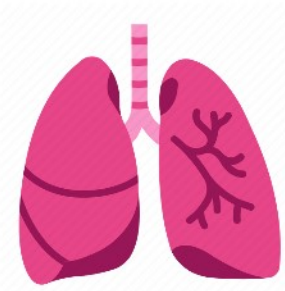
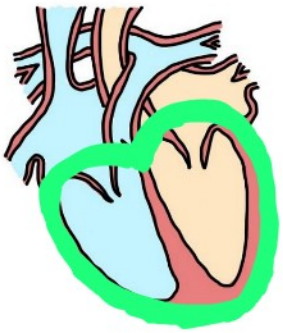
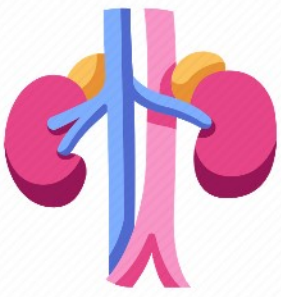
Life Processes

HANDWRITTEN NOTES

(Previous yr. Ques Included)







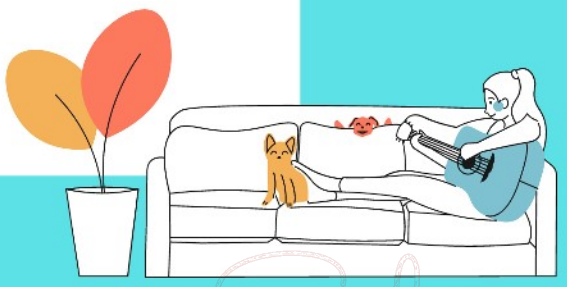
Designed with ❤

Gaurav Suthar

For Notes of other Chapters

Subscribe to my Youtube Channel

GAURAV SUTHAR



If these notes helped in you in any way,
You can show your support by donating.

Even the smallest donations count

Scan the code in any Payment app

OR

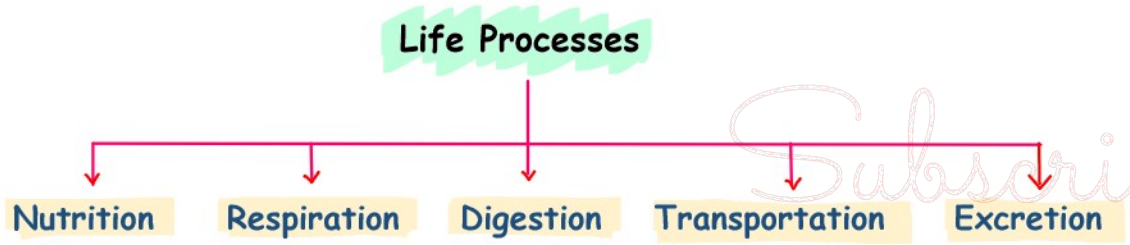
Contribute to UPI Id

Gaurav990823@okaxis

Lets know how our "BODY" works

Life Processes -

1. The basis function performed by living organisms to maintain their life on this Earth.
2. These include nutrition, respiration, transportation, excretion.



Nutrition

Nutrition : The process of intake of nutrients (like carbohydrates, fats, proteins, minerals , vitamin and water) by an organism as well as the utilization of these nutrients by the organism.

Nutrients : Group of food in which protein, fats, vitamins and minerals are involved is called nutrients.

Types of Nutrition

1. Autotrophic Nutrition

- The process by which organism synthesize its own food from simple inorganic substances like carbon dioxide and water present in the surrounding environment is called as autotrophic nutrition.
- Eg- Green Plants and Bacteria

