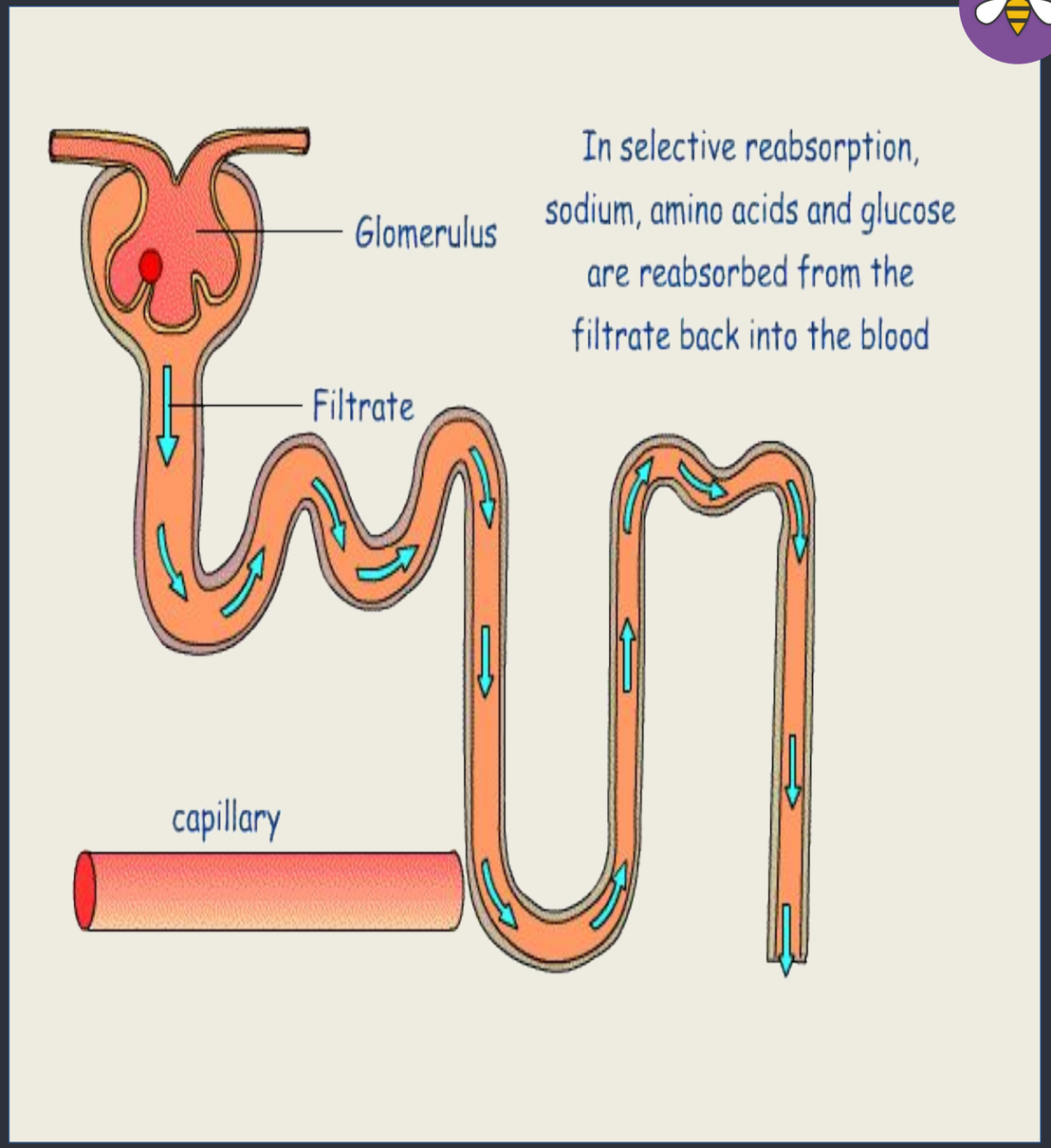
Nephron


Nephron
Glomerulus
Afferent Arteriole
Efferent Arteriole
Bowman's Capsule
Proximal Convoluted Tubule (PCT)
Distal Convoluted Tubule (DCT)
Renal Artery
(Carries oxygenated blood)
Collecting Tubule
Renal Vein
(Carries oxygen-depleted blood)
Loop of Henle
Descending Limb of Loop of Henle
Ascending Limb of Loop of Henle
ScienceFacts.net

