CLASS 10 BIOLOGY

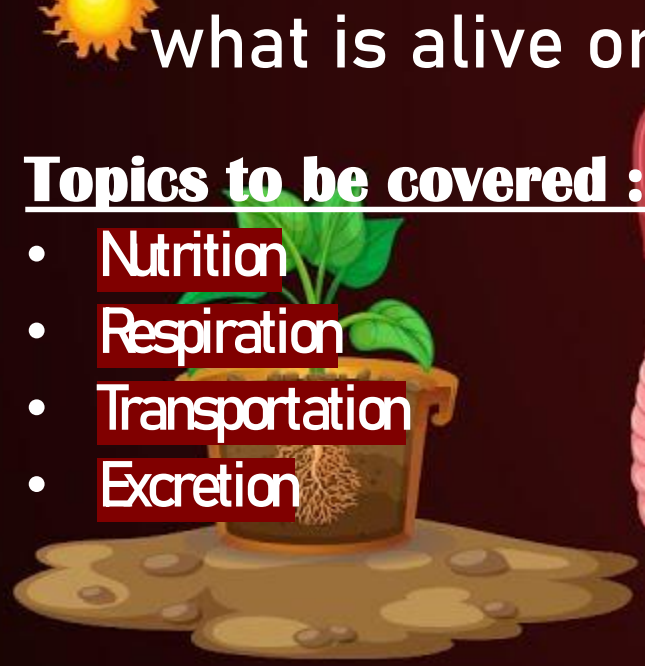
LIFE PROCESSES

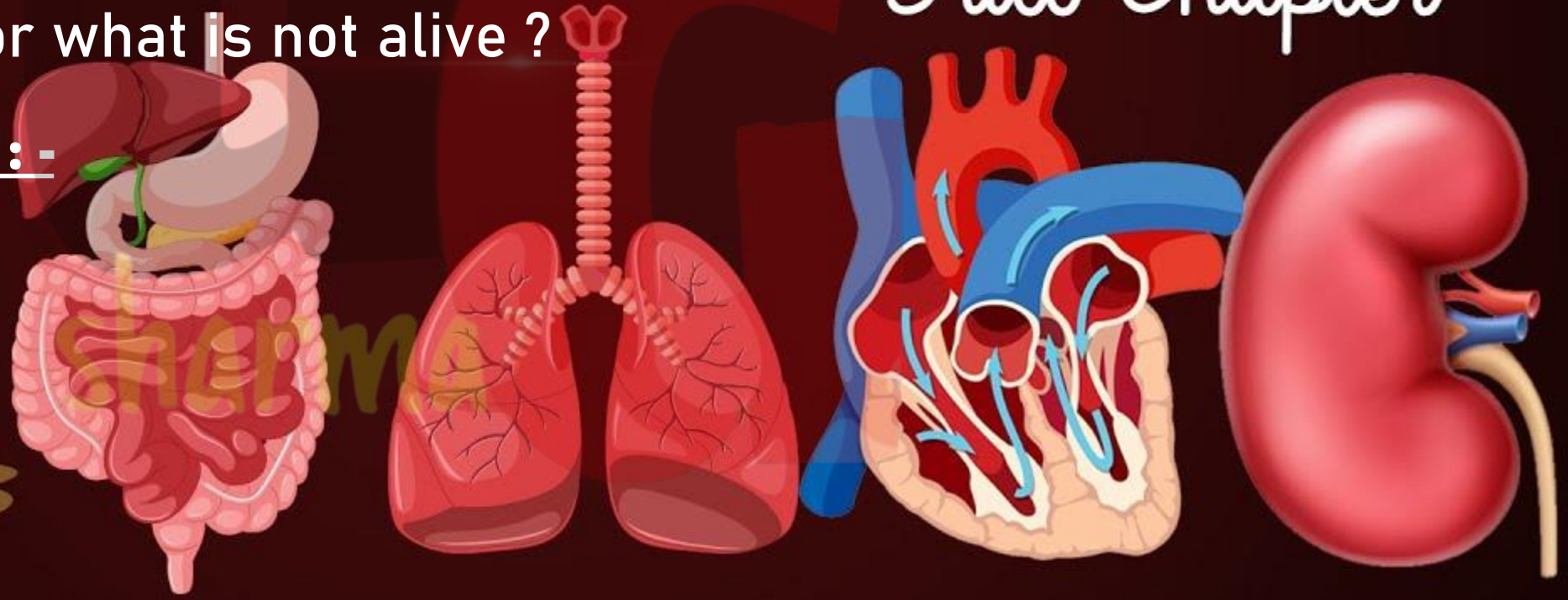
Full Chapter

How do we tell the difference between what is alive or what is not alive ?

Topics to be covered : -

- Nutrition
- Respiration
- Transportation
- Excretion





Life process :- The basic function performed by living organism to maintain their life on this earth are called life process.

These are nutrition, respiration, transportation and excretion etc.

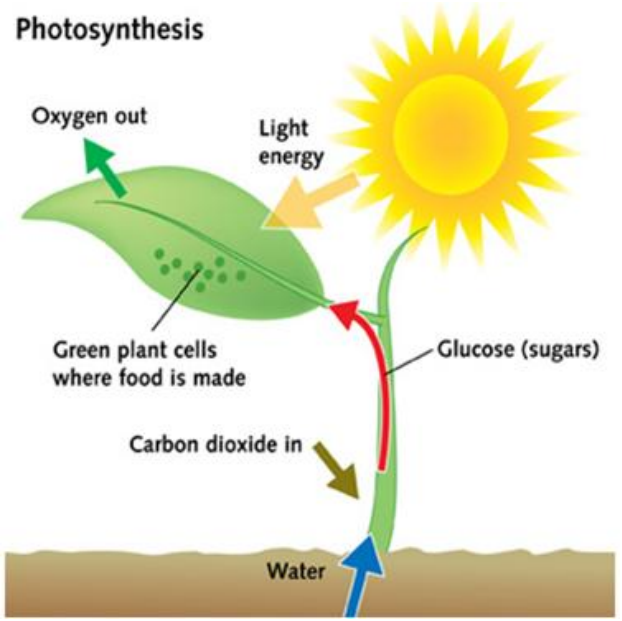
Life process

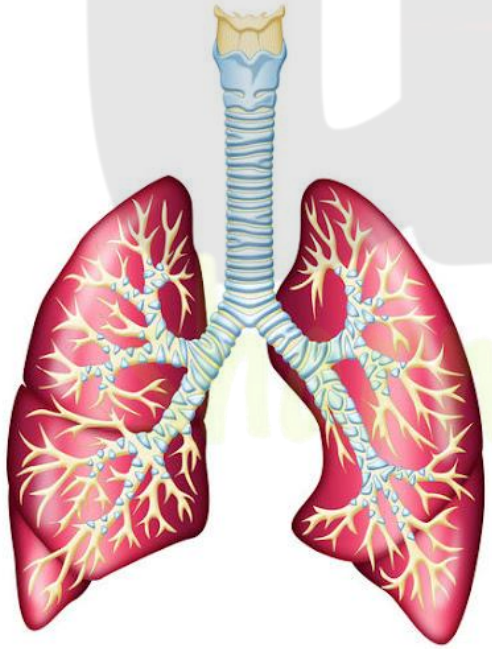
Nutrition

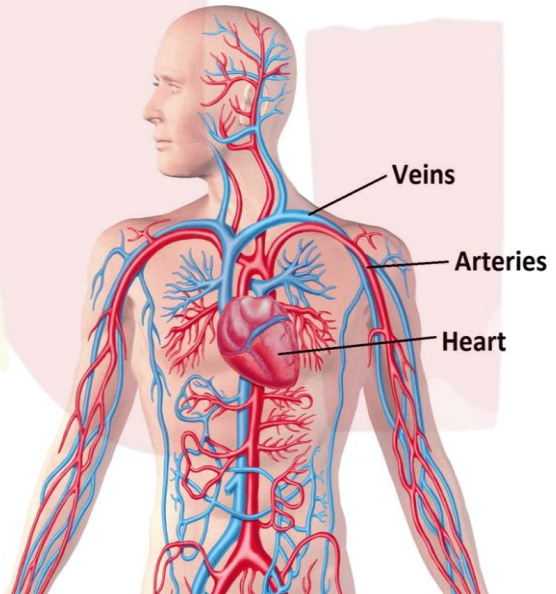
Respiration

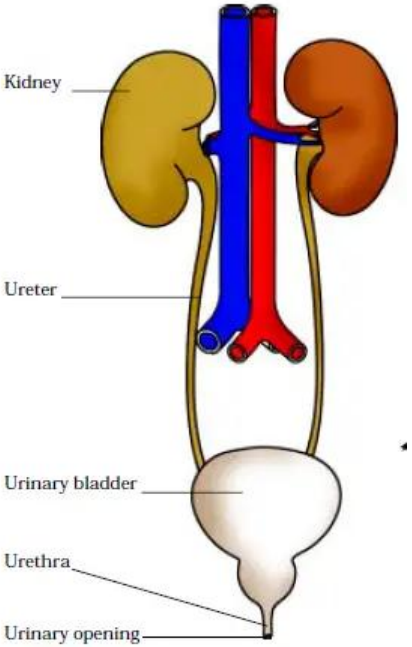
Transportation

Excretion









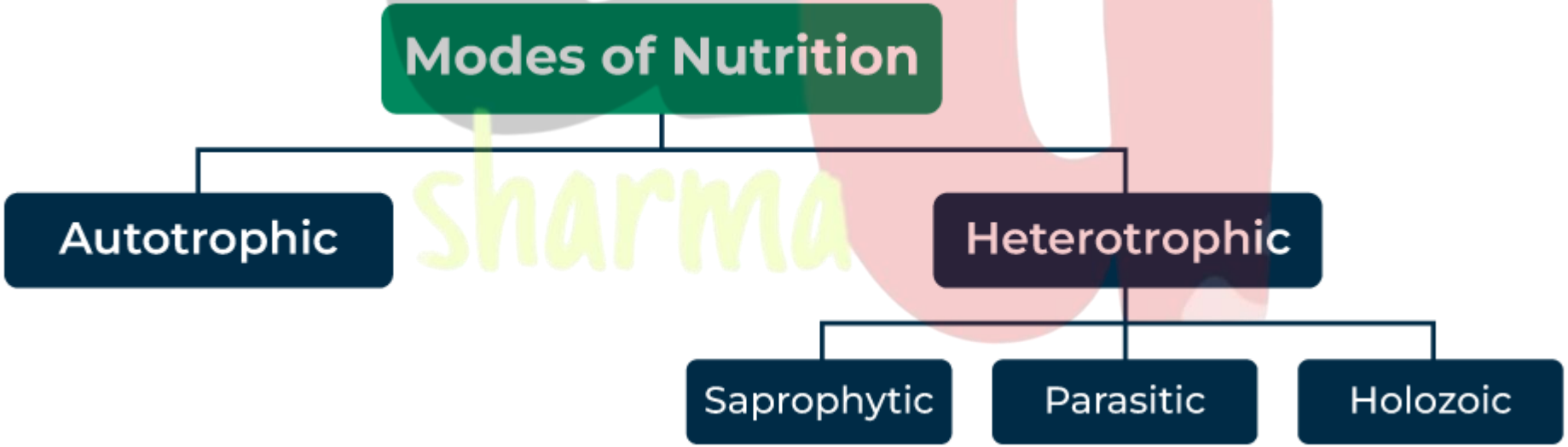
Nutrition

The process of taking in food and utilising it is called nutrition.

Nutrition comes from the word “nutrient” (which means substances obtain from its surrounding as carbohydrates, fats, proteins, minerals, vitamins and water).

➡ There are two modes or methods of nutrition :-

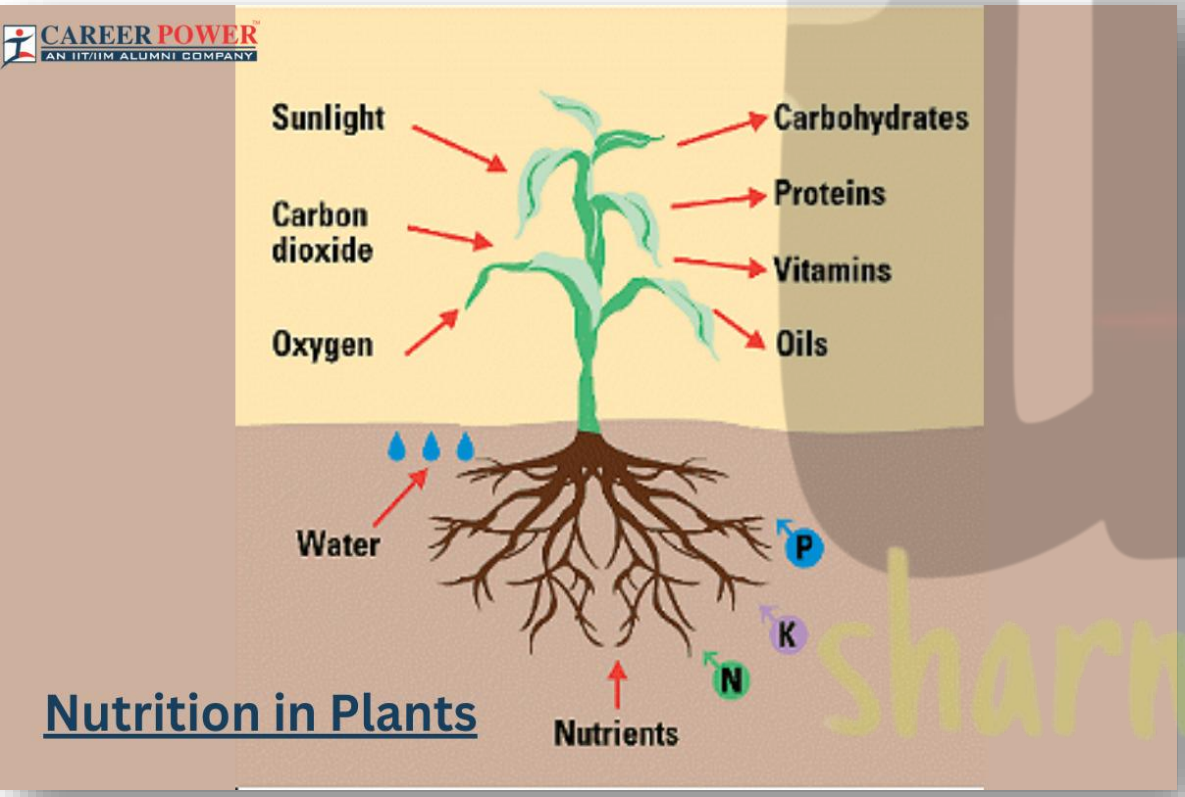
1. Autotropic Nutrition
2. Heterotrophic Nutrition



Modes of Nutrition

AUTOTROPHIC

HETEROTROPHIC

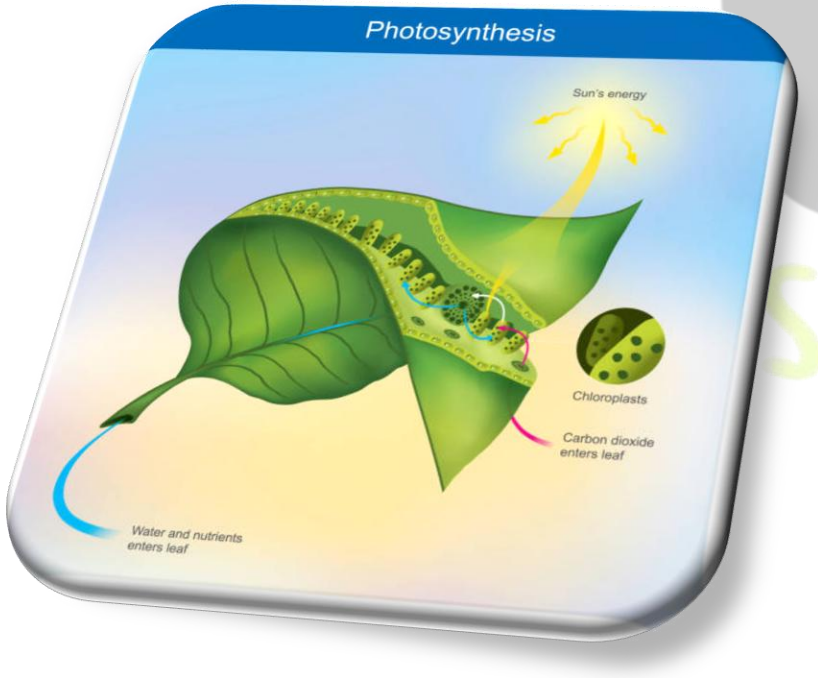


Autotrophic mode of nutrition

Autotrophic nutrition means 'self nutrition'.

Autotrophic nutrition is that nutrition in which an organism makes its own food.
Example :- Green plants & some bacteria as nitrifying bacteria, cyanobacteria, etc

The autotrophic organisms (or autotrophs) contain the green pigment called chlorophyll which is capable of trapping sunlight energy.



Heterotrophic mode of nutrition

Hetero means other and trophic refers to nutrition.

Heterotrophic nutrition is that mode of nutrition in which an organism depends on other organisms for its food.

Example :- Animals, non-green plants (like mushrooms, fungi), yeasts, most bacteria, etc

TYPES OF HETEROTROPHIC NUTRITION

Saprotrophic Nutrition

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

Example

- Fungi
- Bread moulds

Parasitic Nutrition

Obtains nutrients from **living organisms**. The parasite obtains nutrients by living on or in the body of the host

Example

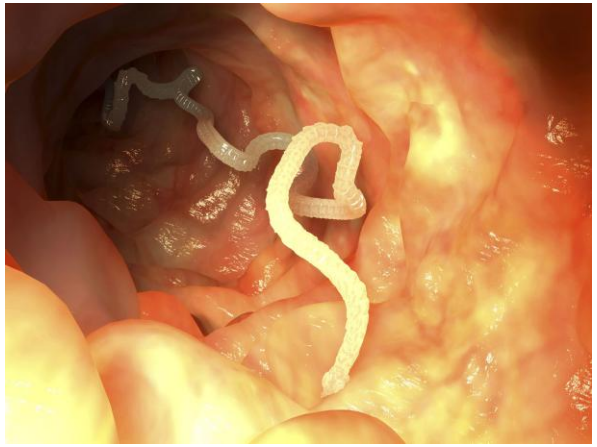
- Cuscuta
- Tapeworm

Holozoic Nutrition

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

Example

- Human Beings
- Animals



Nutrition in plants

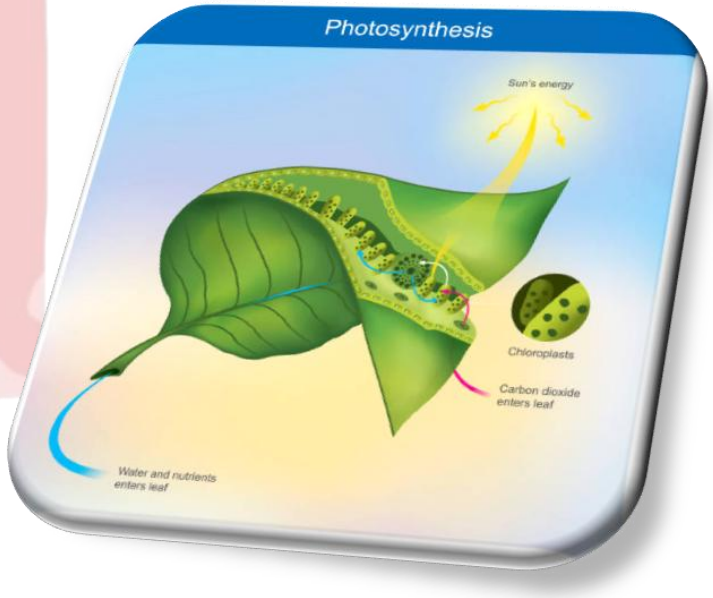
Green plants prepare their own food by the process of "**photosynthesis**".

Photosynthesis :- The process by which green plants make their own food from carbon dioxide and water by using sunlight in the presence of Chlorophyll.

$$\underset{\text{Carbon Dioxide}}{6\,CO_2} + \underset{\text{Water}}{6\,H_2O} \xrightarrow[\textit{Chlorophyll}]{\textit{Sunlight}} \underset{\text{Carbohydrate}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6\,O_2}$$

Chlorophyll :- The Green Pigment which is present in the chloroplast is known as chlorophyll.

- During photosynthesis solar energy (i.e light energy) is converted into chemical energy which result in the formation of carbohydrates.
- Green parts of plant (like leaves) are the main site of Photosynthesis.



Nutrition in plants

- The steps of photosynthesis need not to take place one after the other immediately.

❑ **Events/steps of photosynthesis**

I. **Absorption of light energy by chlorophyll.**
II. **Conversion of light/solar energy into chemical energy & splitting of water molecule into hydrogen and oxygen.**
III. **Reduction of carbon dioxide to carbohydrates**

❑ **Gaseous exchange**

I. **Gas used – carbon dioxide**
II. **By product – oxygen**

❑ **Raw materials and their sources**

I. **Carbon dioxide :- terrestrial (land) plants from air & aquatic plants from water.**
II. **Water :- soil**
III. **Minerals :- soil**

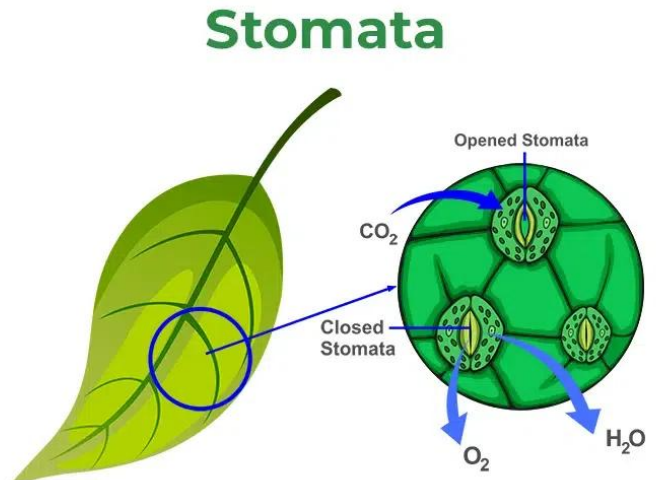
Nutrition in plants

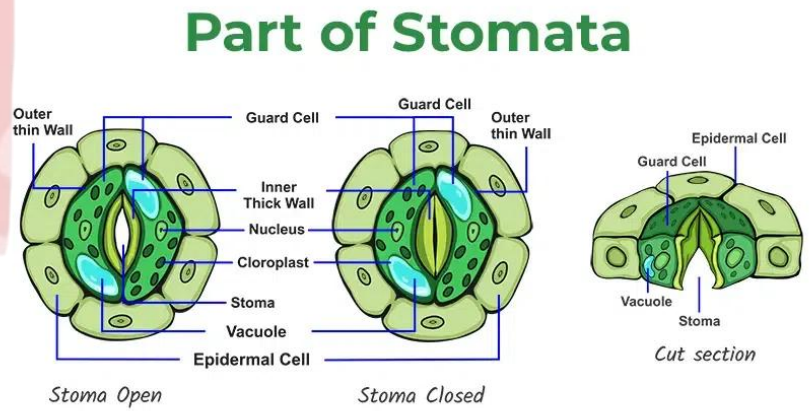
Stomata :- The tiny pores present in the epidermis of leave or steam through which gaseous exchange & transpiration occurs.

Transpiration :- The loses of water in form of water vapour from aerial part of the plants.