2. Heterotrophic Nutrition

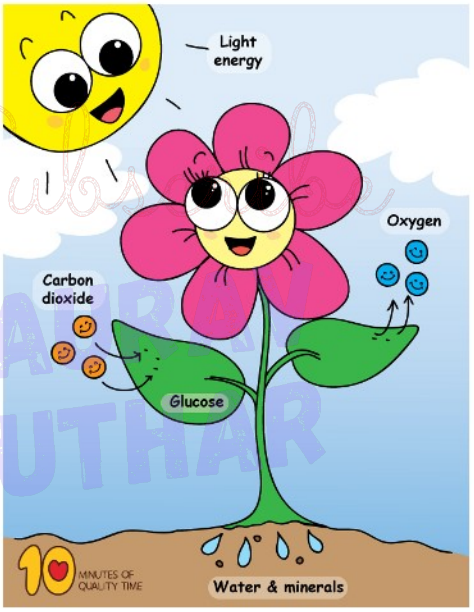
- Organisms that can't synthesize there own food from simple inorganic

substances and obtain there own food from other organisms , this process is called heterotrophic nutrition.

- Eg- Animals and fungi

Nutrition in Plants - Photosynthesis

- The process by which green plants takes in inorganic substances like **CARBON DIOXIDE (CO_2)** and **WATER (H_2O)** and convert them into food (like glucose) in the presence of **SUNLIGHT** and **CHLOROPHYLL** is called **PHOTOSYNTHESIS**.



- **OXYGEN** gas is released during **PHOTOSYNTHESIS**.

$$6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 6H_2O$$

Conditions necessary for Photosynthesis:

1. Sunlight
2. Chlorophyll
3. Carbon Dioxide
4. Water

Steps of Photosynthesis :-

(1) **Absorption** of Light Energy by Chlorophyll.

(2) **Conversion** of Light Energy to Chemical Energy and splitting of Water molecules into Hydrogen and Oxygen

(3) **Reduction** of Carbon Dioxide by Hydrogen to form Carbohydrates like Glucose.

Ques) Where do plants get each of the raw materials required for photosynthesis?

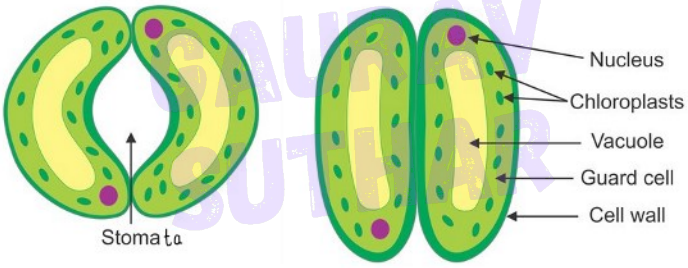
The process of photosynthesis requires two raw materials:
1. Carbon Dioxide
2. Water

1. Carbon Dioxide - The green plants take Carbon Dioxide from air through Stomata.

2. Water - Water required for photosynthesis is absorbed by roots from soil.

STOMATA

- Tiny Pores present on the surfaces of leaves
- Responsible for gaseous exchange
- Surrounded by a pair of guard cells which control opening and closing of stomata.



- Water flows into guard cells → Stomata Open
- Water flows out of guard cells → Stomata Close

Nutrition in Animals

Heterotrophic Nutrition

Saprophytic Nutrition

In this the organism obtains its nutrition from decaying organic matter of the dead Plants and Animals

Eg. Fungi

Parasitic Nutrition

In this organism obtains food from the body of another living organisms (host) without killing it.

Eg. Lice, Ticks etc.

Holozoic Nutrition

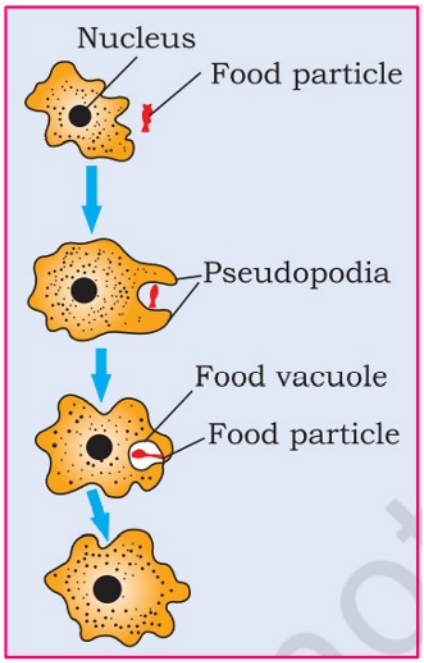
In this the organism takes in Complex organic food by a process called Ingestion, which is then digested and absorbed into the body and waste, undigested part is thrown out of the body through Egestion.