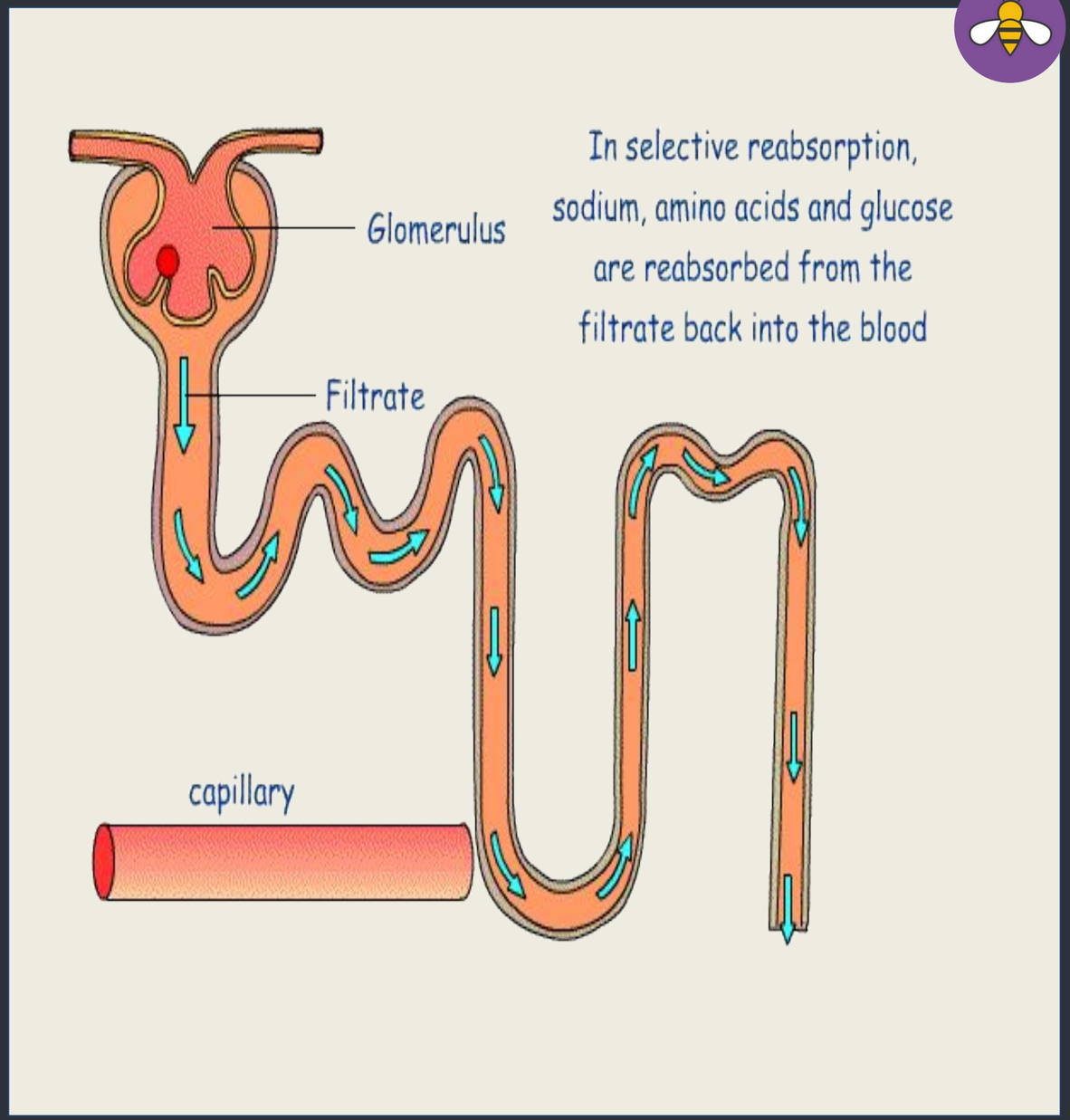
1. Glomerular Filtration: Nitrogenous wastes, glucose, water, amino acid, excessive salts from the blood are filtered and initial filtrate enters into Bowman Capsule of the nephron.