Functions of stomata :-

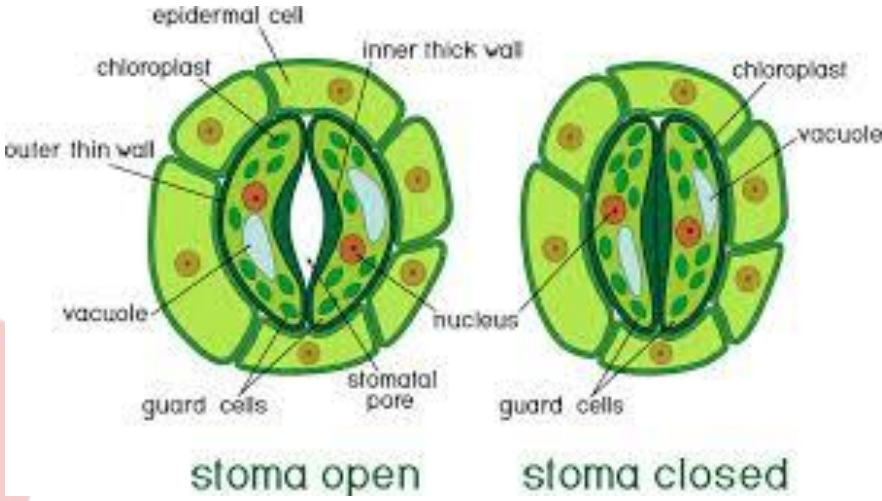
- Exchange of gases (O_2 and CO_2)
- Losses of a large amount of water in form of water vapour during transpiration

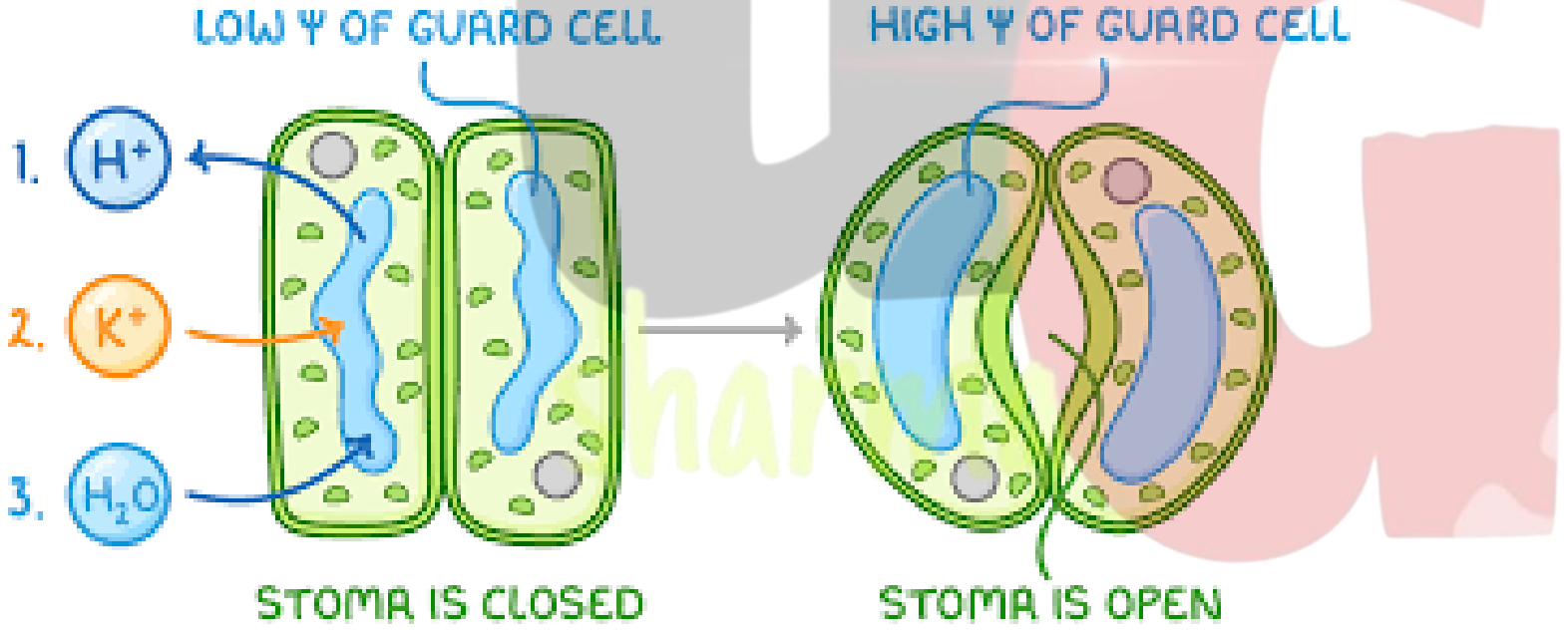




Opening and closing of stomatal pores

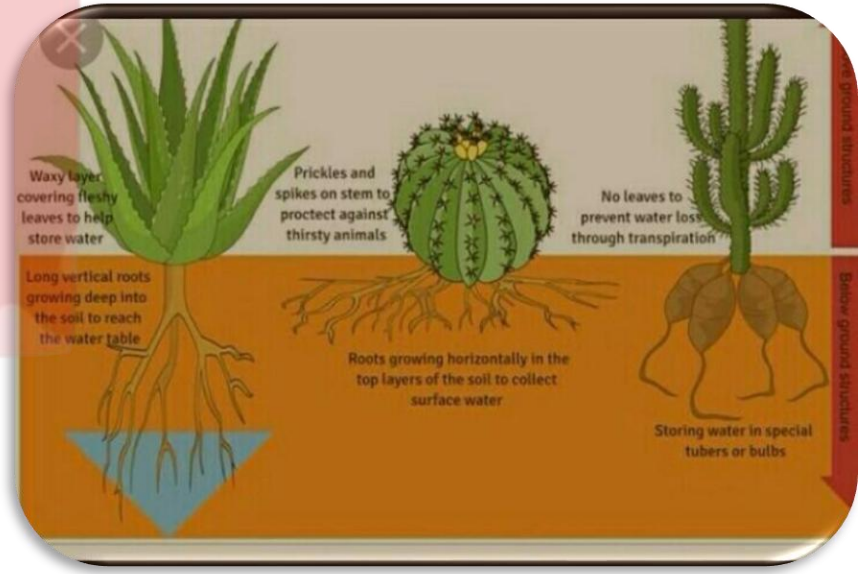
- The opening and closing of stomatal pores are controlled by guard cells.
- When guard cells uptake water from surrounding cells, they swell causing for the opening of stomata.
- When guard cells released water, they become shrinking cause to closing the stomatal pores.





How desert plants perform photosynthesis ?

- Desert plants perform photosynthesis primarily at night to minimize water loss during the hot, dry daytime.
- They take in carbon dioxide at night and store it, using it for photosynthesis during the day when their stomata are closed.
- During day, they closed their stomatal pores to minimize the loses of water in form of water vapour through the processes of transpiration.
- Thus, desert plants perform photosynthesis during day but they stores carbon dioxide in night so that they can reduce their water loses which help them in their survival.
- This adaptation is known as Crassulacean Acid Metabolism (CAM) photosynthesis.



NUTRITION

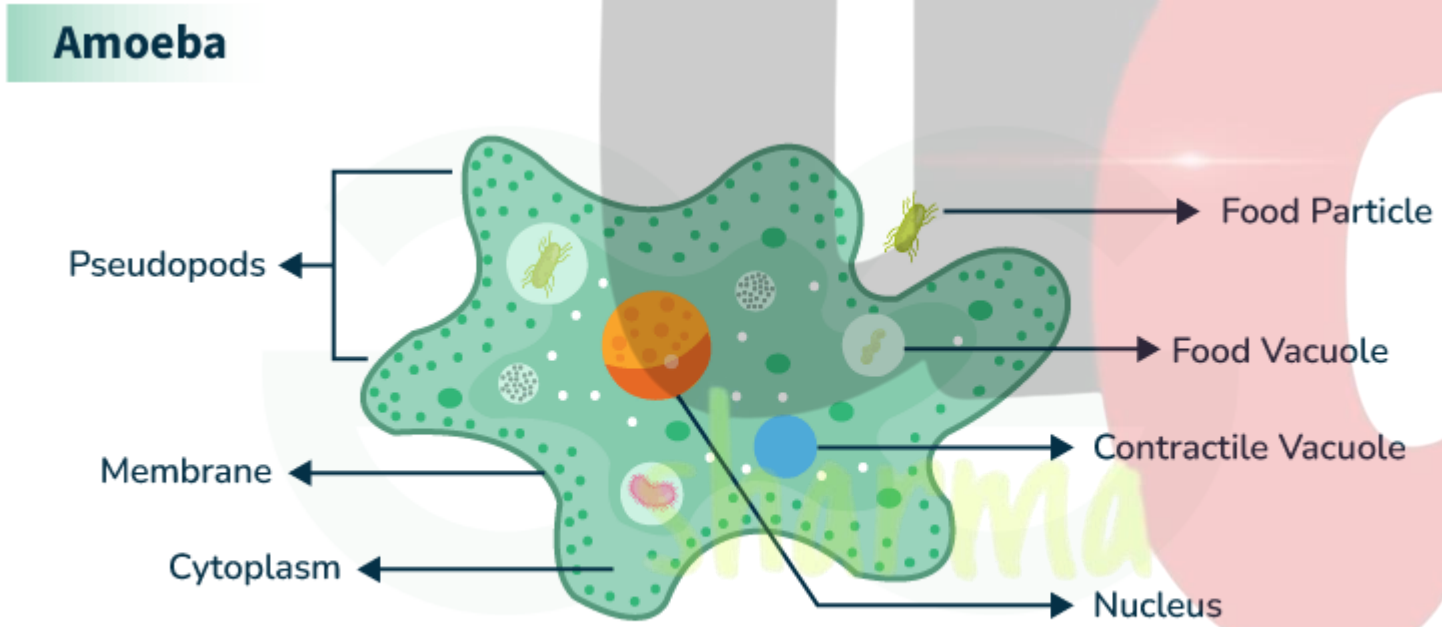
Nutrition involves five steps, these are :-

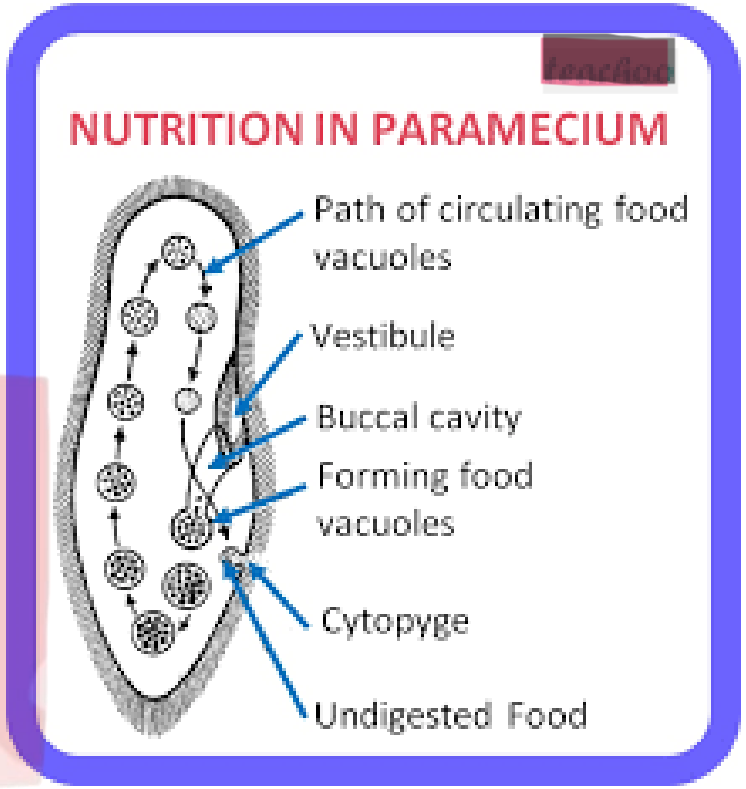
1. **Ingestion** :- Intake of food.
2. **Digestion** :- Breakdown of complex food into simpler components.
3. **Absorption** :- Absorption of digested food its movement.
4. **Assimilation** :- Utilisation of digested food.
5. **Egestion** :- Removal of wastes from body.

Nutrition in unicellular organism

In unicellular organisms, nutrition occurs through processes like phagocytosis, where the entire cell engulfs food particles, or through diffusion and osmosis for smaller molecules. These organisms digest food within the cell, typically in food vacuoles, and absorb nutrients directly into the cytoplasm.

Example :- Amoeba, paramecium





Nutrition in Amoeba

Pseudopodia (extension of the cell membrane)

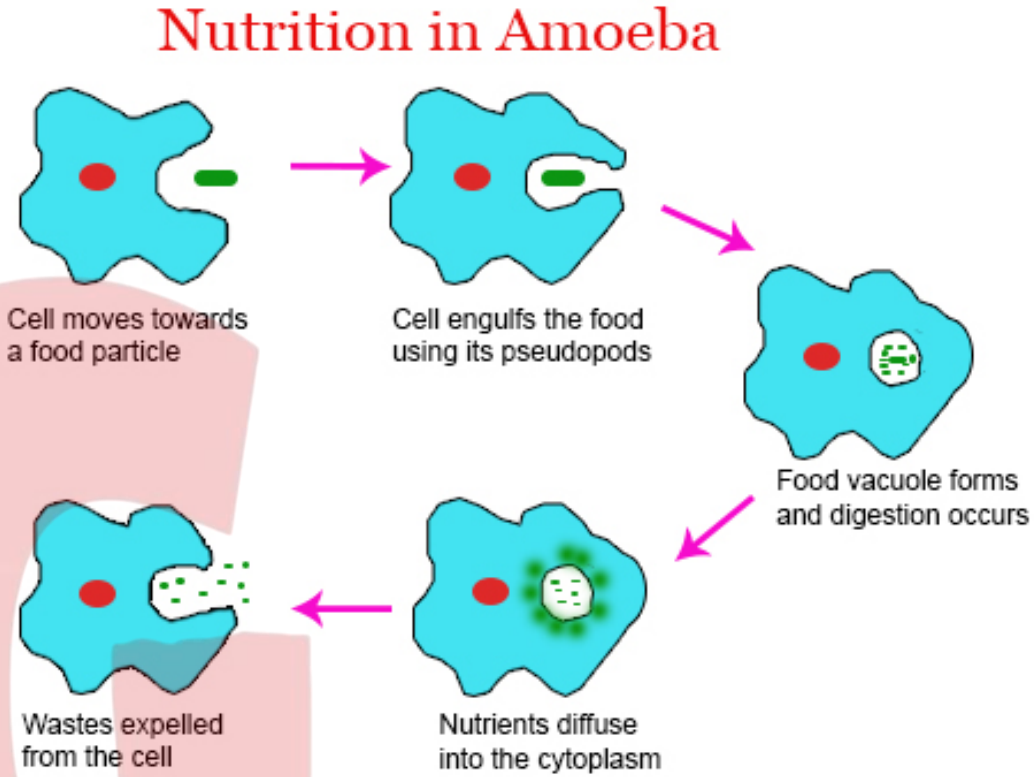
- Capture food and form food vacuole

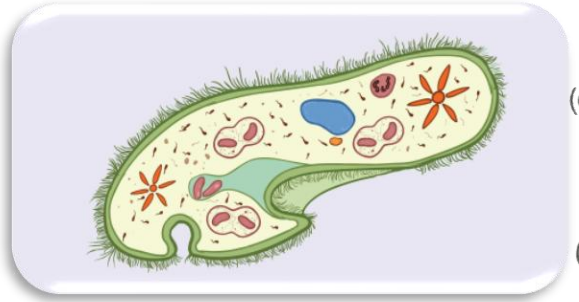
Digestion of food in food vacuole

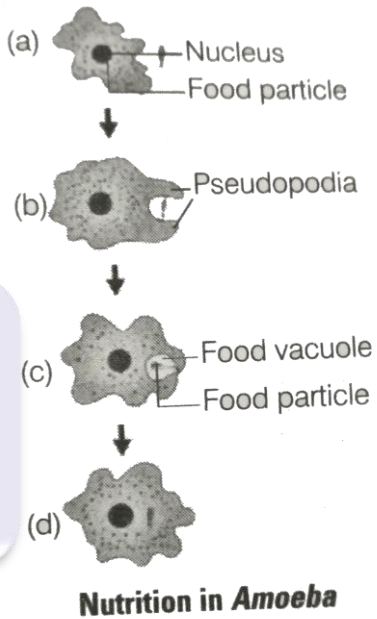
- Digested food diffused to cytoplasm

Undigested food moves towards cell surface

- And it throw out.







Paramecium :- Cilia (present all over the body) → Take in food

Nutrition in Animals (Human beings)

- The alimentary canal is basically a long tube extending from the mouth to the anus.
- Human alimentary canal is about 9 metres long tube.

01. Ingestion

Mouth :- Intake of whole food.

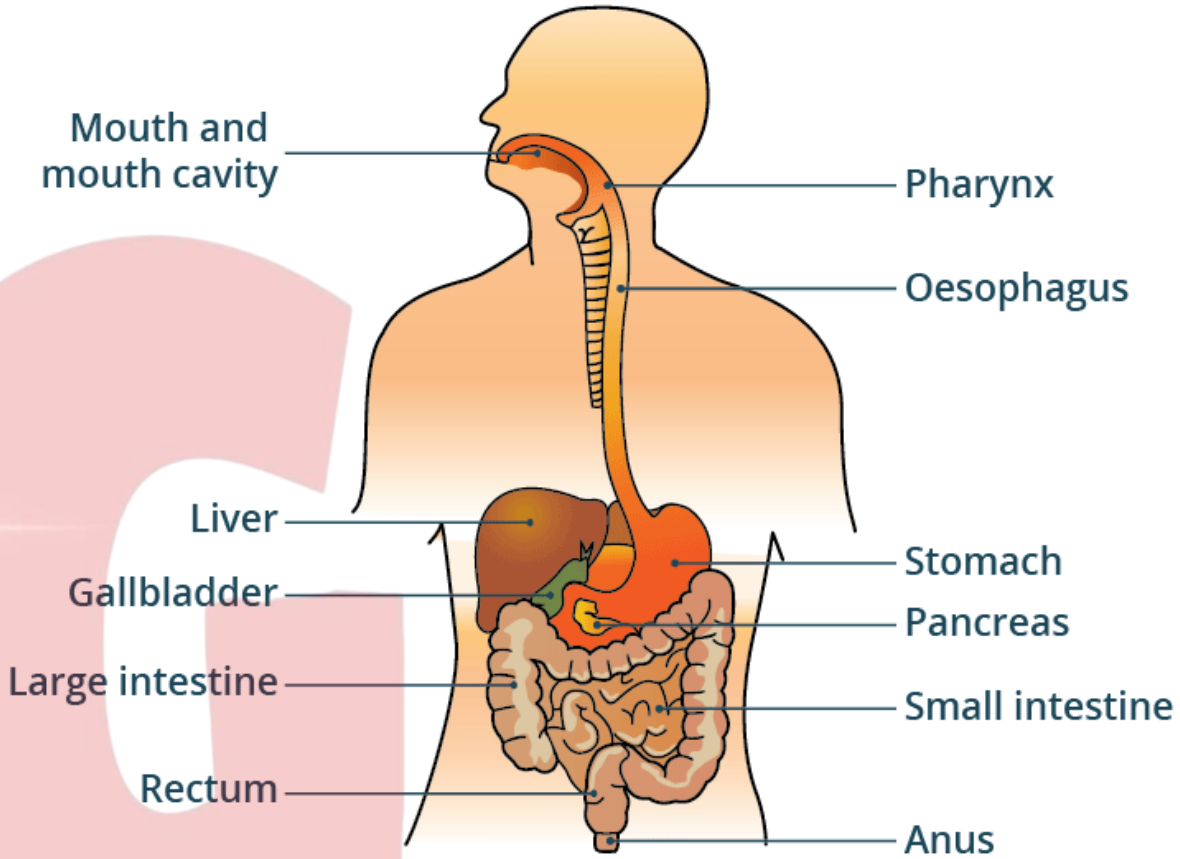
02. Digestion

Teeth :- Chewing/grinding of food help in physical digestion.

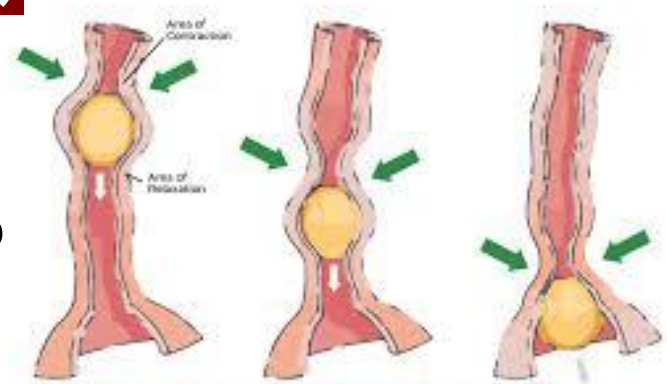
Salivary Glands :- Secrete saliva

Saliva contain an enzyme called salivary amylase that breakdown (or convert) starch or carbohydrate into glucose.

Tongue :- Mix saliva and make food swallowing and push down the food into food pipe.



Nutrition in Animals (Human beings)



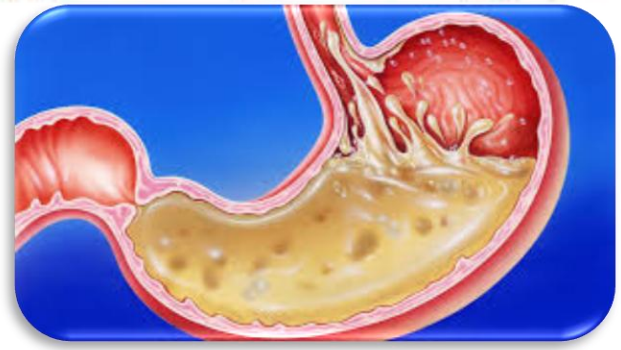
Food pipe or oesophagus :-

Taking food from mouth to a stomach by peristaltic moments.

Peristaltic moments :- Contraction & expansion of wall of food pipe which help in movement of food particles.

Stomach :-

- Gastric glands present in stomach's wall secrete gastric juice.