Eg. Amoeba, Man, Dog etc.

Nutrition in Amoeba

1 Ingestion-

- Amoeba takes in food using temporary finger like extensions of the cell surface called as Pseudopodia
- Pseudopodia fuse over food particle performing a food - vacuole



2 Digestion-

- Various enzymes from cytoplasm enter into food vacuole and breaks down complex substances into simpler ones.

3 Absorption -

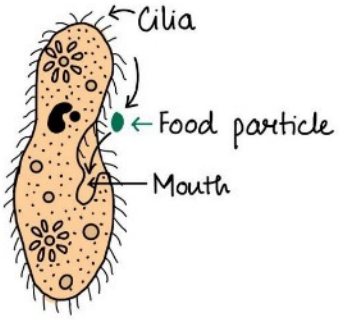
- The simple soluble food is absorbed by cytoplasm of Amoeba through the process of diffusion.

4 Egestion-

- The remaining undigested material is moved to the surface of the cell and thrown out.

Nutrition in Paramecium

Paramecium is an unicellular organism, the cell has definite shape and food is taken in at a specific spot by the movement of Cilia which cover the entire surface of the cell.



Nutrition in Human Beings

Mouth

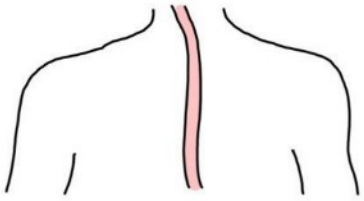
- The food is ingested through mouth.
- Teeth crushes and breaks down food into smaller pieces.
- The process of Digestion starts from Mouth.

- The salivary glands secrete Saliva which contains an enzyme called salivary amylase which digest the starch present in food into Sugar.

Starch (Carbohydrate) —Salivary Amylase→ Sugar

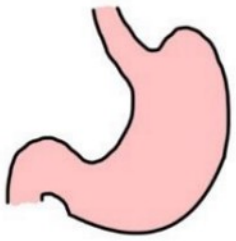
Oesophagus / Food pipe

- The walls of oesophagus show peristaltic movement (Rhythmic contraction and relaxation of muscles) which pushes the food forward into the Stomach.



Stomach

- The glands present in the walls of stomach secrete gastric juice.
- Gastric juice contains - 1. Hydrochloric Juice
  2. Enzyme Pepsin
  3. Mucus



1) Hydrochloric Acid - Creates an acidic medium which facilitates the action of enzyme pepsin..

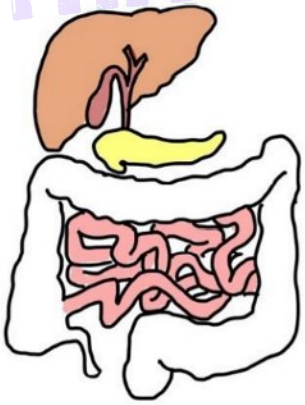
2) Pepsin - It is a Protein digesting enzyme.

3) Mucus - Protects the Inner lining of the stomach from the action of Acid..

- The exit of food into small intestine is regulated by 'Sphincter muscle'.

Small Intestine

- Small Intestine is the site for complete digestion of food (Carbohydrate, Fats, Proteins).



- Small Intestine receives secretion of two glands: Liver and Pancreas.

1) Liver

- Liver secrets Bile juice.
- Bile juice performs two functions.

i) Makes the acidic food coming from Stomach Alkaline so that pancreatic enzymes can act on it.
ii) Bile juice breaks the fat present in food into small globules(emulsified fat) so that enzymes can act on it and digest them.