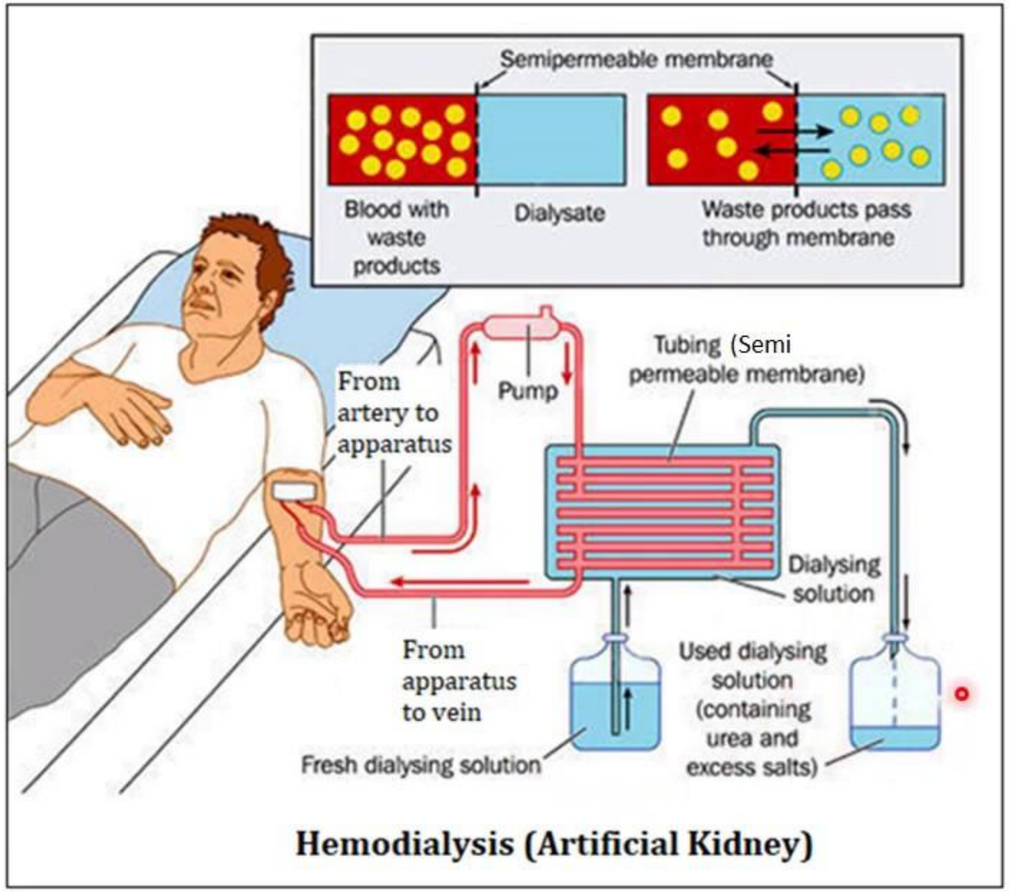
2. Selective reabsorption: Useful substances like glucose, amino acids, salts and a major amount of water from the filtrate are reabsorbed back by capillaries surrounding the nephron.



3. Tubular Secretion: Urea, extra water and salts are secreted into the tubule which open up into the collecting duct and then into the ureter.



Hemodialysis (artificial kidney)



Plants use different strategies for excretion of different products:

- Oxygen and carbon dioxide is diffused through stomata.
- Excess water is removed by transpiration.
- Plants can even loose some of their old parts like old leaves and bark of tree.
- Many plant waste products are stored in cellular vacuoles.
- Other waste products like latex, raisins and gums are stored in old xylem cells.
- Plants also secrete some waste substances into the soil around them.

Thank You!