Gastric Juices

Pepsin

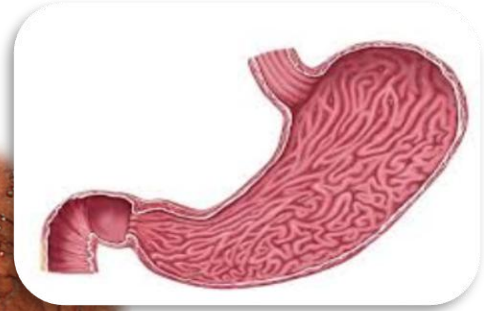
Enzyme that breaks down proteins

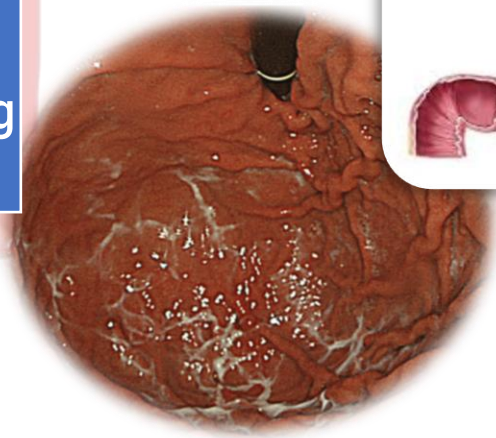
HCl

Make the medium acidic

Mucus

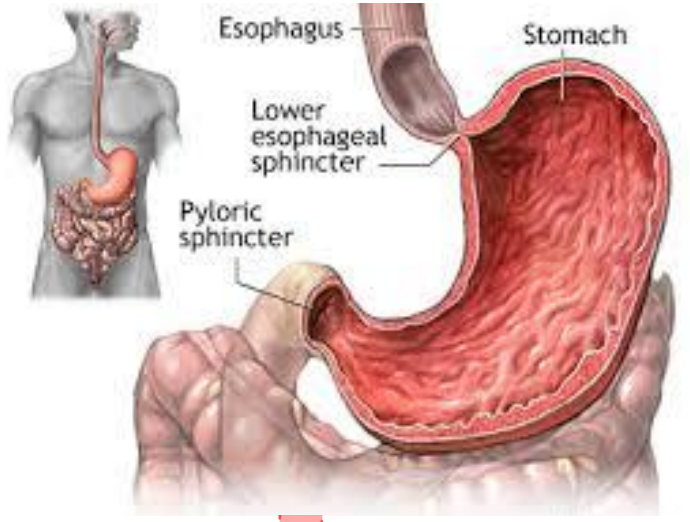
Protects inner lining of the stomach





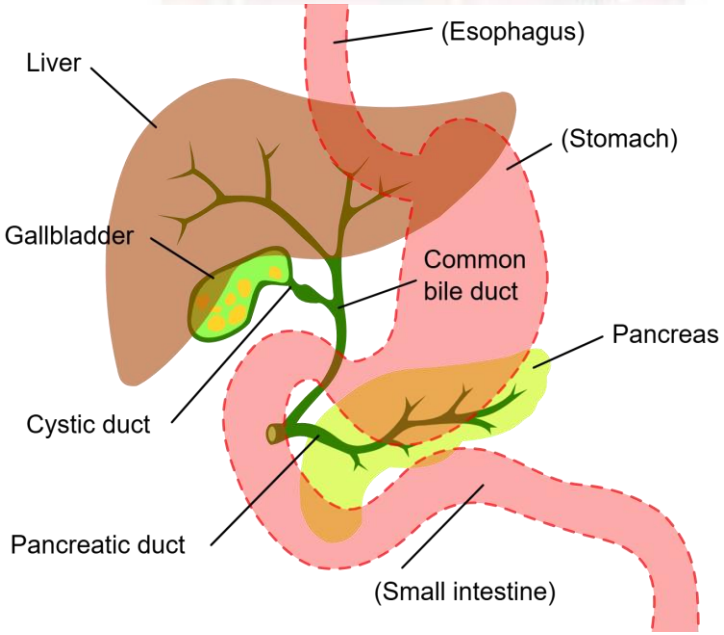
Nutrition in Animals (Human beings)

- Food becomes acidic due to secretion of HCl.
- The digestive enzyme pepsin is active only in the presence of acid (or in acidic medium)
- The exit of food from stomach is regulated by a **sphincter muscle** which releases it in a small amount into the small intestine.



Small Intestine :-

- Longest part of alimentary Canal.
- About 6.5 metres long in an adult man.
- The small intestine is the site of complete digestion in human being.
- Herbivores eating grass needs a longer small intestine to digest cellulose and carnivores like tiger have a shorter small intestine.



❖ A small intestine receives the secretion of two glands:-

i. **Liver :-** secrets bile juice (greenish yellow)

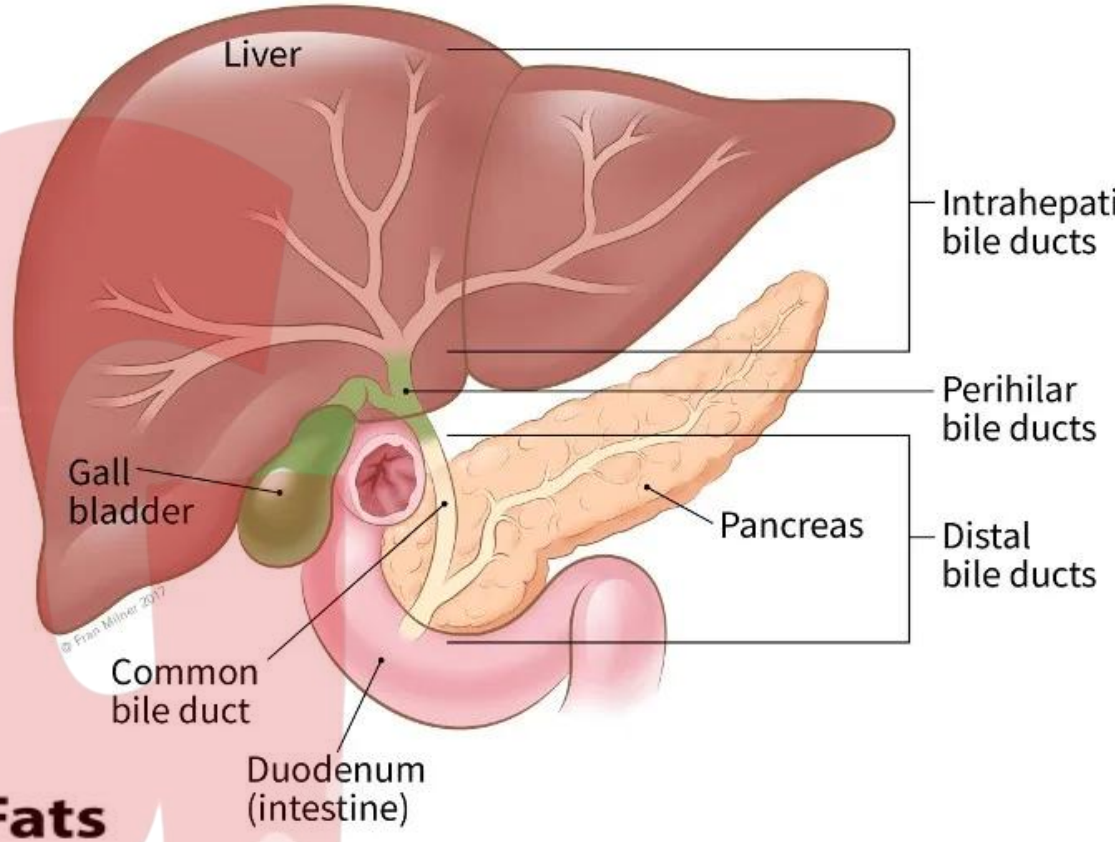
ii. **Pancreas :-** secret Pancreatic Juice Which contain digestive enzymes like amylase, trypsin and lipase.

NOTE :- Bile juice is stored in the gall bladder.

Nutrition in Animals (Human beings)

Bile Juice performs two functions :-

- Make acidic food coming from a stomach **alkaline,** so that pancreatic enzymes can act.
- Break the fats present in the food into smaller globules making it easy for the enzymes to act and digest them.

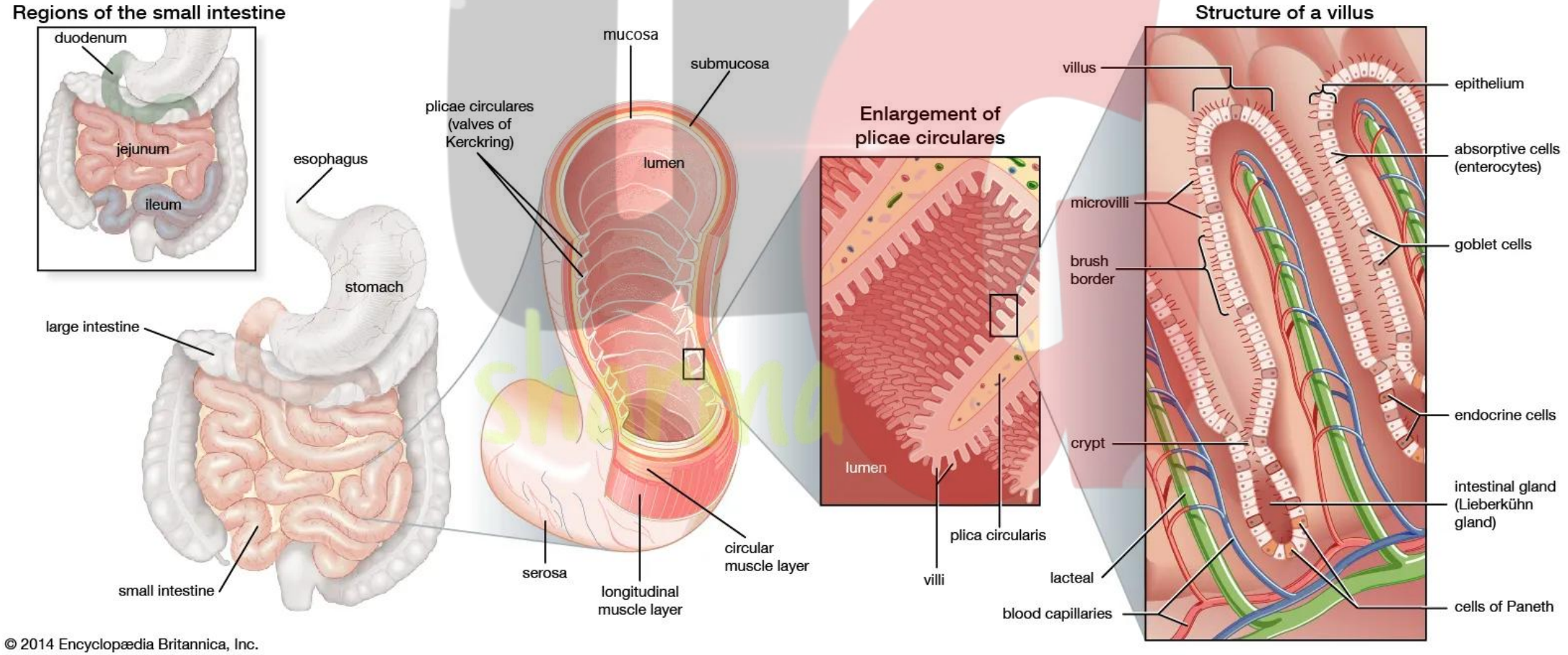


❖ **The digestive enzymes present in pancreatic juice digest as :-**

- Amylase :- Digest / breakdown their starch.
- Trypsin :- Digest protein.
- Lipase :- Breakdown emulsified fats.

Nutrition in Animals (Human beings)

- **The wall of small intestine contain glands with secrete intestinal juice which convert**
  - Carbohydrate into glucose
  - Fats into fatty acid and glycerol
  - Proteins into amino acids

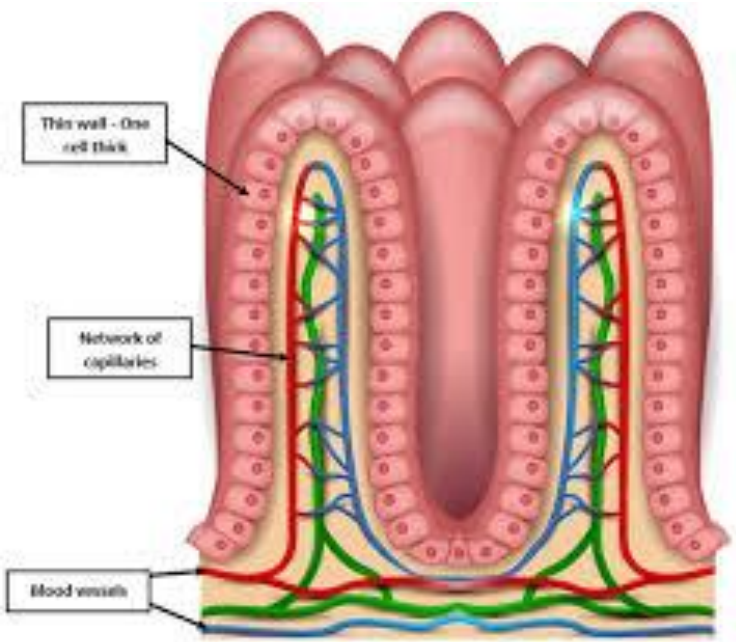


Nutrition in Animals (Human beings)

03. Absorption

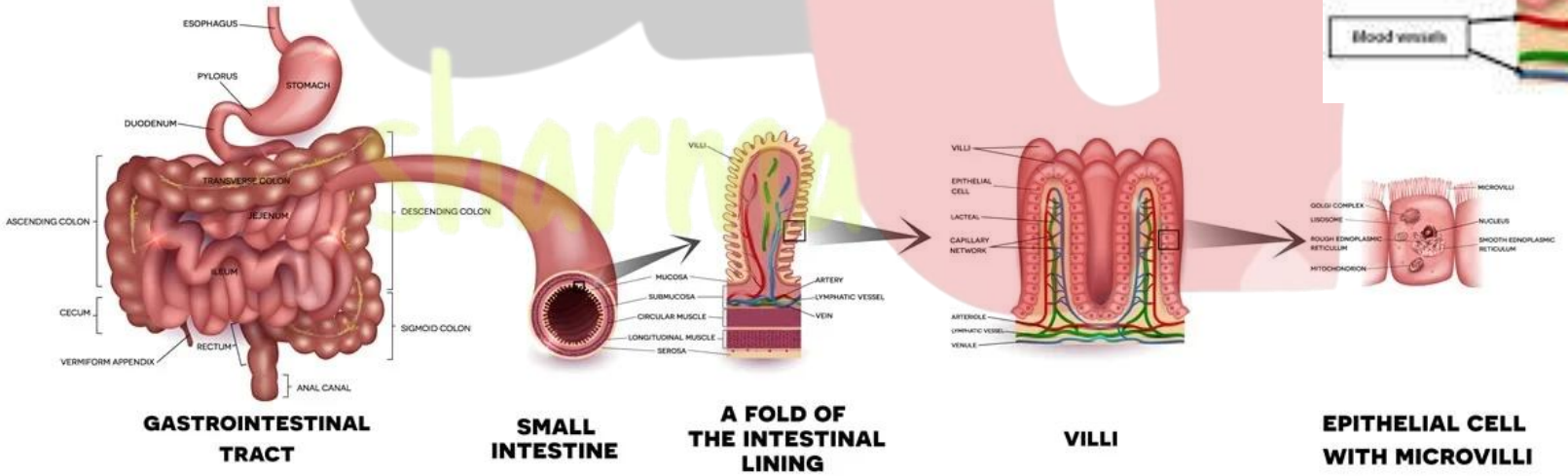
Small intestine :-

- The finger likes projection present in the inner surface of a small intestine called villi.
- Digested food absorbed through villi which connect with blood vessels.
- Main absorption site.



Large intestine :-

- Absorb excess water



Nutrition in Animals (Human beings)

04. Assimilation

Blood carries digested food to all parts of the body cell for obtaining energy which is used in repair of the body and growth.

NOTE :- The digested food which is not used by our body immediately is stored in the liver in the form of a carbohydrate called “glycogen”

04. Egestion

- The rest of the material which become waste for the body is removed from the body through the anus.
- The exit of the faces of is controlled by **“anal sphincter”**

QUESTIONS

1. Why is diffusion insufficient to meet the oxygen requirements of multi-cellular organisms like humans?
2. What criteria do we use to decide whether something is alive?
3. What are outside raw materials used for by an organism?
4. What processes would you consider essential for maintaining life?

QUESTIONS

1. What are the differences between autotrophic nutrition and heterotrophic nutrition?
2. Where do plants get each of the raw materials required for photosynthesis?
3. What is the role of the acid in our stomach?
4. What is the function of digestive enzymes?
5. How is the small intestine designed to absorb digested food?

What is the role of acid in our stomach ?

The role of acid in our stomach are :-

i. It makes the food acidic which cause to the active of pepsin.

ii. It kill the germs present in food

(a) Why is nutrition necessary for the human body?

(b) What causes movement of food inside the alimentary canal?

(c) Why is small intestine in herbivores longer than in carnivores?

(d) What will happen if mucus is not secreted by the gastric glands? (2020)

Explain with the help of neat and well labelled diagrams the different steps involved in nutrition in Amoeba.

(a) Why is nutrition necessary for the human body?

(b) What causes movement of food inside the alimentary canal?

(c) Why is small intestine in herbivores longer than in carnivores?

(d) What will happen if mucus is not secreted by the gastric glands? (2020)

RESPIRATION

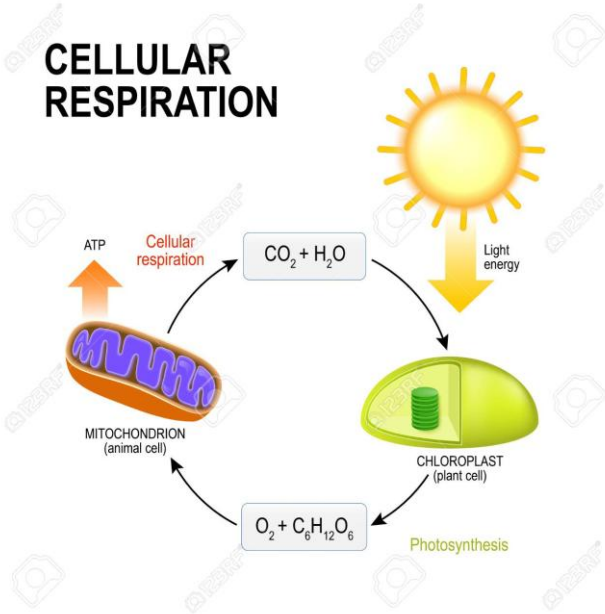
Respiration :- The process of releasing energy from food is called respiration.

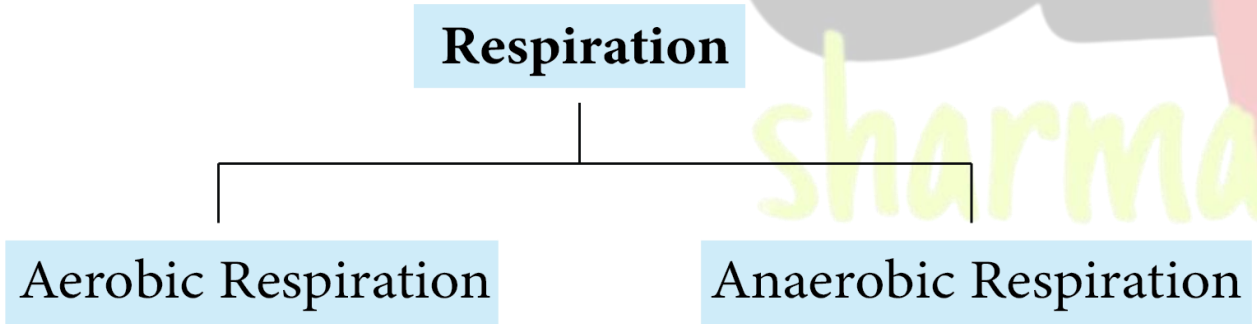
Or, Oxidation of food is called respiration.

Food + Oxygen → Carbon dioxide + Water + Energy

The process of respiration which releases energy takes place inside the cells in the body. So, it is also known as cellular respiration.

- Breathing is just intake of oxygen and release of carbon dioxide, while respiration is the process of releasing of energy.
- The first step is the breakdown of glucose (6-carbon molecule) into three molecule called pyruvate Which take place in the cytoplasm.
- The oxidation of the glucose to Pyruvic acid or (pyruvate) is called glycolysis.

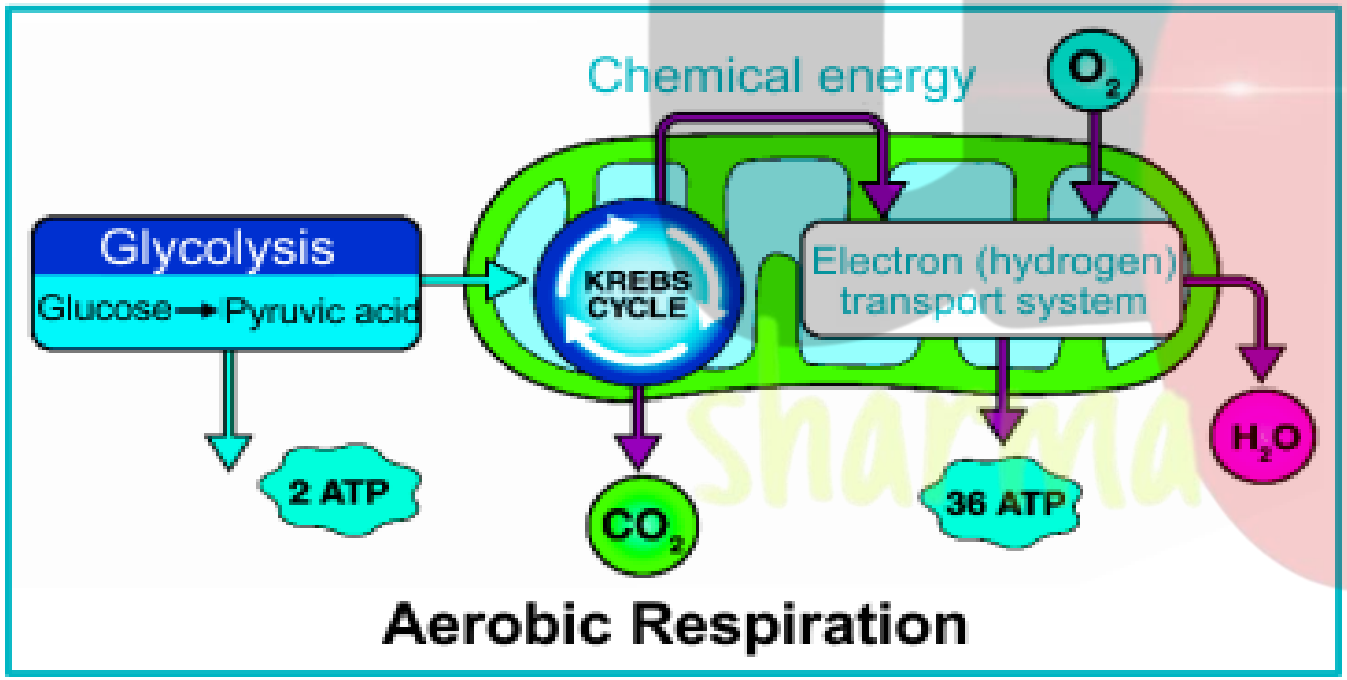




01. Aerobic Respiration

- Aerobic means with air.
- Respiration occurs in presence of oxygen.
- Site of aerobic respiration is mitochondria in cells. Example :- Human

Glucose (1-molecule, $C_6H_{12}O_6$) —Glycolysis (In cytoplasm)→ Pyruvate (2-molecule, $C_3H_3O_3$) —oxygen (In mitochondria)→ $6CO_2 + 6H_2O$ + 38 ATP Energy



Aerobic Respiration

02. Anaerobic Respiration

- Respiration occurs without oxygen.
- Eg :- Yeast
- The whole process of an aerobic respiration takes place in cytoplasm of the cells.