2) Pancreas

- Secrets Pancreatic juice which secrets digestive enzyme Trypsin and Lipase.

i) Lipase - Breaks down emulsified fat.
ii) Trypsin - Digests Protein

i) Lipase - Breaks down emulsified fat.
ii) Trypsin - Digests Protein.

The walls of small intestine contains glands which secrets Intestinal juice.

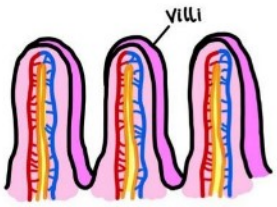
- Intestinal Juice contains enzyme which convert :-

Protein	→	Amino Acids
Complex carbohydrate	→	Glucose
Fats	→	Fatty Acid + Glycerol

The process of absorption starts in small Intestine

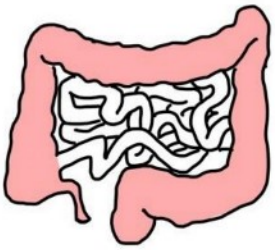
Villi - Small finger - like projections which increase the surface area for absorption and are richly supplied with blood vessels which take absorbed food to each and every cell of body.

- The inner surface of small intestine has millions of villi which absorbs nutrients from digested food



Large Intestine

- Unabsorbed food reaches large Intestine where more villi absorb water.



Anus

- Rest of the undigested food is removed from anus.

Detailed Diagram of Digestive System On Next Page

Human Body: Digestive System

The main functions of the digestive system are mechanical and chemical digestion, and absorption. Digestion is the process in which the body breaks food down into smaller molecules so that nutrients can be easily absorbed. The entire digestion process can take anywhere from 24 to 50 hours.

Mouth/Esophagus

Digestion begins in the mouth through the mechanical and chemical breakdown of food. Smooth muscle tissue in the esophagus squeezes the food down toward the stomach in a process called peristalsis.

Stomach

Mechanical and chemical digestion continues in the stomach. Smooth muscle tissue in the stomach wall squeezes and churns the material, while enzymes and chemicals are added to help further break down the food.