Glucose (1-molecule $(C_6H_{12}O_6)$) $\xrightarrow{\text{Glycolysis (In cytoplasm)}}$ Pyruvate (2-molecule $(C_3H_3O_3)$) $\xrightarrow{\text{(In absence of oxygen)}}$ Ethanol + $6CO_2$ + 2 ATP Energy

- In human during vigorous physical exercise. In lack of oxygen muscle respire as:-

Glucose (1-molecule $(C_6H_{12}O_6)$) $\xrightarrow{\text{Glycolysis (In cytoplasm)}}$ Pyruvate (2-molecule $(C_3H_3O_3)$) $\xrightarrow{\text{(In lack of } O_2\text{) (muscle cells)}}$ Lactic acid + 2 ATP Energy

- The formation of lactic acid causes muscular cramps{pain}

RESPIRATION

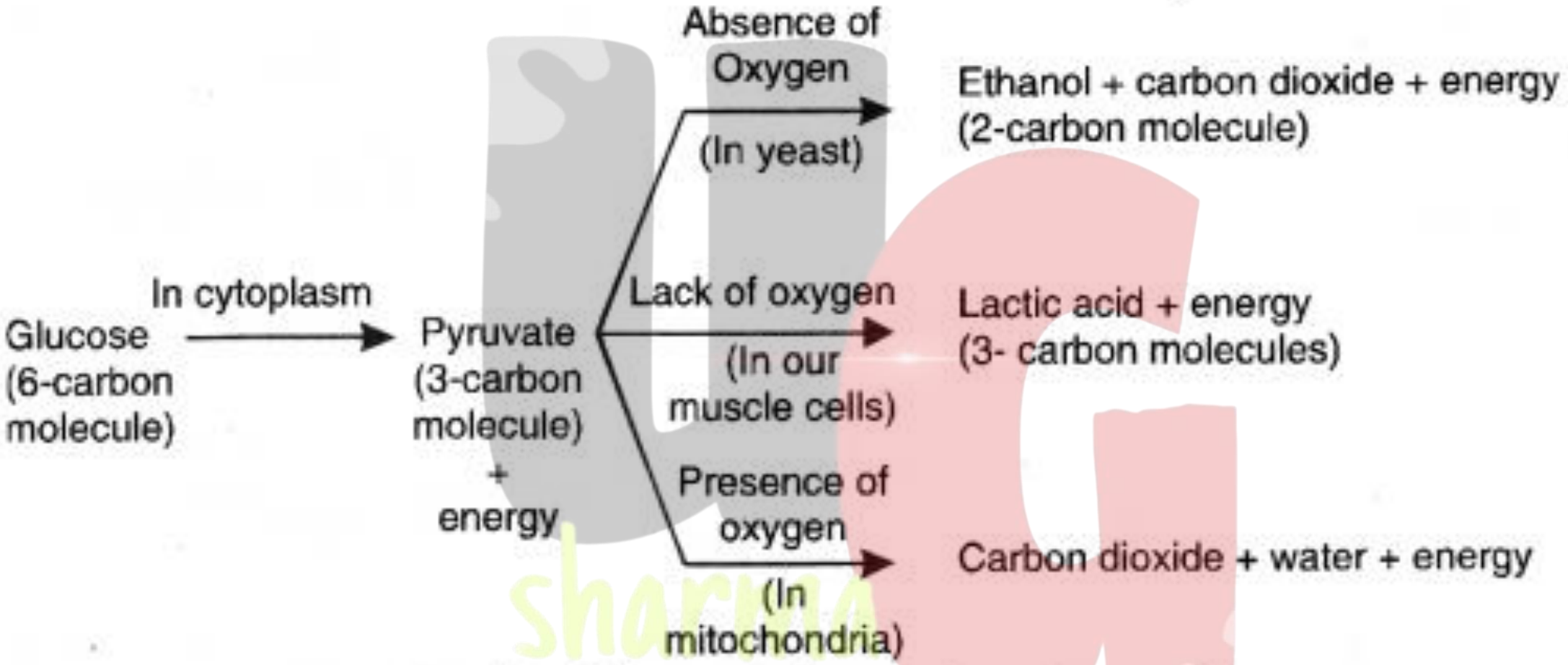
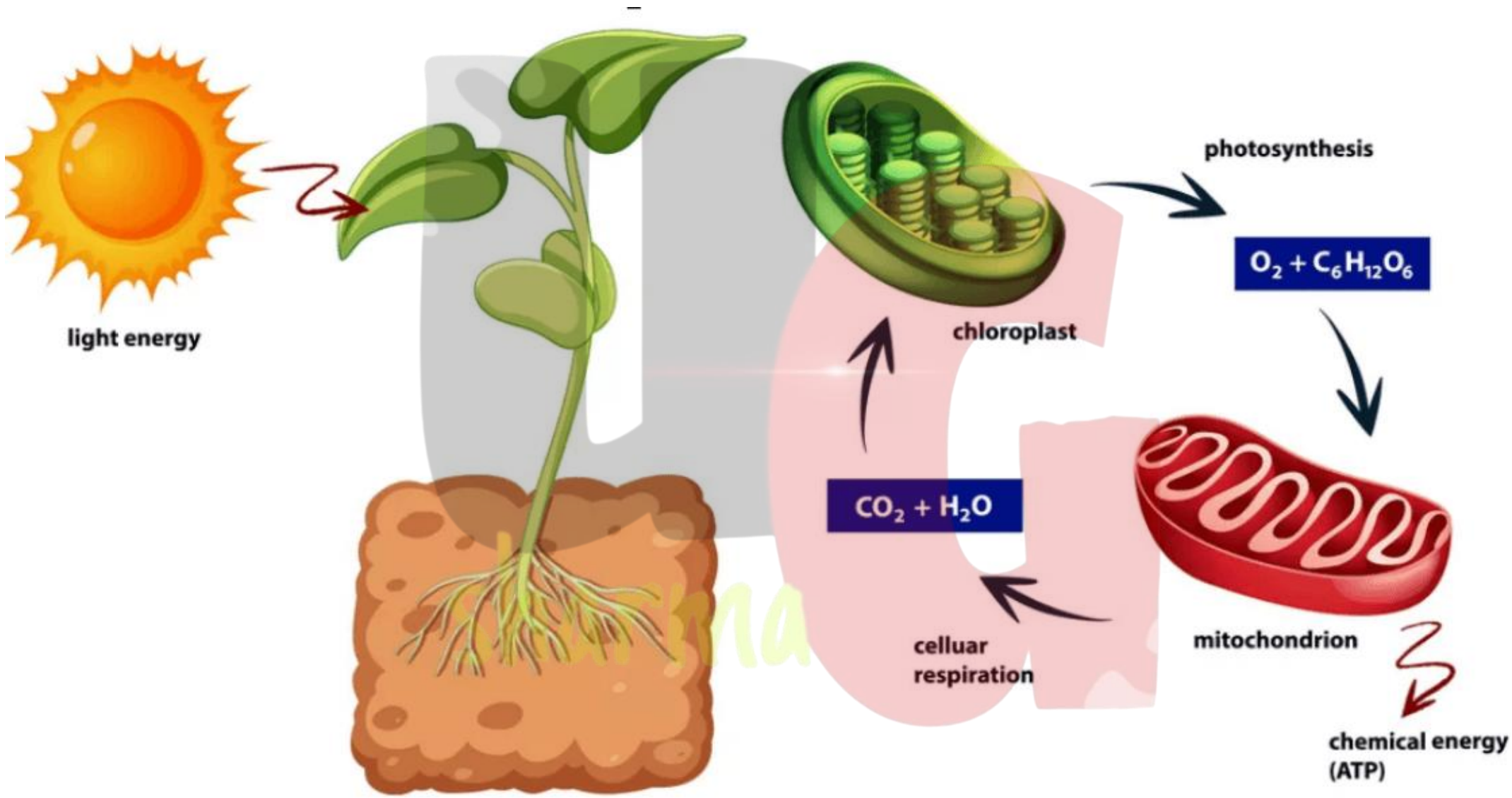


Fig. 1.27. *Breakdown of glucose by various pathways.*

RESPIRATION IN PLANTS



RESPIRATION IN PLANTS

- Plants get oxygen by diffusion.
- Respiration takes place in plants from various organ :-

1. In roots by the help of Root hairs
2. In stems by lenticel (present in bark of steam).
3. In leaves by to stomata

- Respiration in leaves occurs during the day as well as night but photosynthesis occurs only in day.
- Oxygen and carbon dioxide is known as respiratory gases.

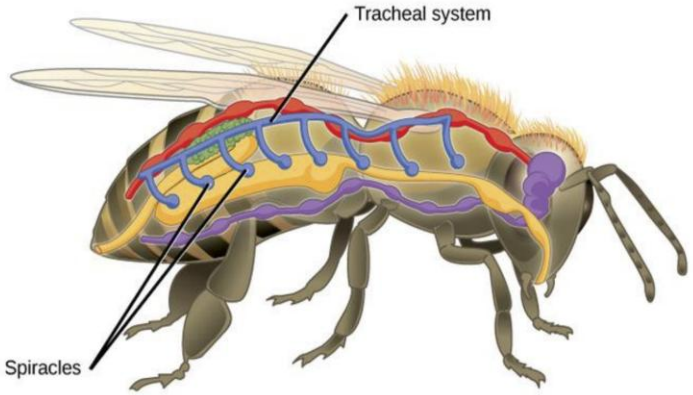
Aerobic respiration	Anaerobic respiration
1. Aerobic respiration requires molecular oxygen.	1. Anaerobic respiration does not require molecular oxygen.
2. Aerobic respiration occurs in cytoplasm and mitochondria.	2. Anaerobic respiration occurs in cytoplasm only.
3. The end products are CO_2 and H_2O.	3. The end products are CO_2 and C_2H_5OH.
4. Large amount of energy is liberated during aerobic respiration.	4. Small amount of energy is liberated during anaerobic respiration.
5. In aerobic respiration, the respiratory materials are completely oxidized.	5. In anaerobic respiration, the respiratory materials are incompletely oxidized.
6. During aerobic respiration, 38 ATP molecules are generated.	6. During anaerobic respiration, only 2 ATP molecules are generated.
7. **Reaction :** $C_6H_{12}O_6 + 6O_2 \longrightarrow 6H_2O + 6CO_2 + 686$ kcal	7. **Reaction :** $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 50$ kcal

RESPIRATION IN ANIMALS

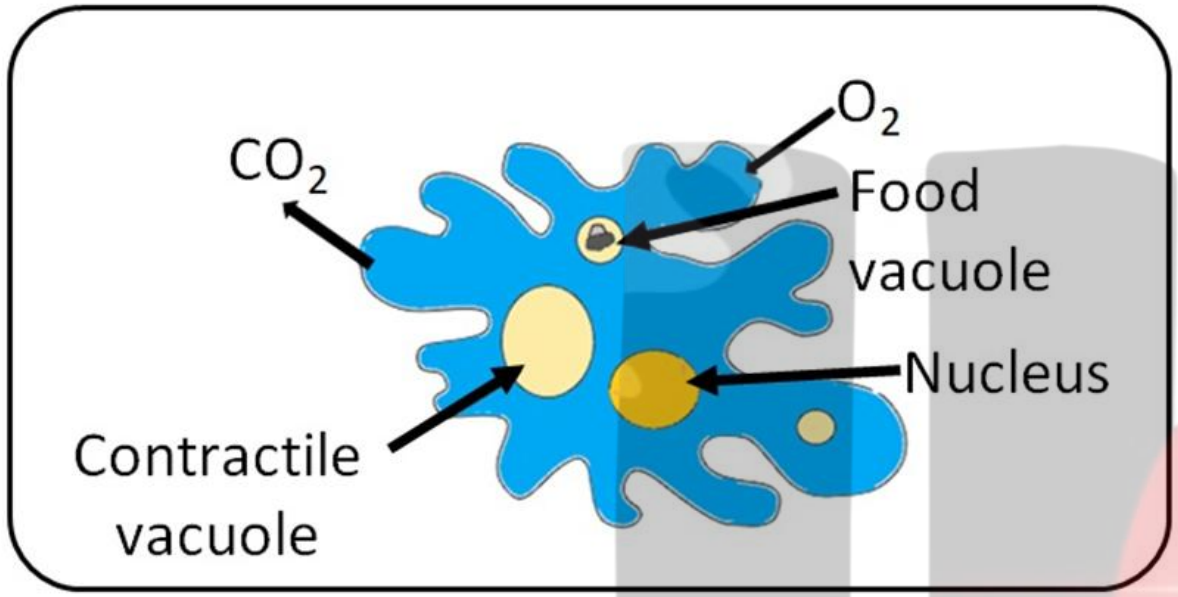
- The rate of breathing in aquatic animals is much greater than in terrestrial animals to get more oxygen.
- The tiny holes on insects body called spiracles and air tube called tracheae.

- Different animals have different mode of respiration.

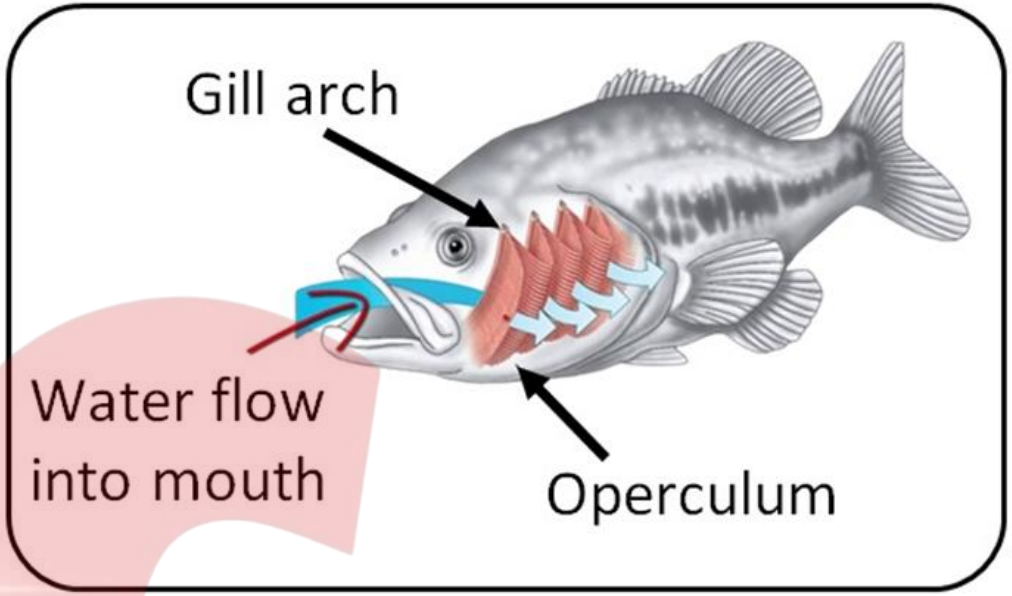
Respiratory organ	Animals
Cell membrane	Amoeba, Planaria Paramecium
Skin	Earthworms, frog, leech
Gills	Aquatic animals like fish, prawns and mussels
Lungs	Man, birds, lizard, dog and frog, etc



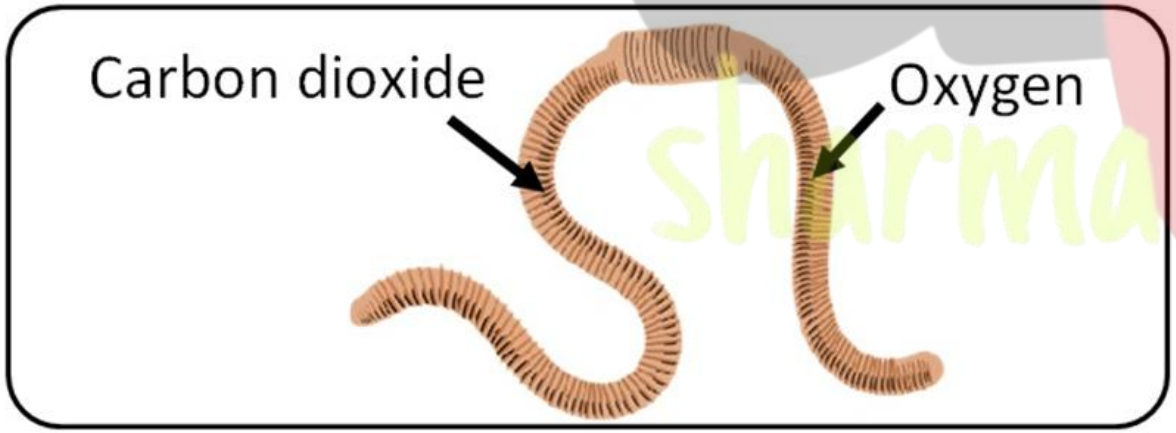
RESPIRATION IN ANIMALS



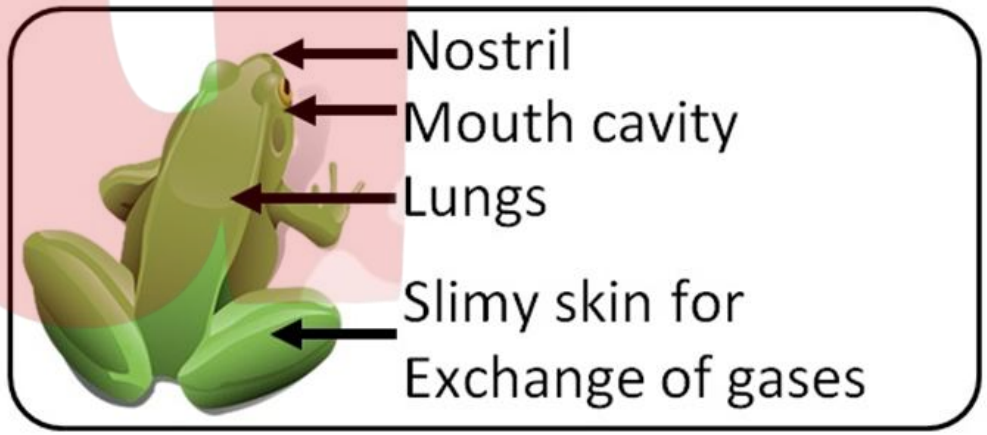
Respiration in Amoeba - Diffusion



Respiration in Fishes - Gills



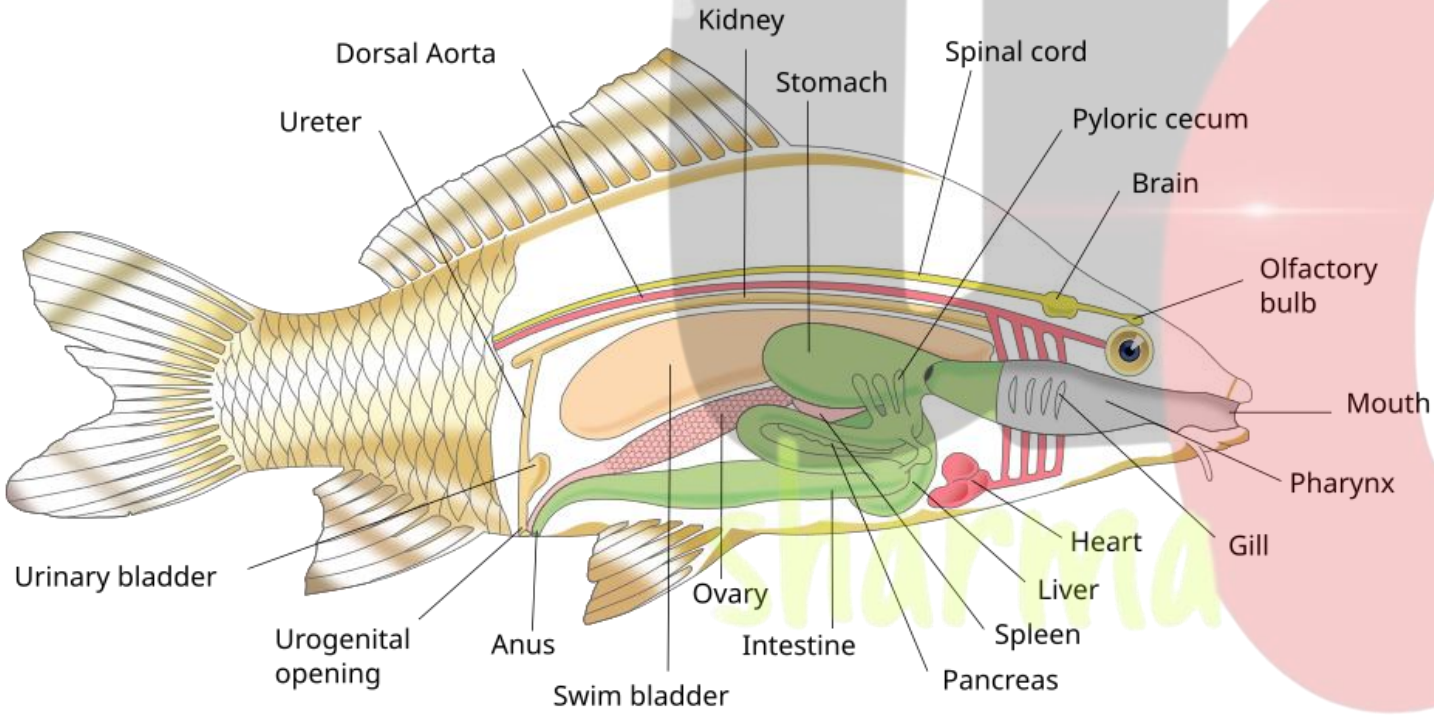
Respiration in Earthworm

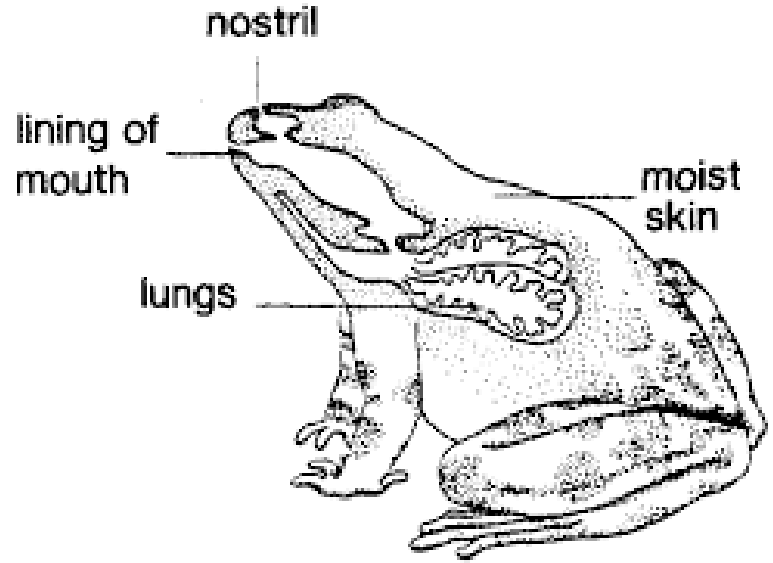


Respiration in Frog

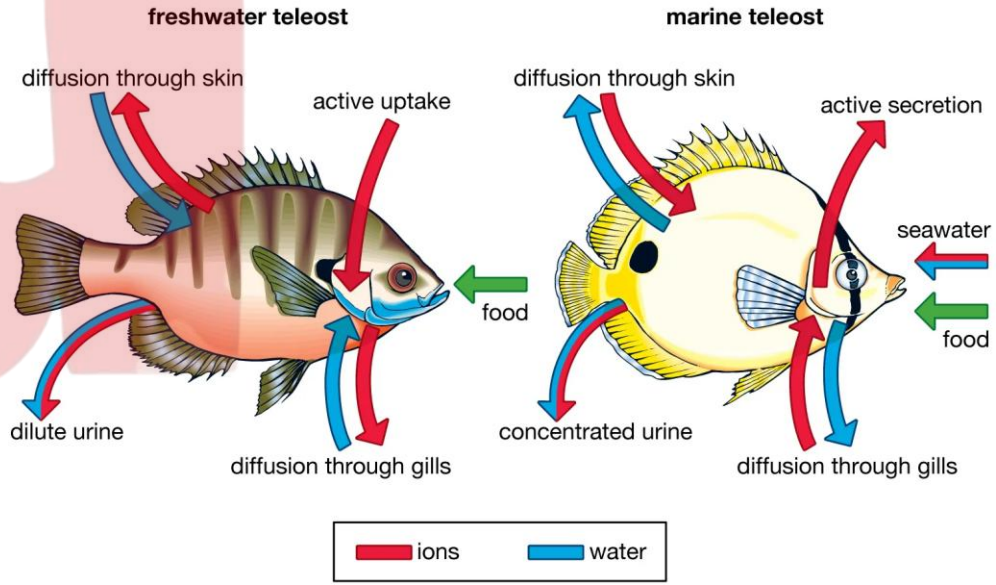
RESPIRATION IN ANIMALS

- Frogs can use both skin and lungs for respiration.
- Only in tracheal system of respiration, air reaches the cells directly. And, in other reach blood.
- Fish has no lungs as human for respiration.





Breathing organs of the frog



HUMAN RESPIRATORY SYSTEM

The main organs of human respiratory system a

1. Nose
2. Nasal passage (or nasal cavity)
3. Trachea (wind pipe)
4. Bronchi
5. Lungs
6. Diaphragm

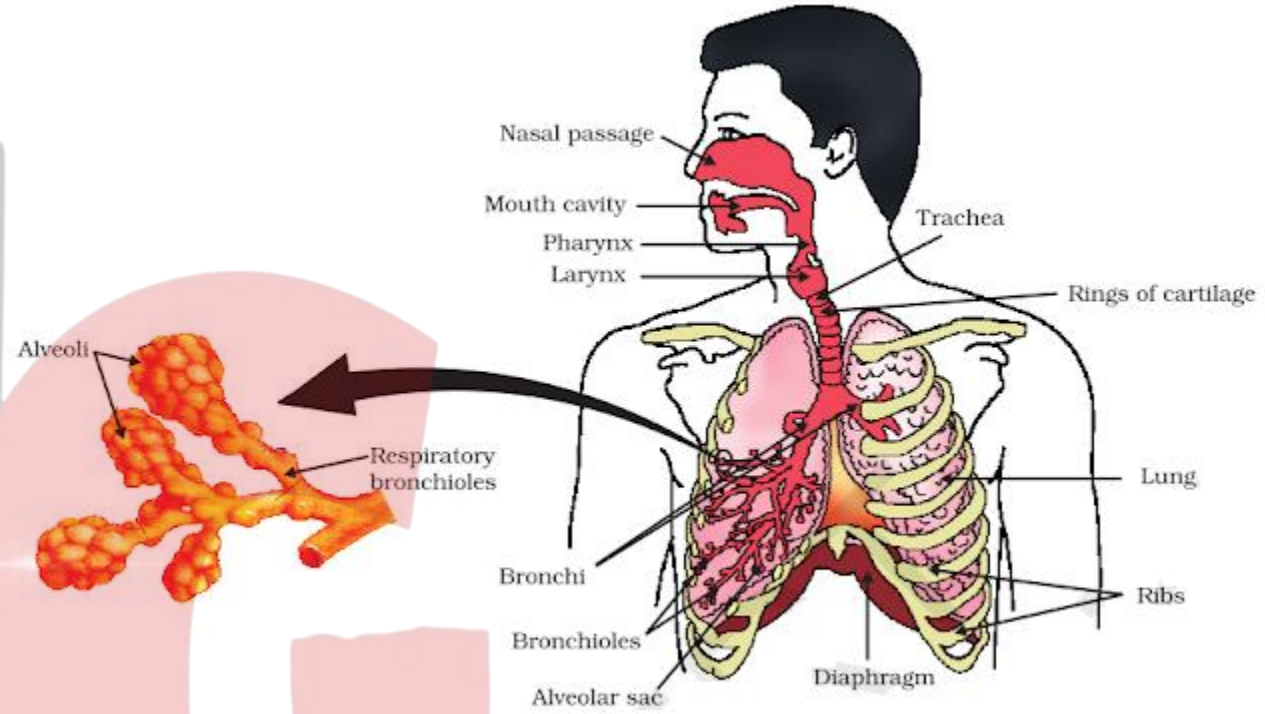
Date ___/___/___

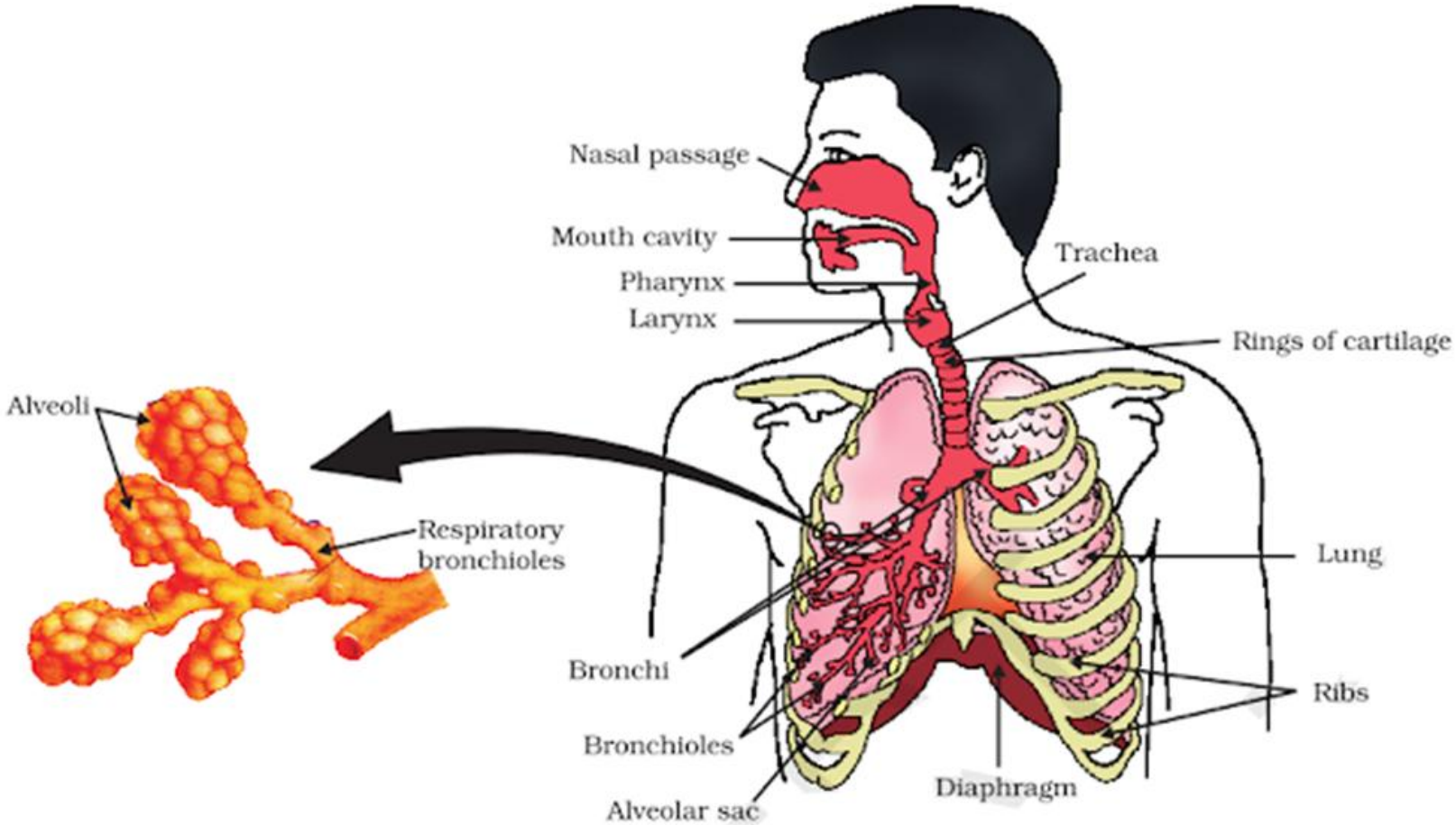
Nose :- Two holes in it c/d nostrils
→ Air enter through it.

Nasal Cavity :- The passage behind the nostrils in nose c/d nasal cavity or passage.
→ Seperated from mouth cavity. So, we can breathe during eating food.
→ Contain lined with fine hair and mucus which absorbed impurities of air.
→ Air from nasal cavity enters into pharynx and then goes into trachea.

Pharynx :- The part of throat b/w the mouth & windpipe is c/d pharynx.

Larynx :- Upper end of ~~voice box~~ trachea Contain voice box c/d larynx.





If the alveolar surface were spread out, it would cover an area of about 80 m2.

HUMAN RESPIRATORY SYSTEM

Trachea:- Commonly known as ~~wide~~ windpipe

→ It does not collapse ~~w~~ even their is no air because of presence of ring of soft bone around it c/d Cartilage.

→ At its lower end, trachea divide into two parts c/d bronchi.

Lungs:-

→ Covered by two thin membrane c/d Pleura.

→ Each bronchus divides ~~int~~ the lungs to form a large number of still smaller tubes c/d bronchioles.

→ The pouch-like air sacs at the ends of the smallest bronchioles are c/d alveoli (singular alveolus)

RESPIRATION IN HUMAN

→ Alveoli is surrounded by very thin blood capillaries.

→ Alveoli is site of gaseous exchange.

Note :- In human beings, the respiratory pigment is haemoglobin which has a very high affinity for oxygen.

* CO_2 is more soluble in water than O_2, so it mostly ~~trap~~ transported in the dissolved form in our blood.

* The deficiency of haemoglobin in the blood of a person reduces the oxygen-carrying capacity of blood resulting in breathing problems, tiredness and lack of energy.

Normal haemoglobin level in adult is 12-18 g/dl

TRANSPORTATION

Transportation is a life process in which a substance absorbed {or made} in one part of the body of organism is carried to other parts of its body.

TRANSPORTATION IN HUMAN BEINGS (CIRCULATORY SYSTEM)

Human beings like other multicellular organism need regular supply of food, oxygen etc. This function is performed by circulatory system.

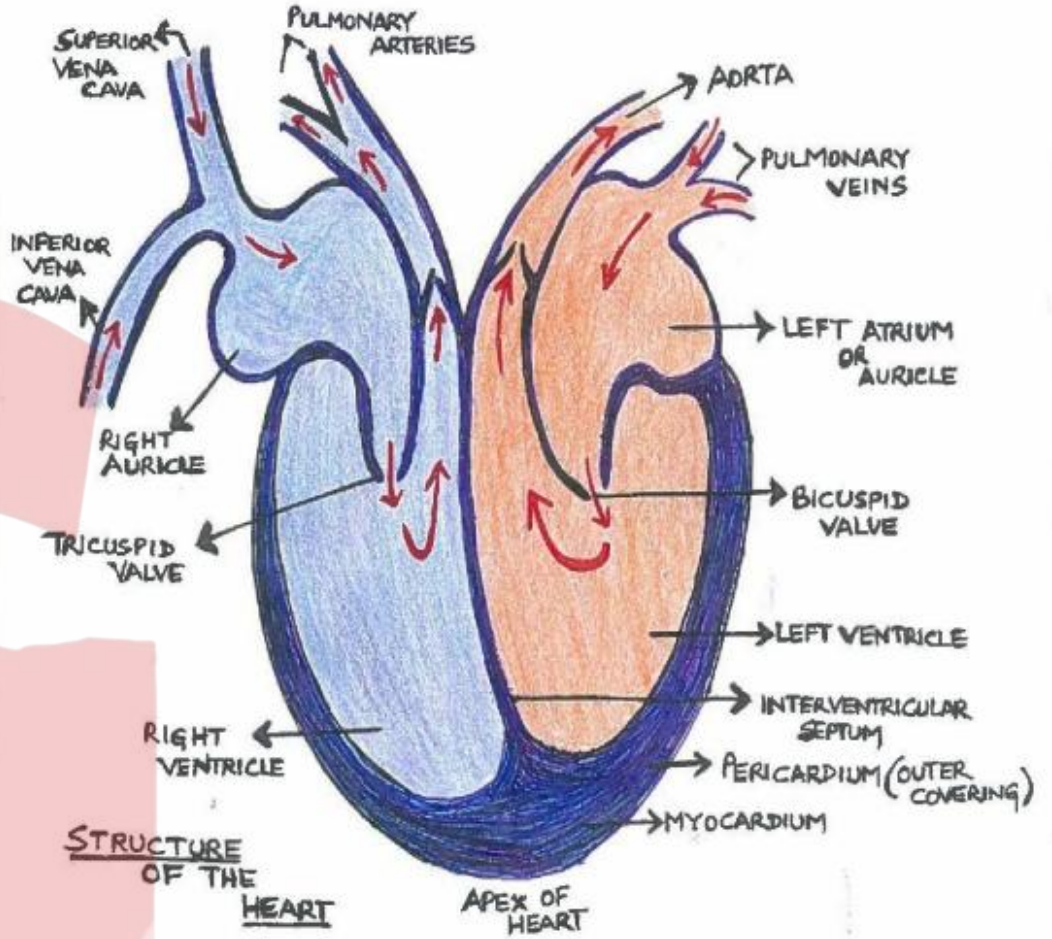
- This circulatory system in human beings consist of :-

1. Heart(Pumping organ)
2. Blood vessels
3. Blood and lymph (circulatory medium)

There is a pumping organ (heart) to push blood around the body, a network of tubes to reach blood to all the tissues and a system in place to ensure that this network can be repaired if damaged.

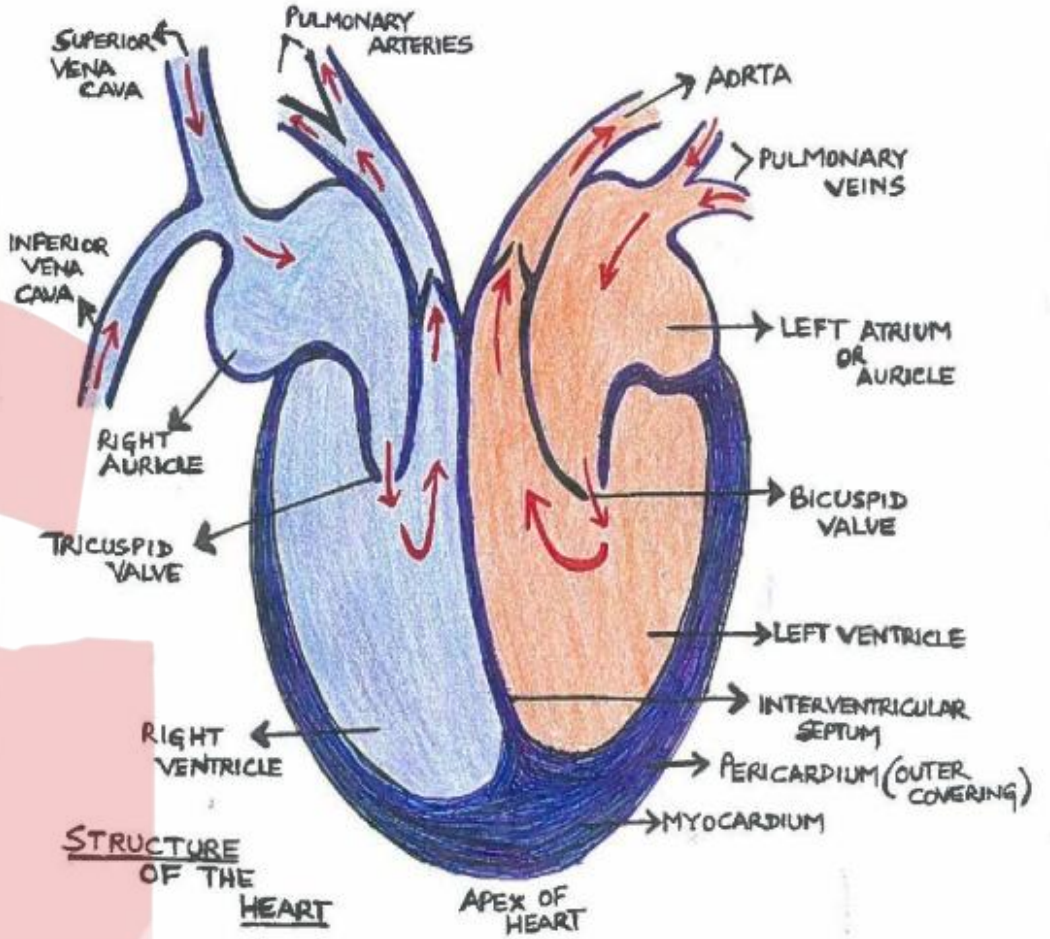
01. THE HUMAN HEART

- The size of the heart is the of a clenched fist and it is located between the lungs in the thoracic cavity.
- The heart is located towards the left side of our thoracic cavity.
- A two layered sac called **PERICARDIUM** encloses the heart.
- It is made up of **MYOCARDIUM** i.e. cardiac muscles which is seen to contract and relax rhythmically throughout life.
- The heart has 4 prominent chambers.
- The upper two chambers are called the Atria or the Auricles/ Artium.
- The lower two chambers are called the ventricles
- The oxygenated and deoxygenated blood are kept separate (by a muscle called **septum**) in the left and right side of the heart respectively.
- The walls of the auricles are thinner than that of the ventricles as they send blood only to the ventricles, situated below them.
- The walls of the ventricles are thicker as they send blood to the different parts of the body.



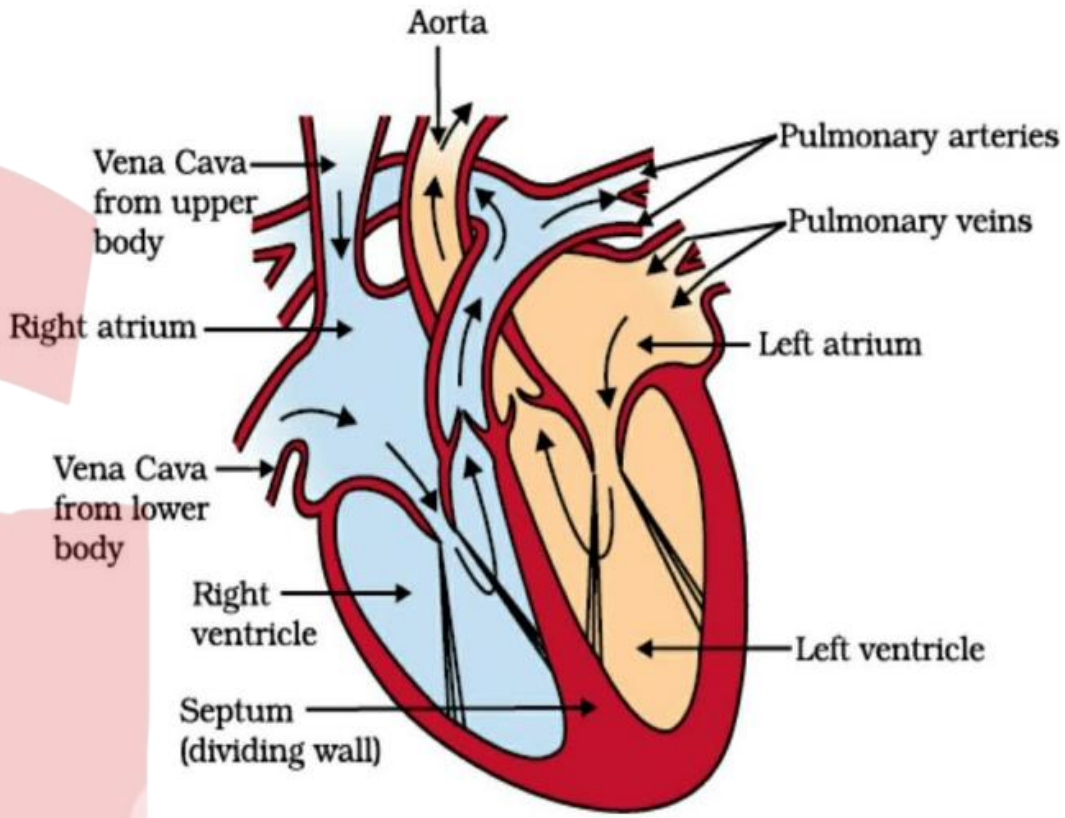
01. THE HUMAN HEART

- The wall of the left ventricle is thickest as it sends blood to all the body parts through the aorta.
- The left auricle and ventricle has the bicuspid/mitral valve.
- The right auricle and ventricle has the tricuspid valve.
- The 4 chambers are separated by the septum(dividing wall).
- The right auricle gets deoxygenated blood via the vena cavas.
- The left auricle receives oxygenated blood via the pulmonary veins.
- The right ventricle sends out deoxygenated blood via the pulmonary arteries to the lungs. This has the pulmonary valve.
- The left ventricle sends out oxygenated blood via the aorta to the body parts. This has the aortic valve.
- The valves prevent the backflow of blood.
- Heart rate (at rest) = 75 beats per min

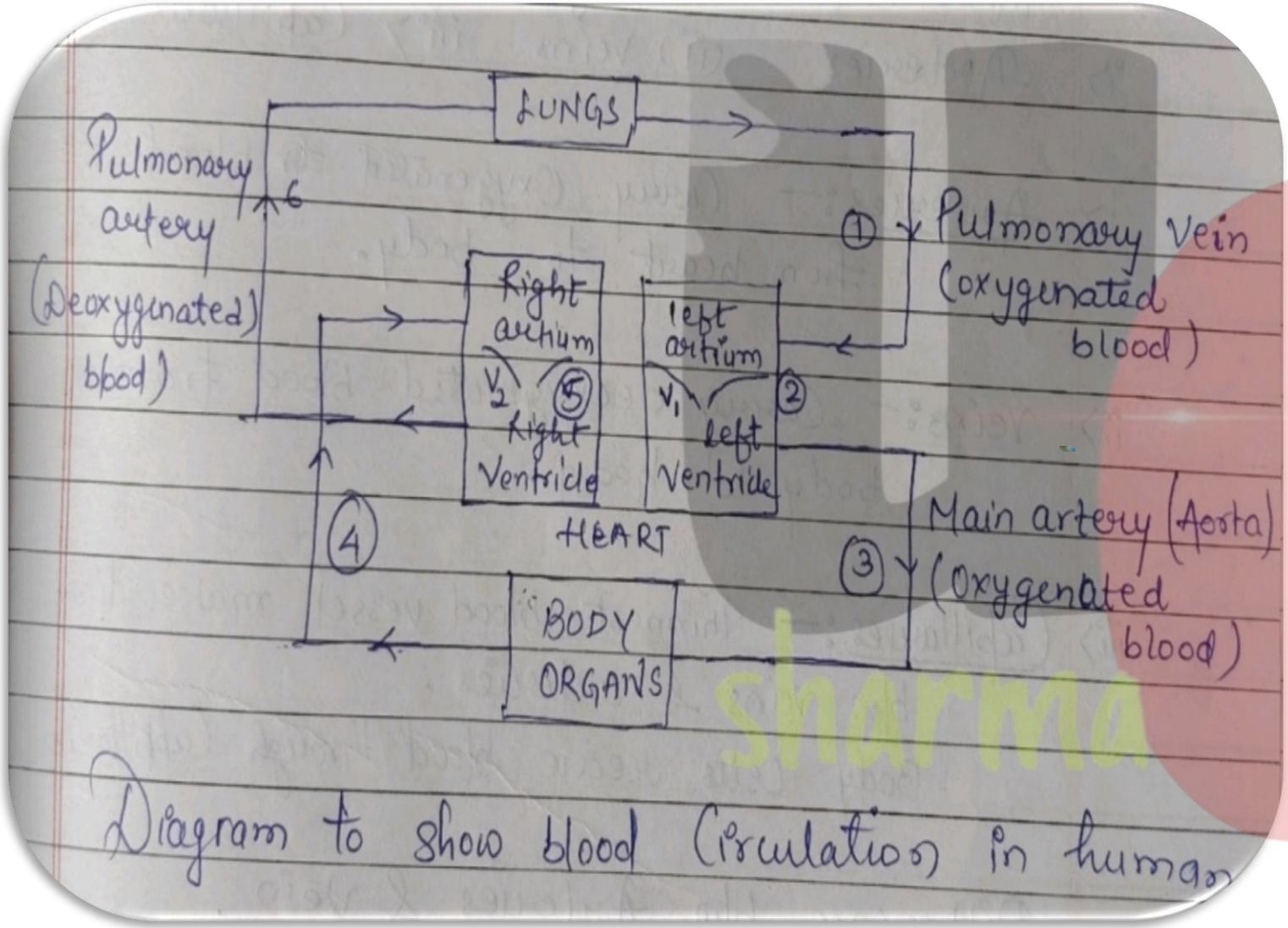


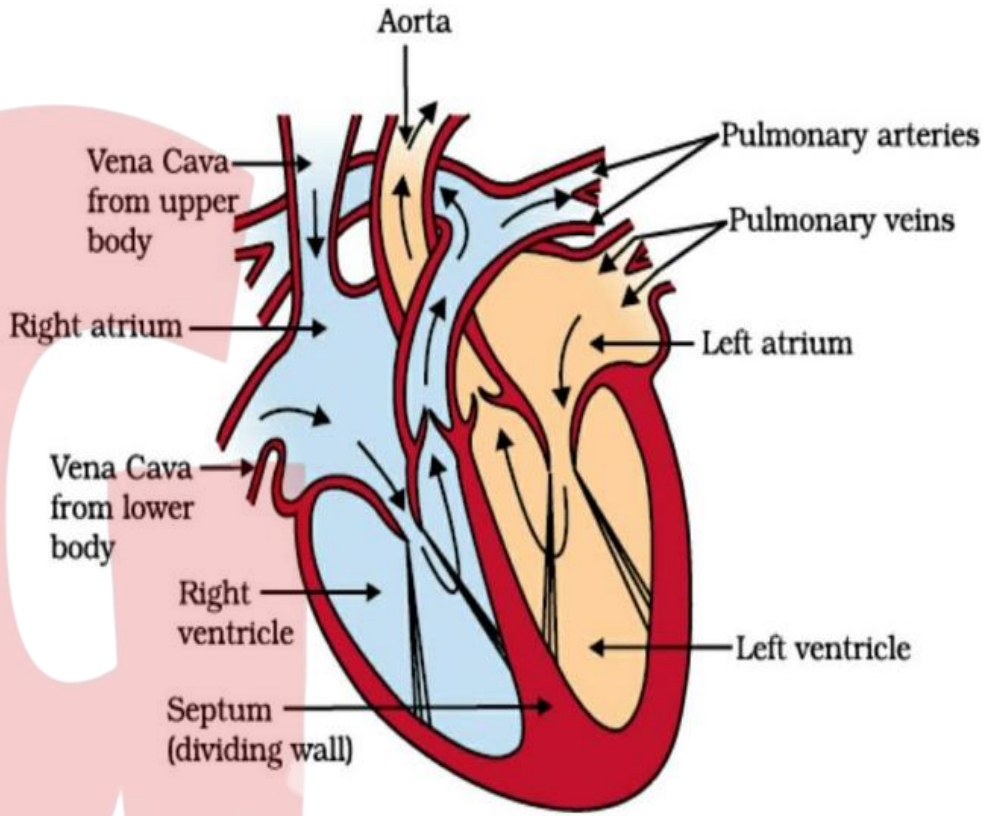
FLOW OF BLOOD THROUGH HEART

- Deoxygenated blood from the body enters the relaxed right atrium.
- The right atrium now contracts, and simultaneously its lower chamber(the right ventricle) relaxes and the deoxygenated blood pours into it.
- Now the right ventricle contracts sending the blood through the pulmonary arteries to the lungs for oxygenation to take place.
- The oxygenated blood is seen to enter the relaxed left auricle through the pulmonary veins.
- Now the left auricle contracts sending the oxygenated blood to its lower chamber, the left ventricle which relaxes.
- The left ventricle on contracting sends the oxygenated blood out to all the body parts through the aorta.
- Valves help to stop the back flow of the blood.