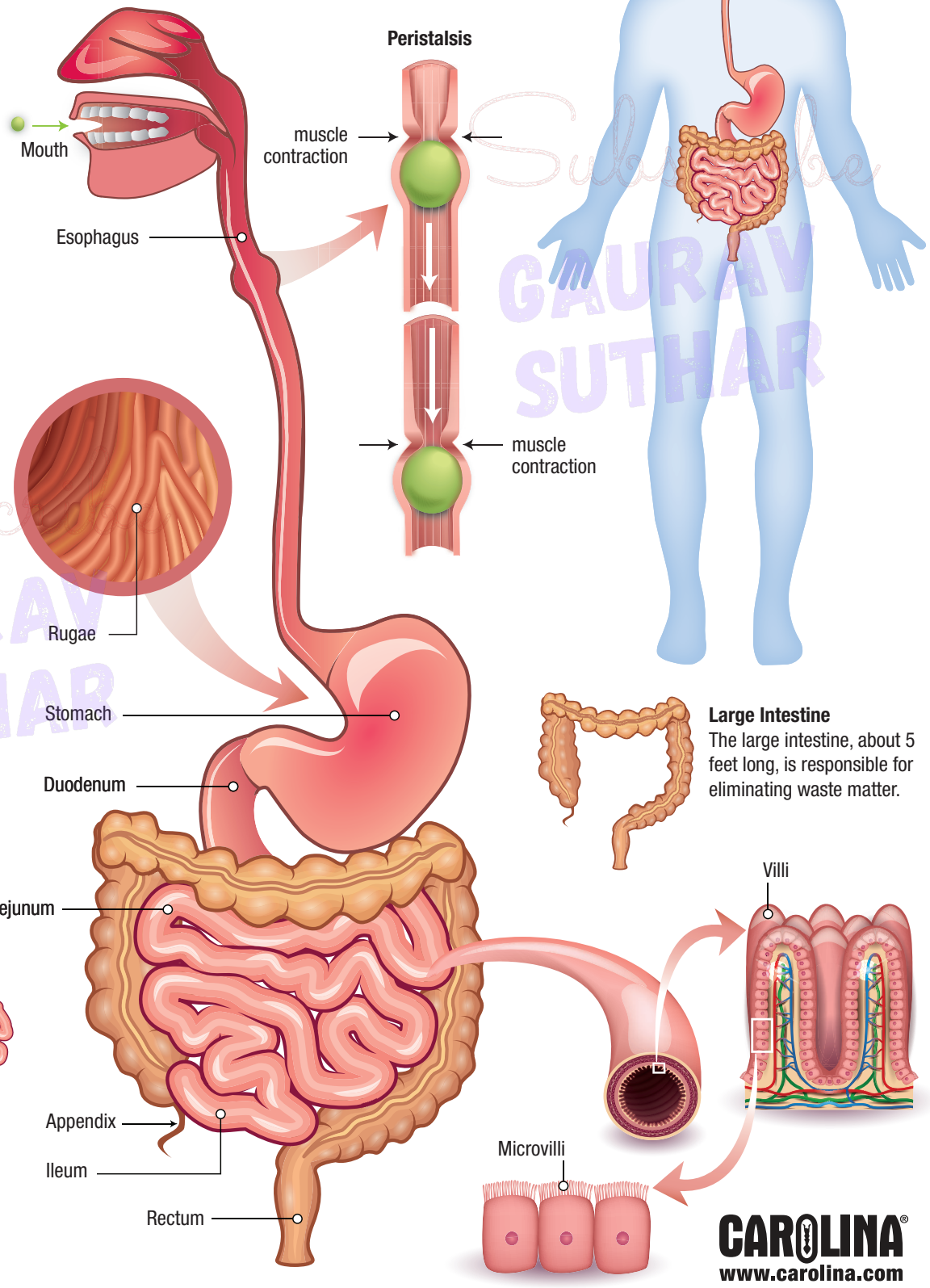
Stomach structure
The internal structure of the stomach has ridges and folds called rugae. This increases the surface area within the stomach and allows it to expand to hold more food.

Intestines

The small intestine and large intestine (colon) combined average 25 feet long.

Small Intestine
The majority of absorption takes place in the small intestine, which is about 20 feet long. The small intestine has 3 sections: duodenum, jejunum, and ileum.

Finger-like extensions called villi and microvilli increase the surface area of the small intestine, allowing maximum absorption of nutrients and water.



Large Intestine
The large intestine, about 5 feet long, is responsible for eliminating waste matter.

CAROLINA®
www.carolina.com

Respiration

- The process of releasing energy from food is called Respiration.
- The process of respiration takes place inside the cells of the body.

How Energy Released During Respiration is Stored :-

- The energy released during respiration is stored in the form of ATP

ATP	-	Adenosine tri-phosphate
ADP	-	Adenosine di-phosphate

(i) Energy released during respiration is used to make ATP from ADP and inorganic phosphate.

$$ADP + Phosphate + Energy \longrightarrow ATP$$

(ii) When the cell needs energy, then ATP can be broken down using water to release energy.

$$ATP \longrightarrow ADP + Phosphate + Energy$$

- The Energy equivalent to 30.5KJ/mole is released in this process.

Types of Respiration

- Aerobic Respiration
- Anaerobic Respiration

1. Aerobic Respiration

- The Respiration which uses oxygen is called aerobic respiration.
- Glucose is completely broken down into carbon dioxide and water in presence of oxygen.

Glucose (6 carbon molecule) —In Cytoplasm→ Pyruvate (3 carbon molecule) —Presence of oxygen, In Mitochondria→ $CO_2 + H_2O$ + Energy (38 ATP)

- Most of the organisms carry out Aerobic Respiration for Eg:- Man, Dogs, Earthworms etc.