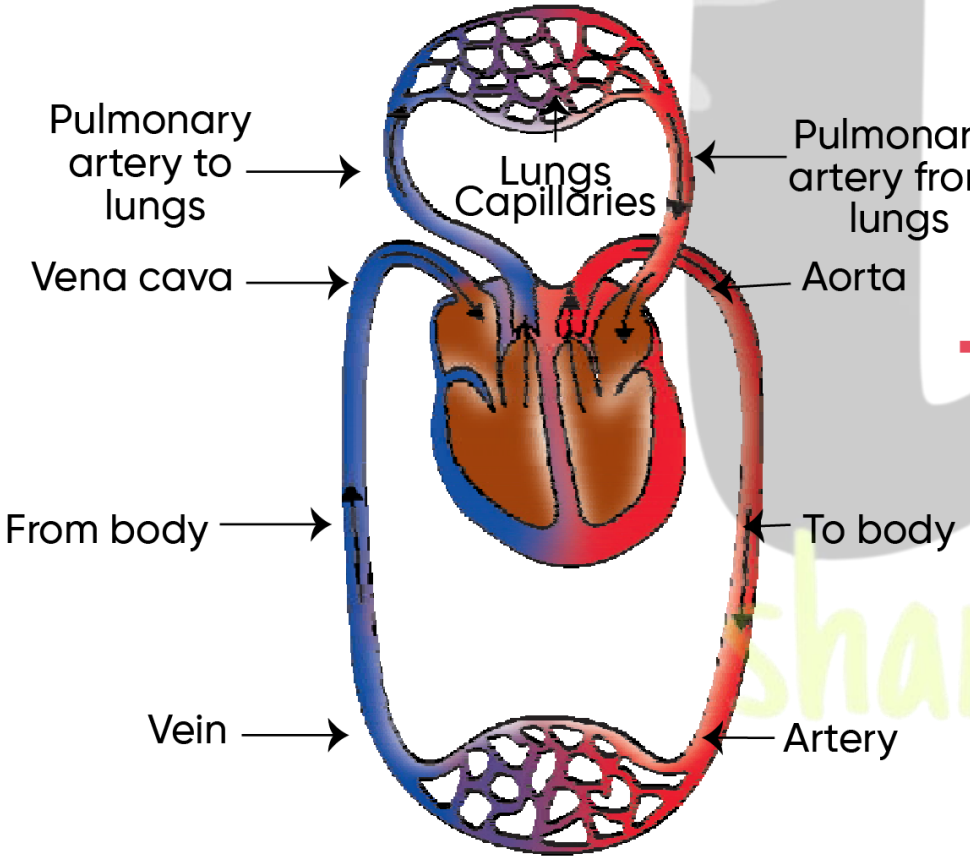


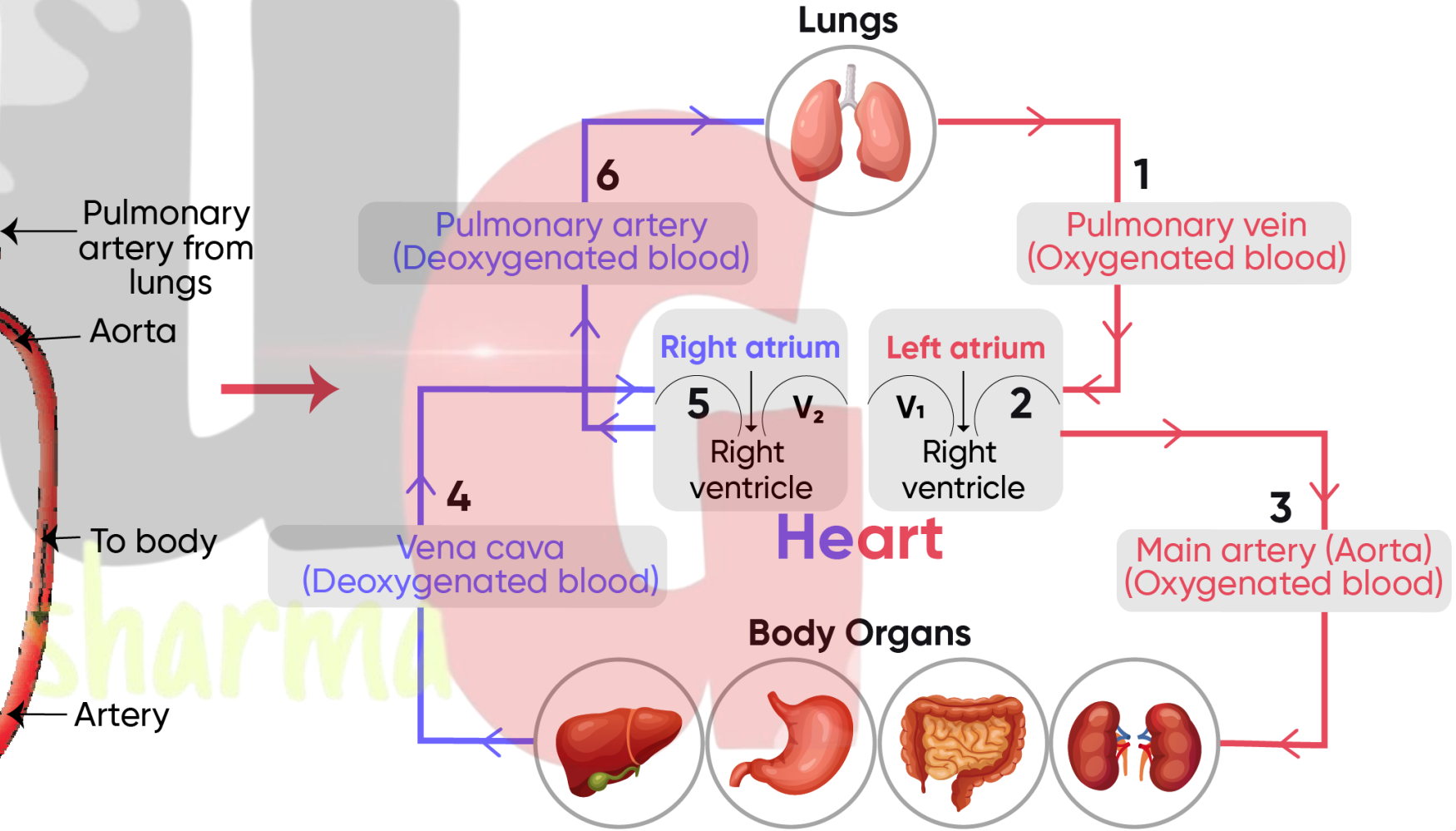
FLOW OF BLOOD THROUGH HEART





SCHEMATIC PLAN OF BLOOD CIRCULATION IN HUMANS

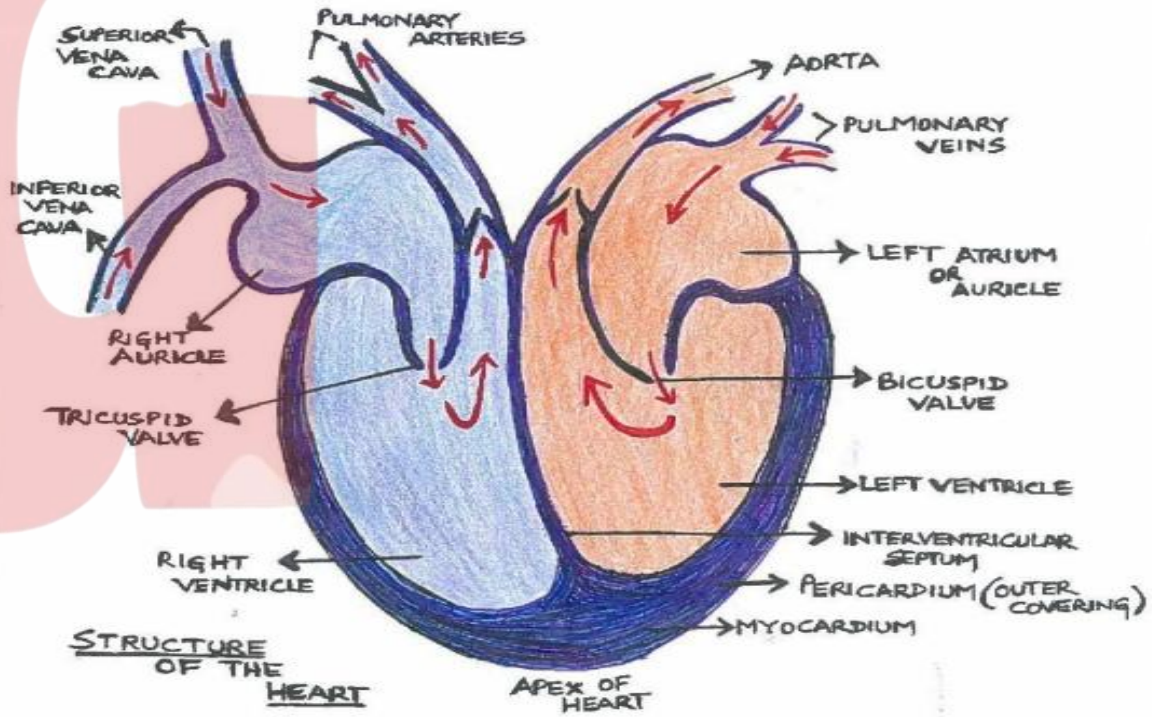




FLOW OF BLOOD THROUGH HEART

Superior Vena Cava
Inferior Vena Cava
Right Atrium
Tricuspid Valve
Right Ventricle
Pulmonary Valve
Pulmonary Artery
Lungs
Pulmonary Veins
Left Atrium
Mitral Valve
Left Ventricle
Aortic Valve
Aorta
Rest of Body

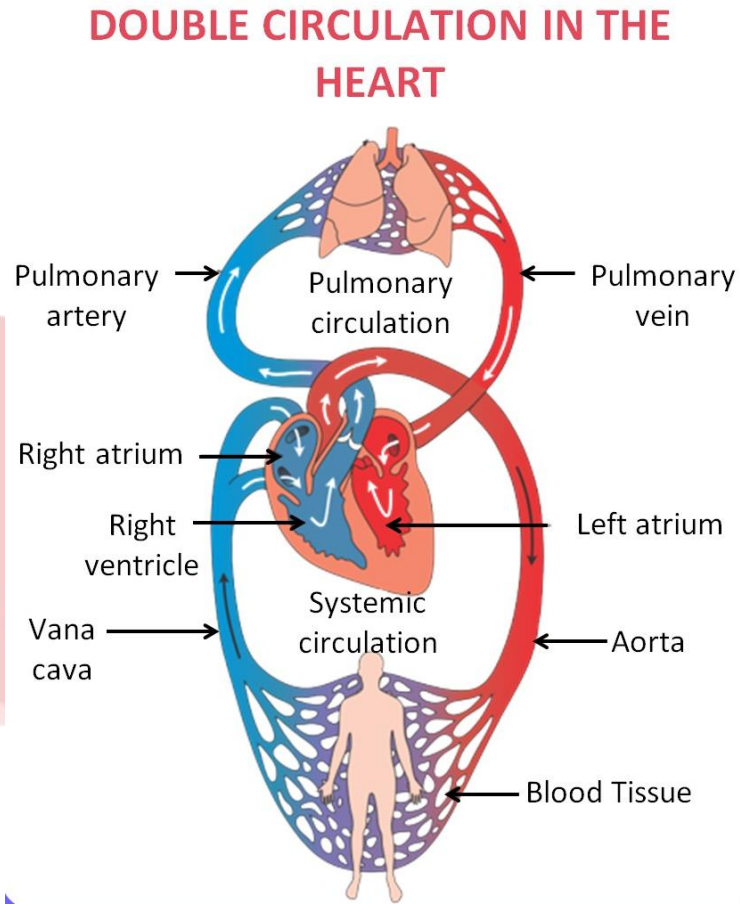
Circulation of Blood Through the Heart:



Septum :- Dividing wall which divides heart to avoid intermixing of oxygenated deoxygenated blood.

- The amphibian (like frogs) and reptiles (like lizards) have a three chambered heart which consists of two atria and one ventricles.
- The fish has two chambered heart which consist of one atrium and one ventricle, oxygenation of blood takes place in the gills.

Double circulation :- The circulation in which blood travels twice through the heart in one complete cycle of the body (as in humans), is know double circulation.



02. BLOOD VESSEL

There are three types of blood vessels:-

i. Arteries
ii. Veins
iii. Capillaries

Arteries :- Carry oxygenated blood from heart to body.

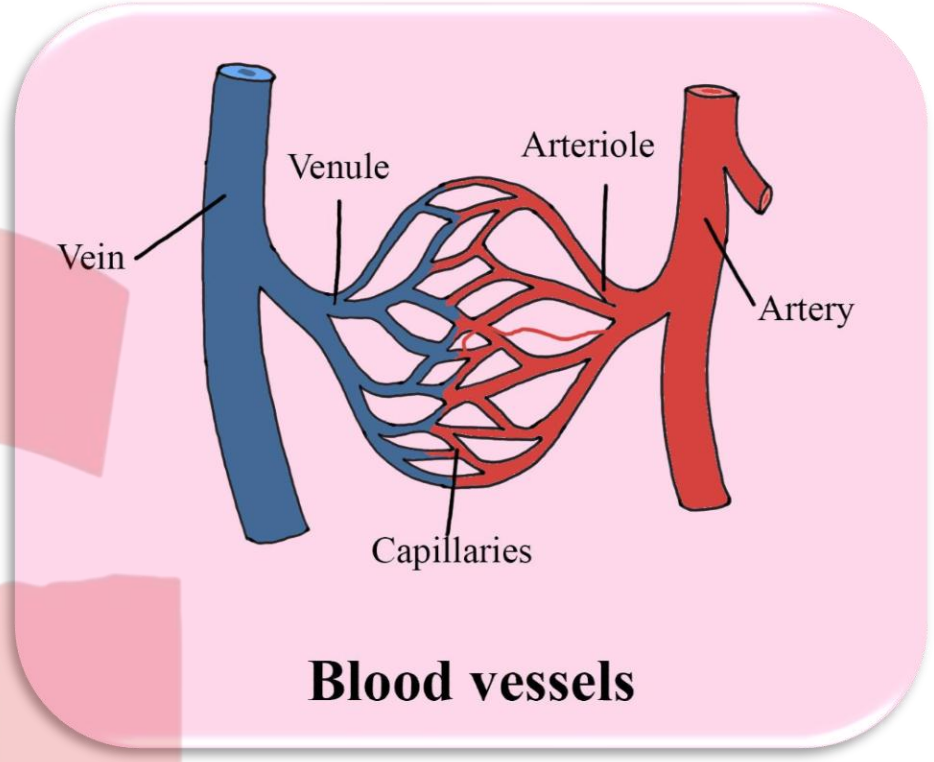
- They are thick and elastic.

Veins :- Carry deoxygenated blood from body to heart.

- They are thin and less elastic.

Capillaries :- Thinnest blood vessels makes link between veins and artery.

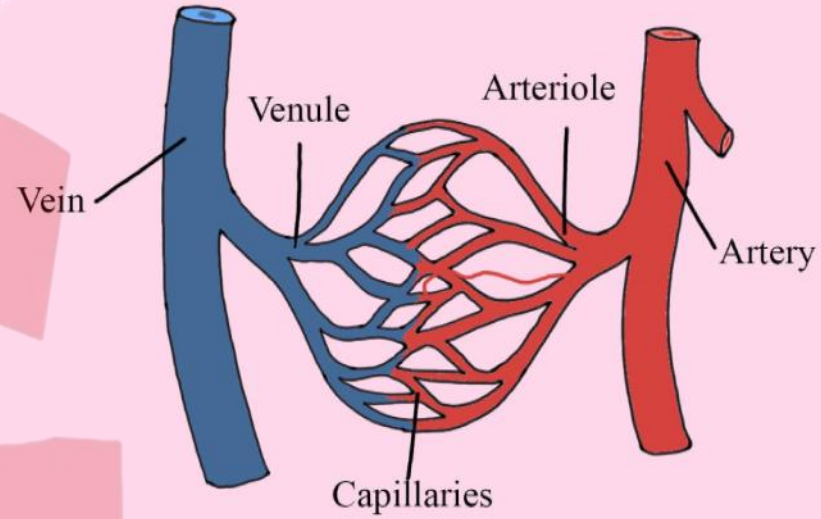
- Body cells receive blood through capillaries.



Blood vessels

Difference between arteries and veins

Arteries	Veins
Carry blood away from the heart	Carry blood towards the heart
Carry oxygenated blood	Carry deoxygenated blood
Red in colour due to oxygenated blood	Blue in colour due to deoxygenated blood
Located deep in the body	Located close to the skin
Valves are absent.	Presence of valves prevents backflow of blood.

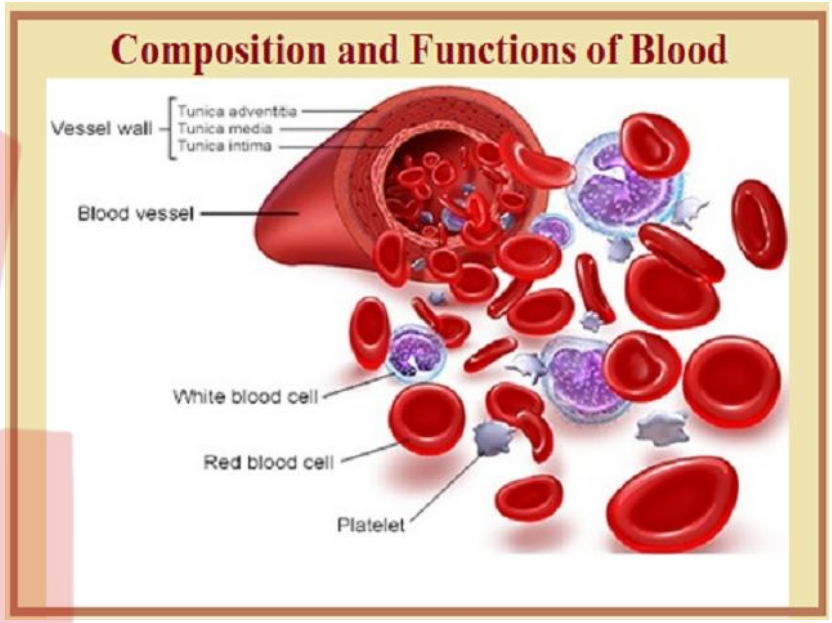


Blood vessels

03. BLOOD

- Blood is a connective tissue which is fluid in nature.
- Blood consists of a fluid medium called plasma in which the cells are suspended.
- Solid components of blood called **blood corpuscles**.These are:-

i. RBCs { Red blood cells }
ii. WBCs { White blood cells }
iii. Blood platelets



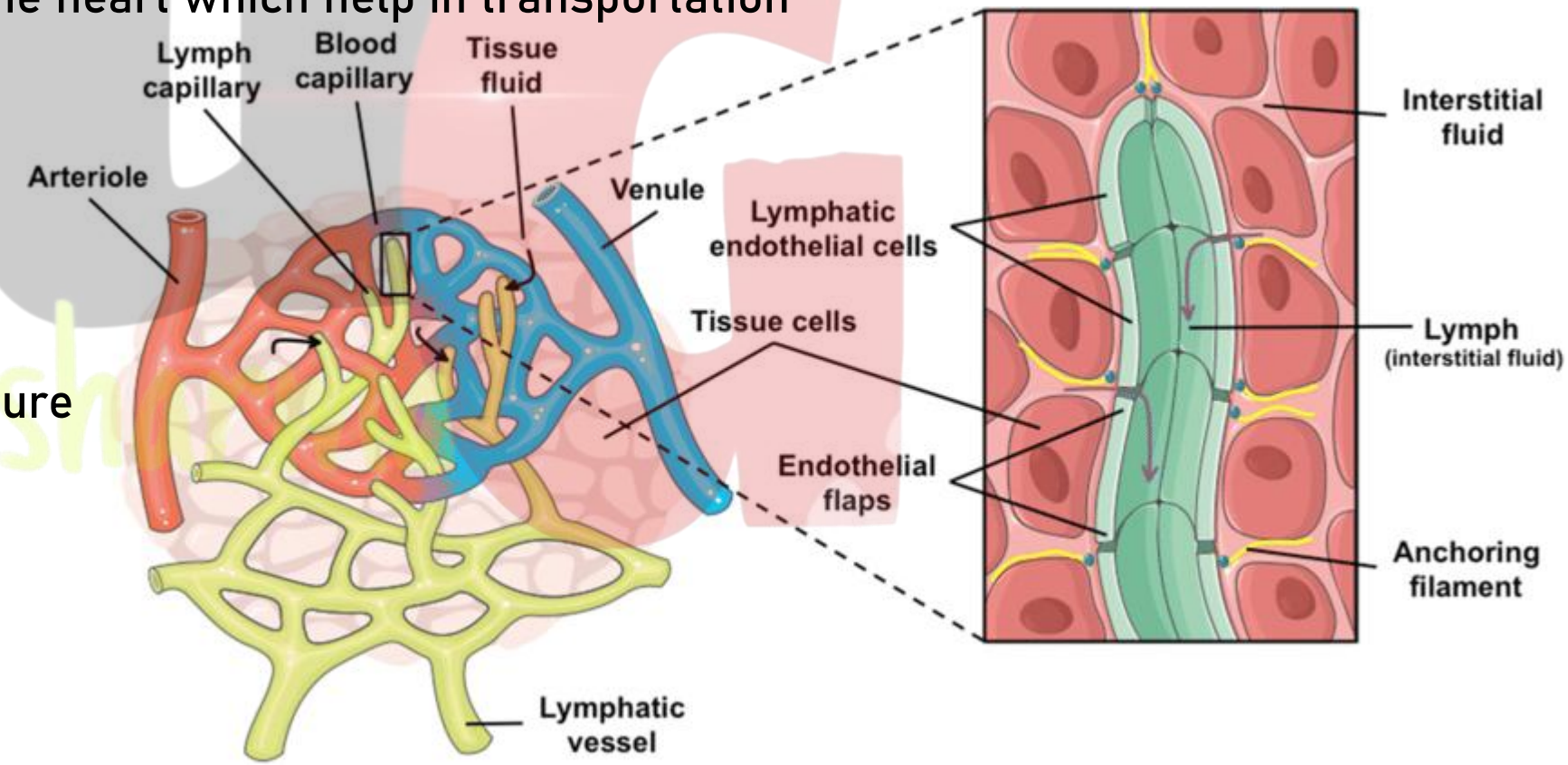
RBCs :- RBC stands for red blood cell. Carries O_2 and CO_2 and also contain haemoglobin.

WBCs :- WBC stands for white blood cell. Fight against germs and produce antibodies.

BLOOD PLATELETS :- It helps in blood clotting during injury.

LYMPH

- Lymph is a latin words which means “water like”.
- Lymph is also known as **tissue fluid.**
- It is colourless due to absence of RBCs
- It is a yellowish fluid which escapes from the blood capillaries into the intracellular spaces.
- It contains less protein than blood.
- It flows from the tissue to the heart which help in transportation and destroying germs.
- It carries digested and absorbed fat from a small intestine and drains excess fluid from extra cellular space back into the blood vessel which has low pressure (i.e. vein)

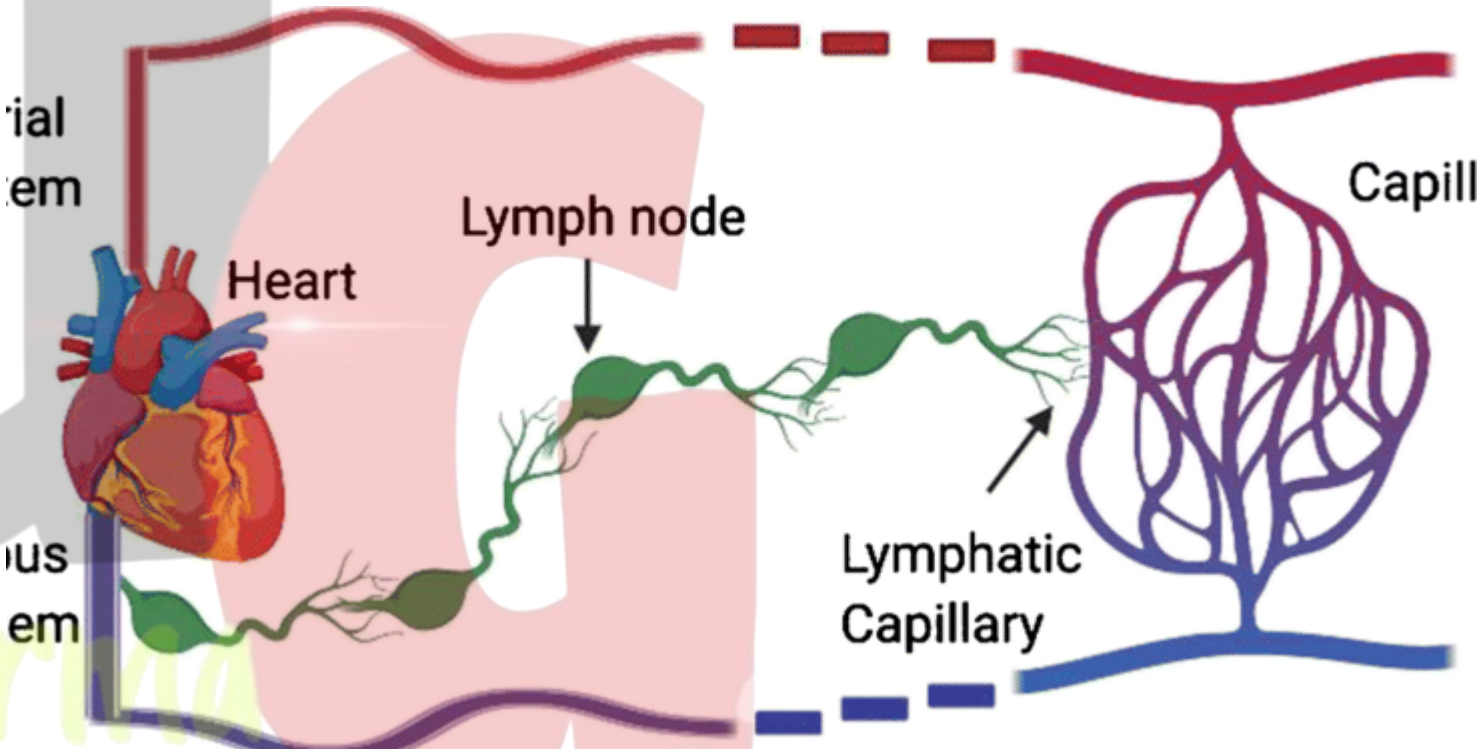


Lymphatic system consists of **lymph, lymph vessels and lymph node**.

▪Lymph:
A clear, watery fluid that transports white blood cells (lymphocytes) and filters waste from tissues.

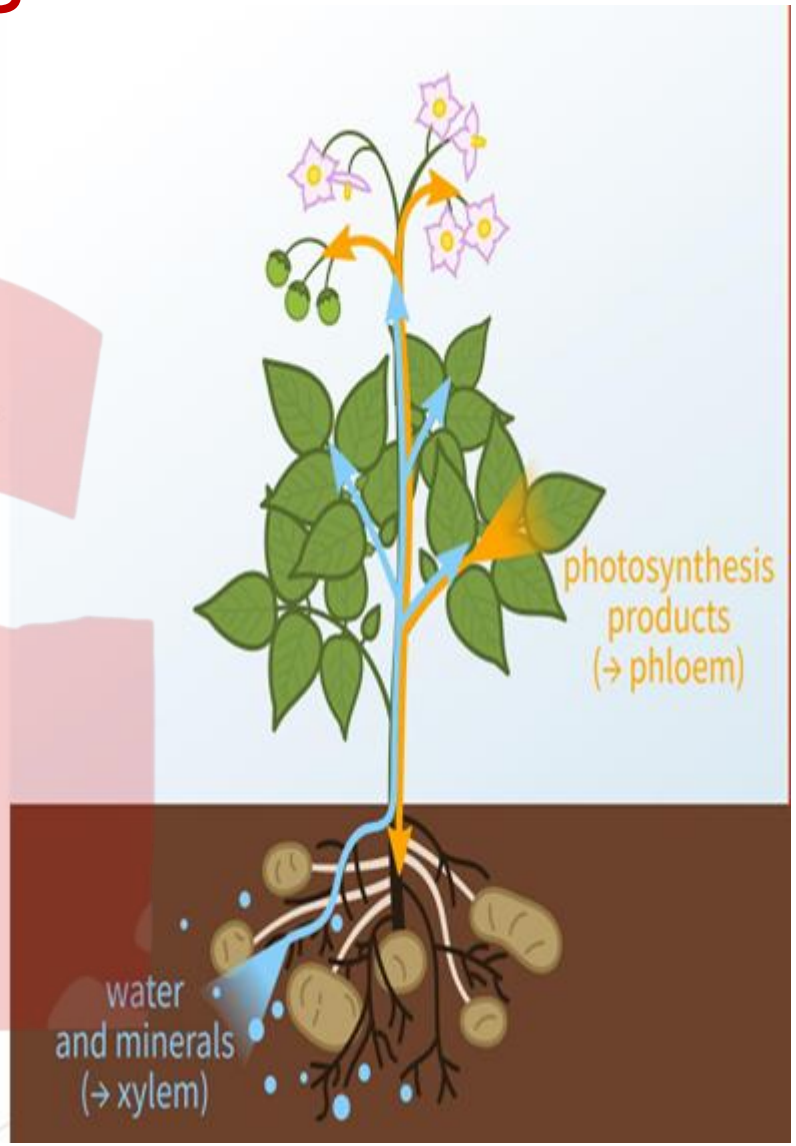
▪Lymph Vessels:
Tiny tubes that carry lymph throughout the body, similar to blood vessels but with valves to prevent backflow.

▪Lymph Nodes:
Small, bean-shaped organs located along lymph vessels that filter lymph and contain lymphocytes (WBCs).



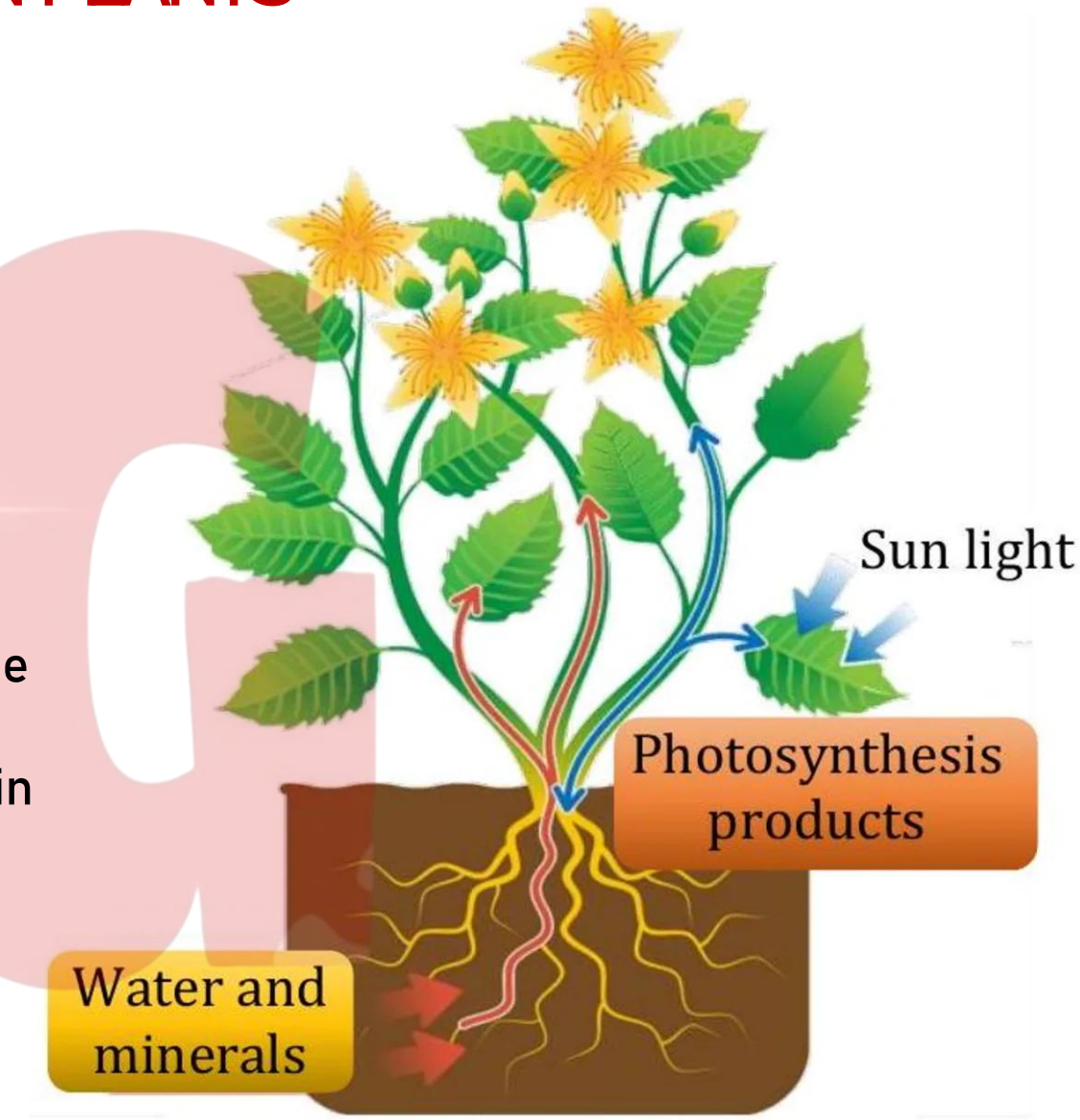
TRANSPORTATION IN PLANTS

- Plants need various raw materials for photosynthesis.
- They take in CO_2 through the stomata that diffuses into their cells.
- They take in nitrogen, phosphorus, other minerals through the roots.
- The distance between the soil and chlorophyll containing organs is large so, diffusion process is not sufficient to provide these raw materials to the leaves and energy to the roots.
- Thus, a proper transportation system is needed in plants.
- Energy requirements in plants is low because
  - Plants do not move.
  - Plant bodies have a large proportion of dead cells in many tissues. So, transport system in plants is a slow process, though the distances to be operated are very large.
- Plant transport systems move energy stores from the leaves and raw materials from the roots



TRANSPORTATION IN PLANTS

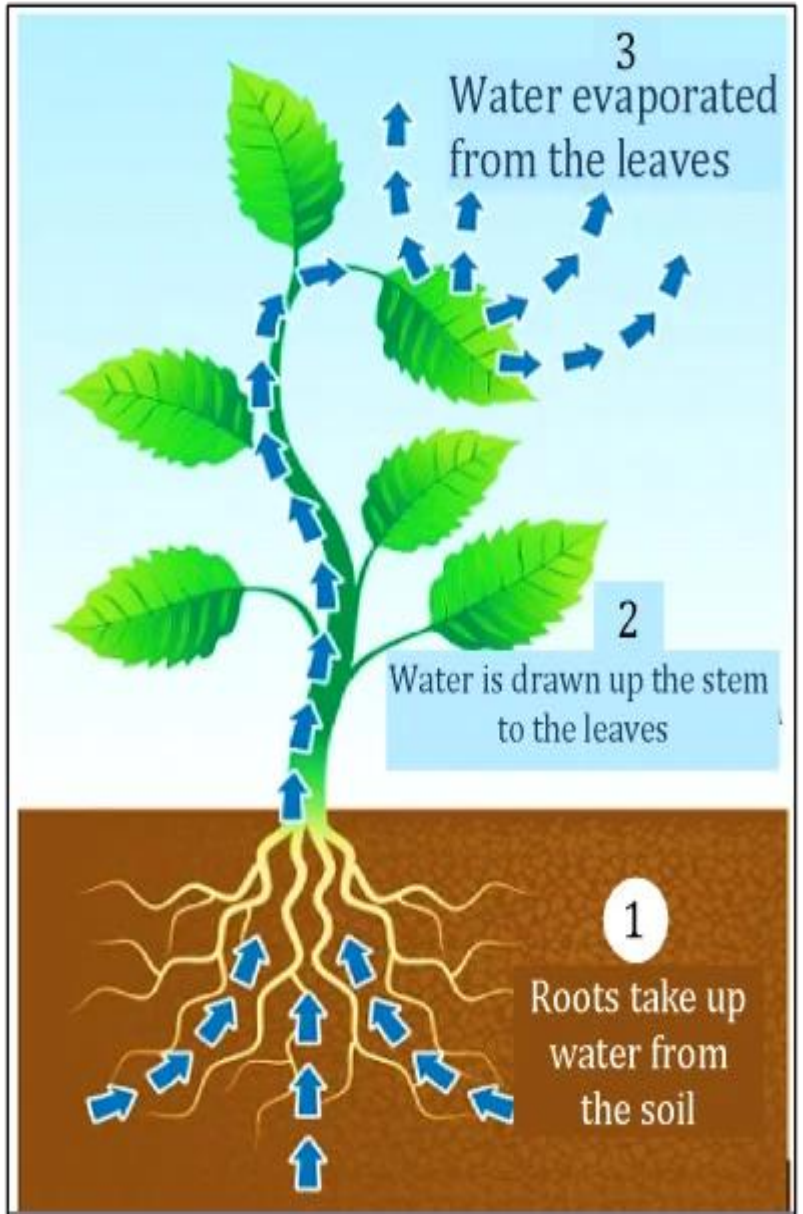
- Plants have two pathways of conducting tubes
  - Xylem that moves water and minerals from the roots to the leaves.
  - Phloem transports food/sugars/energy from the leaves to all parts of the plant body.
- Similar to the circulatory system in humans, the xylem and phloem tissues extend throughout the plant body.
- Plants have gas exchange taking place through the stomata.
- Roots also exchange gases within the air spaces in the soil.



Transport of materials in plant

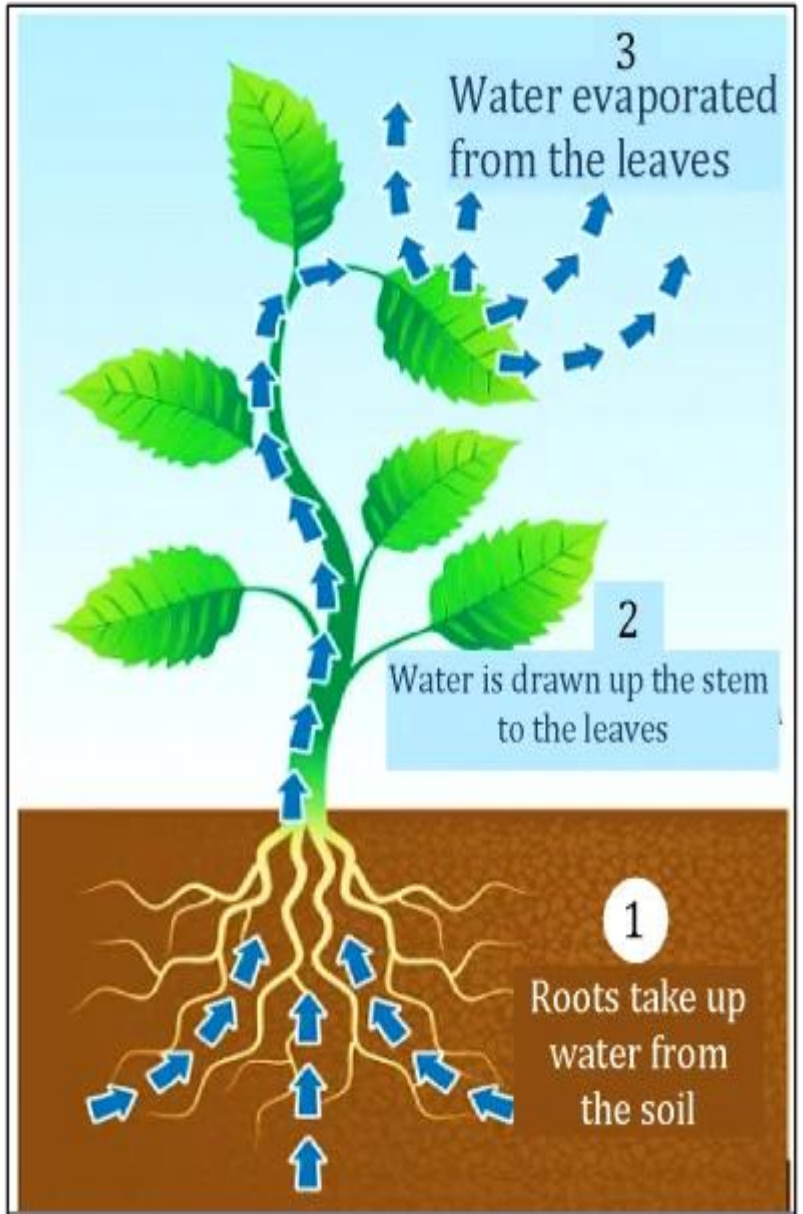
TRANSPORT OF WATER THROUGH XYLEM

- Xylem is the specialized vascular tissue in plants that transports water and nutrients from the soil to the leaves.
- **The flow of water is unidirectional and in the upward direction.**
- It is responsible for replacing water lost through transpiration and photosynthesis.
- Xylem is a complex tissue that is composed of four basic types of cells (tracheid, vessel, xylem fibre and xylem parenchyma).
- The water is absorbed by the root hair and undergoes cell to cell movement by osmosis until it reaches the xylem.
- The water then travels through the plant to reach the leaves.
- This is called **Ascent of sap**
- At the root, the cells in contact with the soil actively take up ions causing a concentration difference between the roots and the soil. So, water moves into the root to eliminate the difference.



TRANSPORT OF WATER THROUGH XYLEM

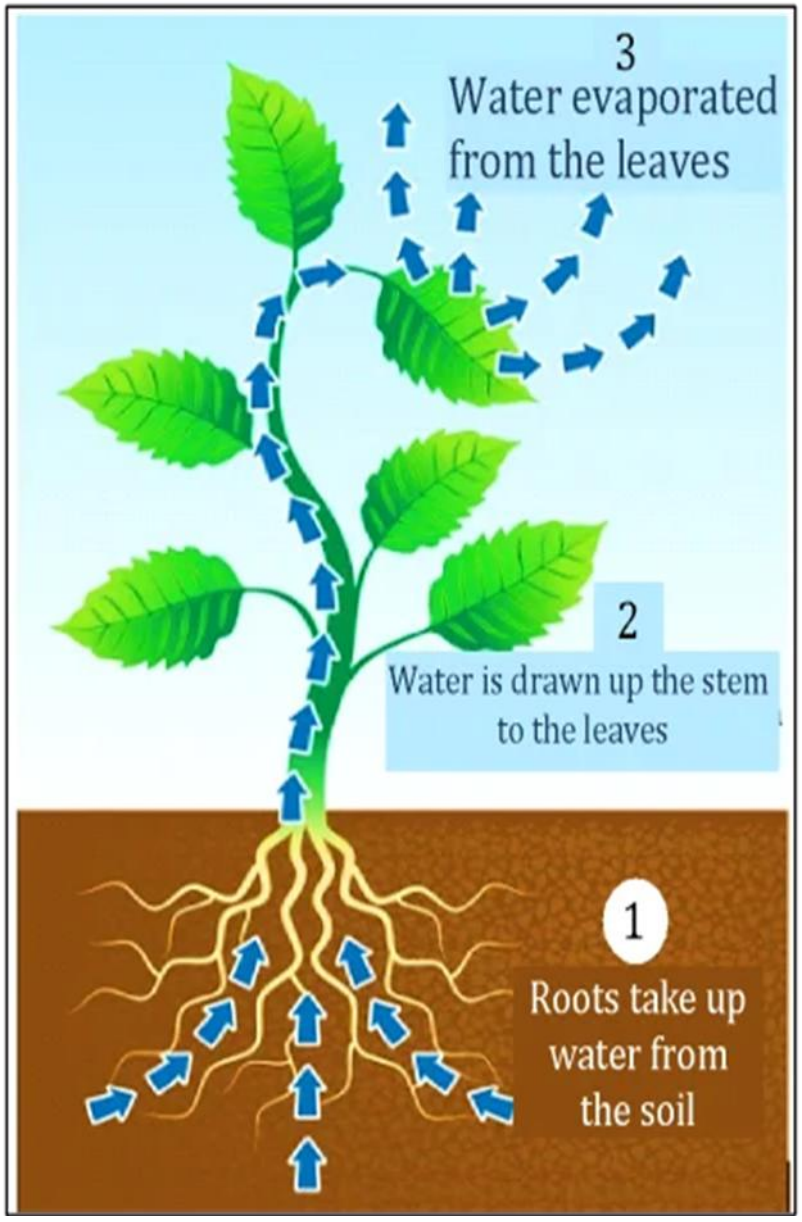
- The absorbed water at the root hair undergoes cell to cell movement by osmosis until it reaches the xylem.
- This causes a continuous movement of water into the root xylem, creating a column of water that is steadily pushed upwards and is called **root pressure**.
- This alone isn't enough for the ascent of sap.
- The continuous supply of water to the xylem of the leaf ,replaces the water which is lost through the stomata.
- The evaporation of water(Transpiration) from the stomata creates a **suction effect/pull.**
- This pulls the water up from the xylem cells of the roots. Transpiration helps in absorption and upward movement of water and minerals, also called ascent of sap.
- **Transpiration also helps in temperature regulation**.