2. Anaerobic Respiration

- Respiration which takes place without oxygen is called Anaerobic respiration.
- Glucose is completely broken down into carbon dioxide and water in presence of oxygen.

(i) Micro-organisms like yeast break down glucose into ethanol and carbon-dioxide, and release the energy.

Glucose (6 carbon molecule) —In Cytoplasm→ Pyruvate (3 carbon molecule) —Absence of oxygen, (In Yeast)→ Ethanol + CO_2 + 2ATP

- This process is known as Fermentation.

(ii) Anaerobic Respiration takes place in our muscles during vigorous physical exercise.

Glucose (6 carbon molecule) —In Cytoplasm→ Pyruvate (3 carbon molecule) —Absence of oxygen, (In our Muscle cells)→ Lactic Acid + 2ATP

- This causes Muscle Cramps.

Ques) Differentiate between Aerobic Respiration and Anaerobic Respiration.

Aerobic Respiration	Anaerobic Respiration
1) It takes place in the presence of oxygen.	1) It takes place in the absence of oxygen.
2) In this complete breakdown of food occurs.	2) In this, partial breakdown of food occurs.
3) End products are carbon-dioxide and water.	3) End products maybe ethanol and carbon-dioxide (in yeast) or lactic acid (in animal cells)
4) It produces a considerable amount of energy.	4) Much less energy is produced.

Human Respiratory System

- The main organs of human respiratory system are: Nose, Nasal passage (or nasal cavity), Trachea, Bronchi, Lungs and Diaphragm.

1) Nostrils
- Air is taken in the body through nostrils.
- The Air passing in through nostrils is filtered by fine hair that the line passage.
- The passage is also lined with mucus.

2) Pharynx
- The part of throat between the mouth and wind pipe is called pharynx.
- From nostril, air enters into pharynx and then goes into the trachea or wind pipe.

3) Larynx
- The upper end of trachea has a voice box called larynx.

4) Trachea
- Trachea is a tube which is commonly is called wind pipe.
- It is composed of rings of cartilage which prevent the collapse of trachea in the absence of air.

5) Bronchi
- The trachea divides into two smaller tubes called "Bronchi".
- The two bronchi are connected to the lungs.

6) Lungs
- The lungs lie in chest cavity which is separated from abdominal cavity by a muscular partition diaphragm.
- The lungs are enclosed in a "Rib Cage" made of bones called "Ribs".

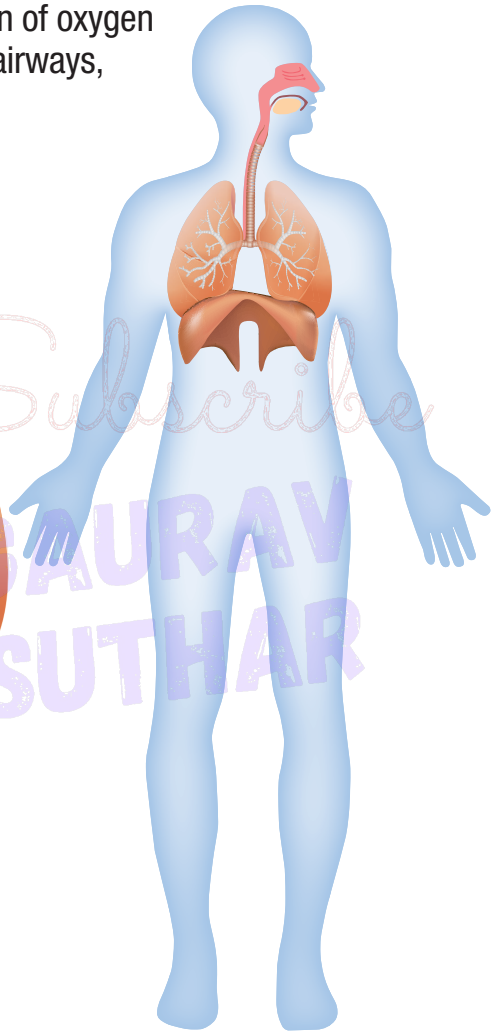
7) Bronchioles - Each bronchus divides into smaller tubes called "Bronchioles".