FACTORS AFFECTING ASCENT OF SAP

1. **Root Pressure** is the positive pressure created by the movement of water from the soil to the roots, for upward movement of water. The effect of root pressure in the transport of water is more important **at night**.

Transpiration pull is the pull of water as a result of tension created by transpiration in the aerial parts of the plant. It is the major driving force of water movement upwards in a plant during **the day**. High temperature, wind velocity and low humidity influence transpiration pull.



TRANSPORT OF FOOD/ TRANSLOCATION THROUGH PHLOEM

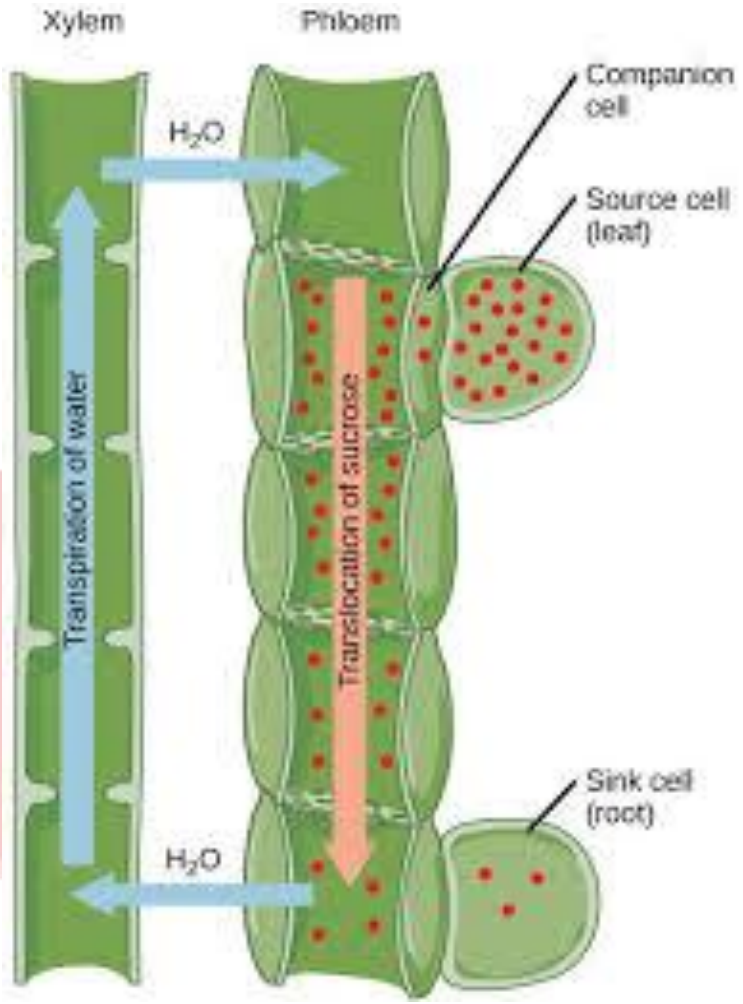
- The transport of food/glucose and also amino acids and other substances from the leaves to the different parts of the plant body is called **TRANSLOCATION.**

- Translocation takes place in the phloem delivering substance to the storage organs like roots, fruits etc and to growing organs.

- Phloem is a complex tissue that is composed of four basic types of cell (sieve tubes, companion cells, phloem fiber and phloem parenchyma)

- **Translocation is bidirectional i.e both in the upward and downward directions and takes place in the sieve tubes with the help of the companion cells.**

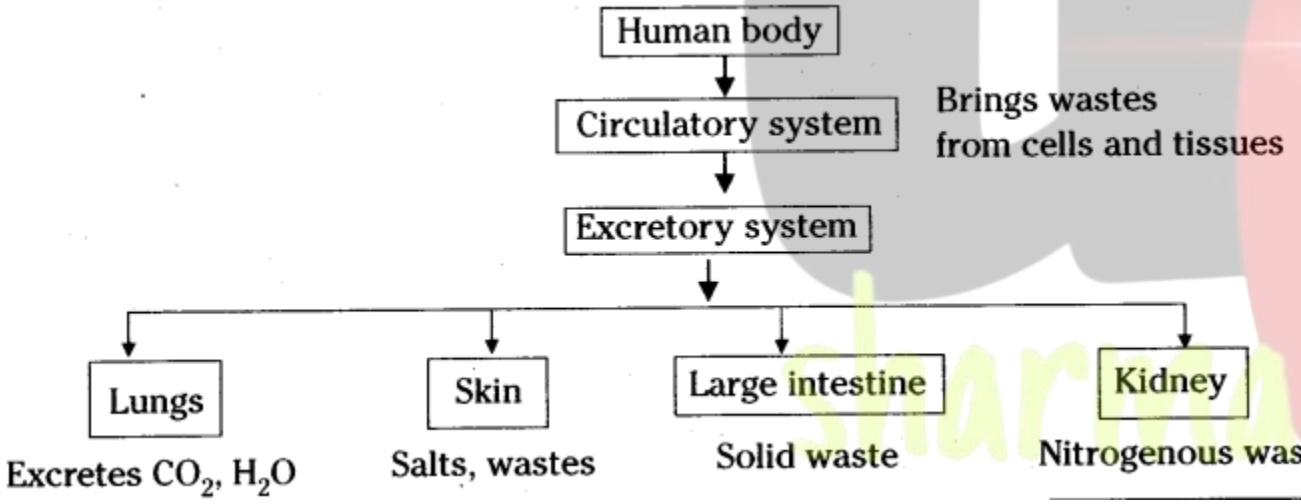
- Ascent of sap takes place by simple physical forces but translocation in phloem is achieved by utilising energy

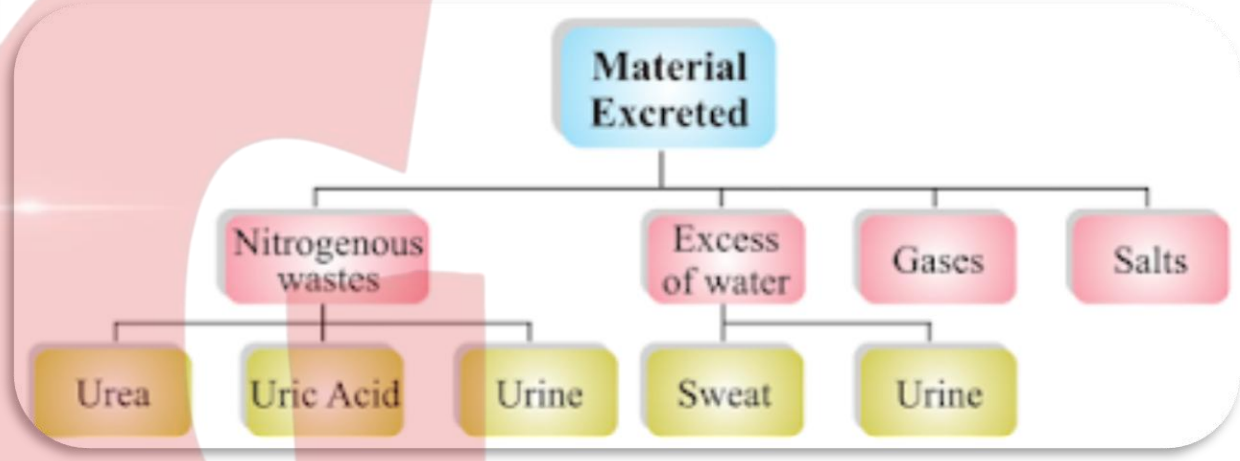


EXCRETION

The body generates many kind of wastes including nitrogenous wastes which are harmful for body and hence need to be removed.

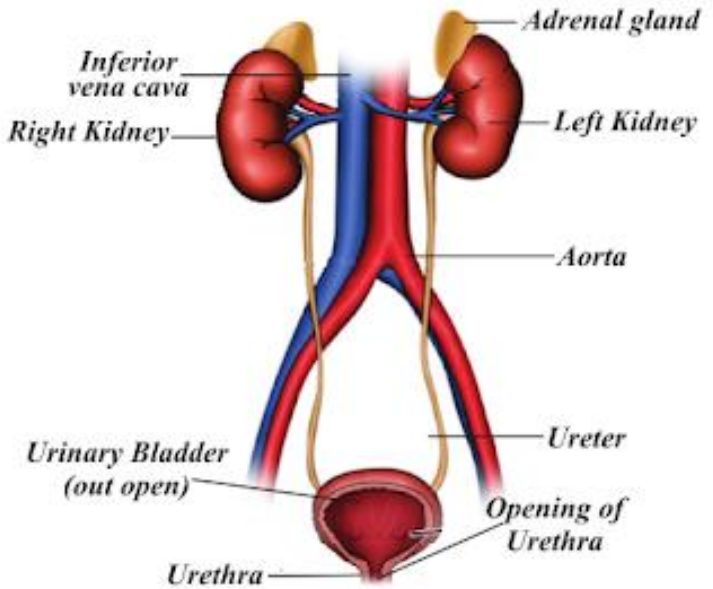
- Excretion is a process by which the wastes are removed from our body.
- unicellular organism remove these waste by diffusion.





Excretion System in Human Beings

Excretory/urinary system consists of :
(1) The kidneys : The excretory organ
(2) The ureters : The ducts which drain out urine from the kidneys
(3) The urinary bladder : The urinary reservoir
(4) The urethra : The channel to the exterior



Functions of Organs involved in Excretory System

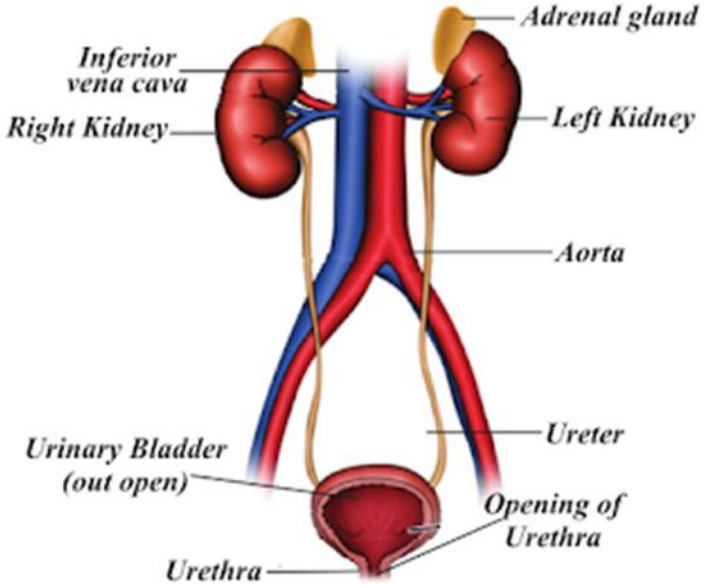
Each kidney contains many filtration units called as **nephrons**.

→ Nephrons are made up of a cluster of thin walled capillaries called glomerulus which is associated with a cup like structure called as Bowman's capsule and the long tube which terminates through this capsule.

→ The renal artery brings oxygenated blood to the kidneys along with the nitrogenous wastes like urea and uric acid and many other substances.

Excretion System in Human Beings

→ The blood gets filtered through the glomerulus and this filtrate enters the tubular part of nephron.



→ As this filtrate moves down the tubular part, glucose, amino acids, salts and excess of water gets selectively reabsorbed by the blood vessels surrounding these tubules.

→ The amount of water reabsorbed depends upon :
(i) How much excess of water is there in the body and,
(ii) How much nitrogenous wastes need to be excreted out.

→ So, the fluid now flowing in the tubular part is urine which gets collected in collecting ducts of nephrons.

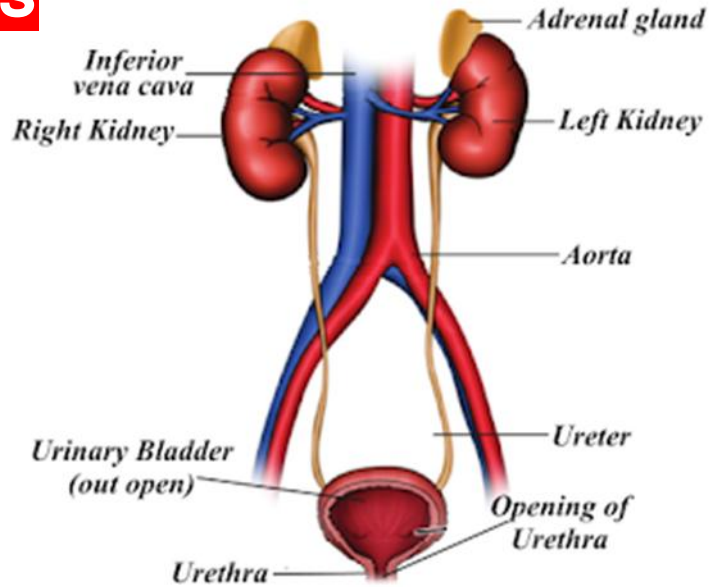
→These collecting ducts together leave the kidney at a common point by forming the ureter.

Excretion System in Human Beings

→ Each ureter drains the urine in the urinary bladder where it is stored until the pressure of expanded bladder leads to an urge to pass it out through urethra.

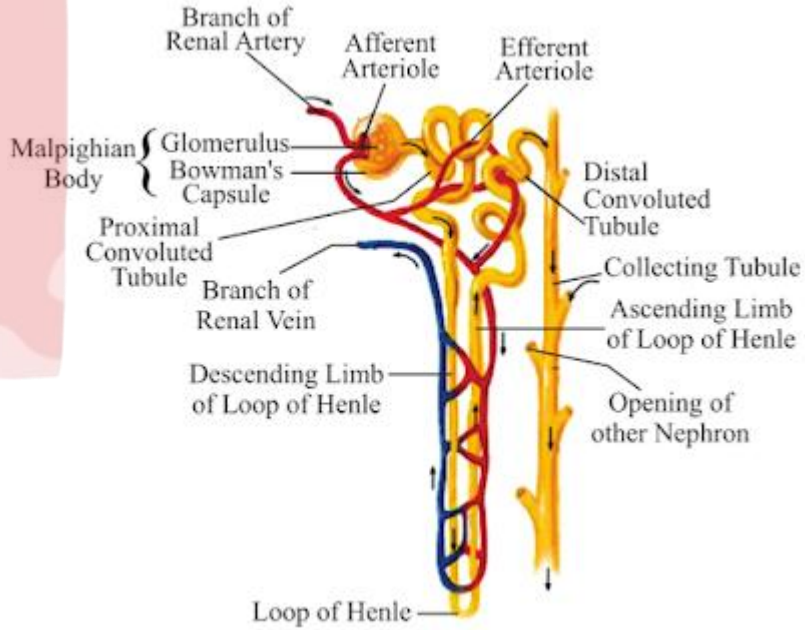
⟶ This bladder is a muscular structure which is under nervous control.

⟶ 180 litres of filtrate is formed daily but only 2 litres is excreted out as urine so the rest is reabsorbed in the body.



Functions of Nephron

⟶ Excretion of nitrogenous wastes.
⟶ To maintain the water and ionic balance (osmic regulation).



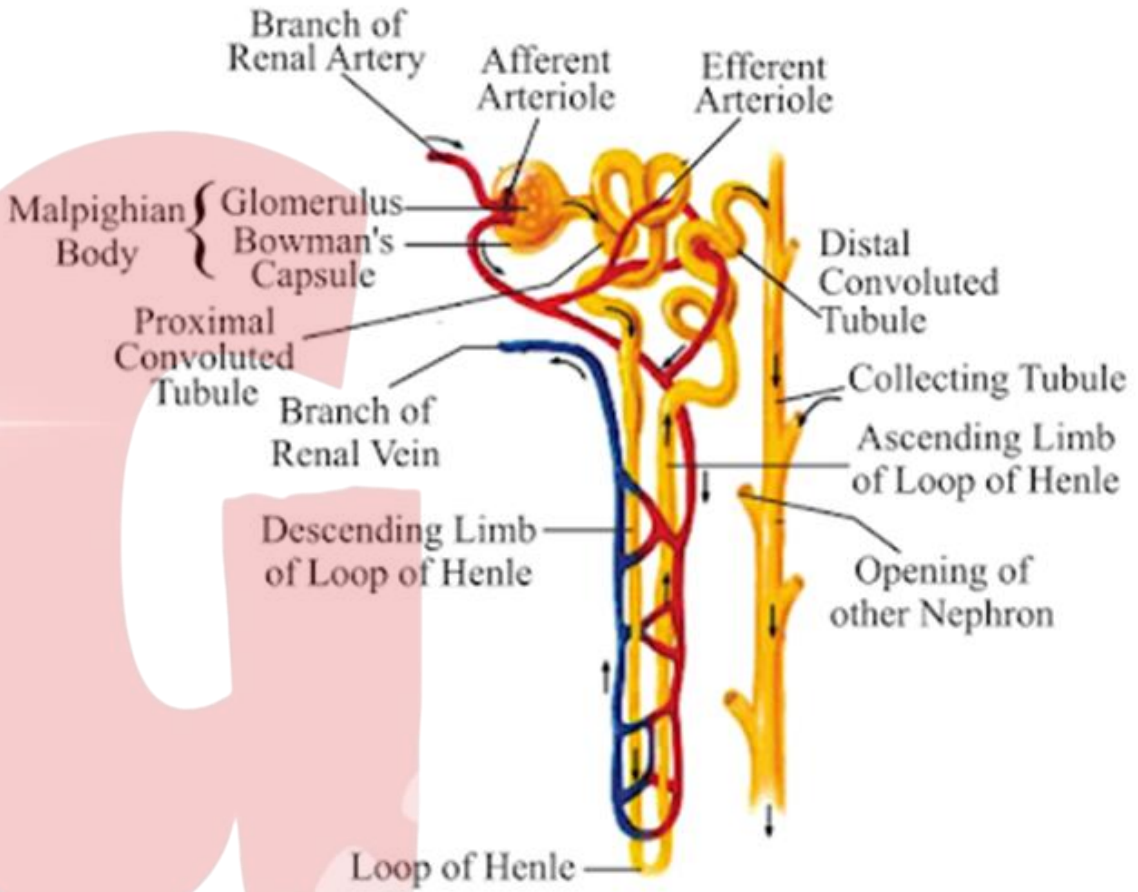
Formation of urine in Humans

The urine formation involves three steps :

(i) Glomerular filtration: Nitrogenous wastes, glucose water, amino acid filter from the blood into Bowman Capsule of the nephron.

(ii) Tubular reabsorption: Now, useful substances from the filtrate are reabsorbed back by capillaries surrounding the nephron.

(iii) Secretion: Urea, extra water and salts are secreted into the tubule which open up into the collecting duct & then into the ureter.



Artificial Kidney

Haemodialysis: The process of purifying blood by an artificial kidney. It is meant for kidney failure patients.

Excretion in Plants

Plants use different strategies for excretion of different products :

→ Oxygen and carbon dioxide is diffused through stomata.

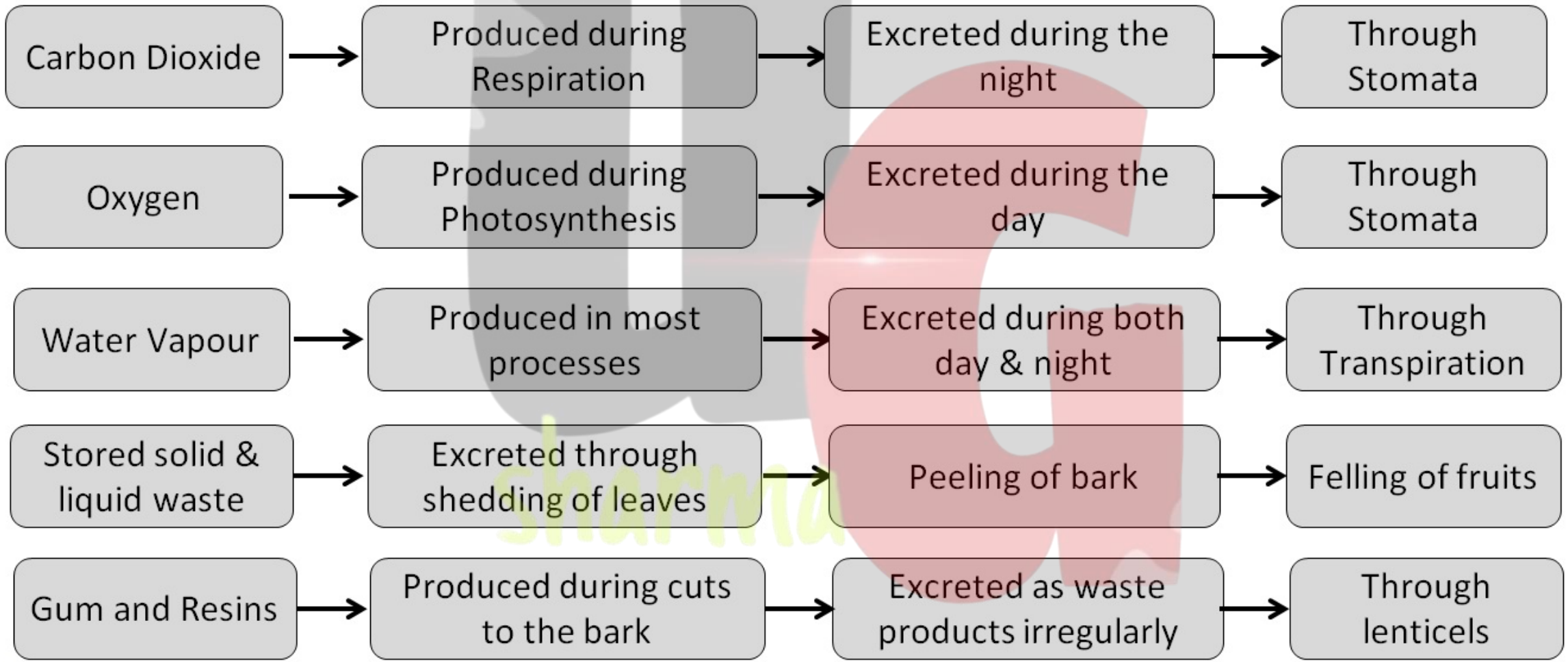
→ Excess water is removed by transpiration.

→ Plants can even loose some of their old parts like old leaves and bark of tree.

→ Other waste products like raisins and gums especially in old xylem cells which can also be lost by plants.

→ Plants also secrete some waste substances into the soil around them.

EXCRETION IN PLANTS : FLOWCHART



QUESTIONS

1. What are the components of the transport system in human beings? What are the functions of these components?
2. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?
3. What are the components of the transport system in highly organised plants?
4. How are water and minerals transported in plants?
5. How is food transported in plants?

QUESTIONS

1. Describe the structure and functioning of nephrons.
2. What are the methods used by plants to get rid of excretory products?
3. How is the amount of urine produced regulated?

EXERCISES

1. The kidneys in human beings are a part of the system for
   (a) nutrition. (c) excretion.
   (b) respiration. (d) transportation.
2. The xylem in plants are responsible for
   (a) transport of water. (c) transport of amino acids.
   (b) transport of food. (d) transport of oxygen.
3. The autotrophic mode of nutrition requires
   (a) carbon dioxide and water. (c) sunlight.
   (b) chlorophyll. (d) all of the above.
4. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in
   (a) cytoplasm. (c) chloroplast.
   (b) mitochondria. (d) nucleus.
5. How are fats digested in our bodies? Where does this process take place?
6. What is the role of saliva in the digestion of food?
7. What are the necessary conditions for autotrophic nutrition and what are its by-products?
8. What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.
9. How are the alveoli designed to maximise the exchange of gases?
10. What would be the consequences of a deficiency of haemoglobin in our bodies?
11. Describe double circulation of blood in human beings. Why is it necessary?
12. What are the differences between the transport of materials in xylem and phloem?
13. Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.