8) Alveoli
- These are Air-Sacs at the end of "bronchioles".
- Its walls are very thin and they are surrounded by thin blood capillaries.
- Gaseous exchange takes place inside alveoli.
- Millions of alveoli in the lungs provide large area for the exchange of gases.

Detailed Diagram of
Human Respiratory System
On Next Page

Human Body: Respiratory System

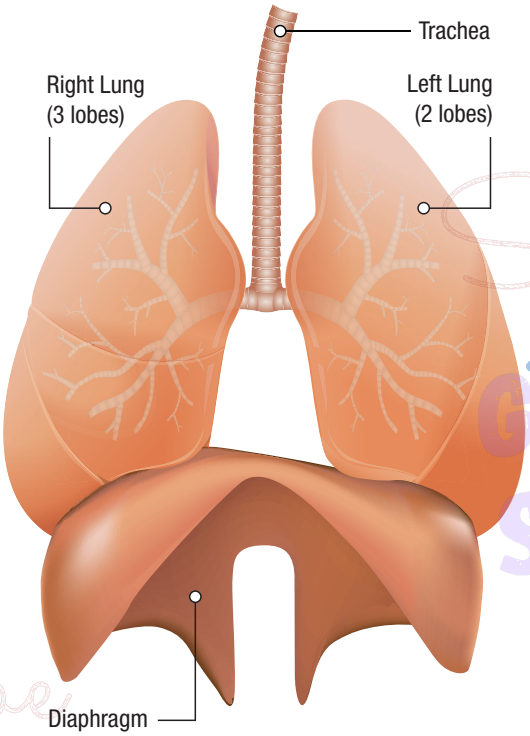
The respiratory system is responsible for gas exchange—the inhalation of oxygen (O_2) and the exhalation of carbon dioxide (CO_2). The lungs, conducting airways, and the diaphragm are key structures of the system.



Lungs and Diaphragm

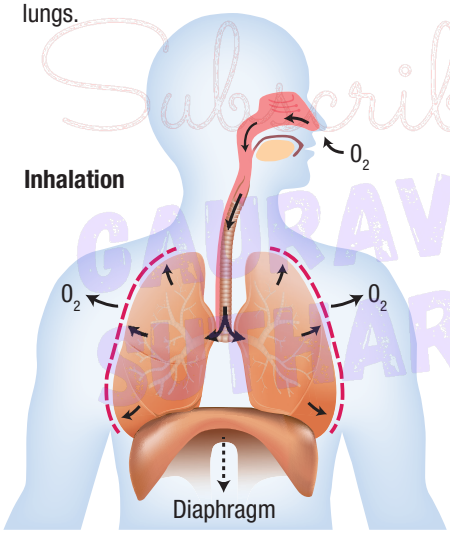
Human lungs are sponge-like organs found in the thoracic (chest) cavity. The right lung has 3 lobes and is larger than the bilobed left lung, as the heart occupies more space on the left side.

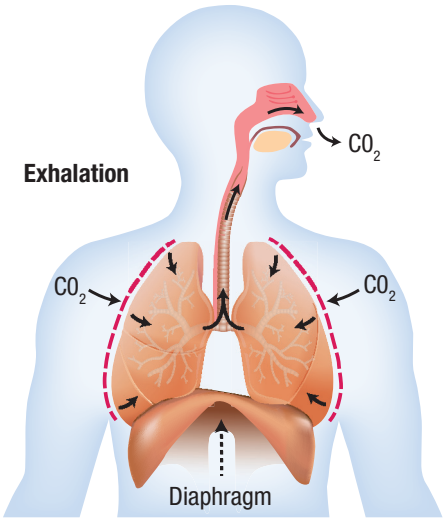
The diaphragm is a domed, sheet-like muscle that separates the thoracic and abdominal cavities.

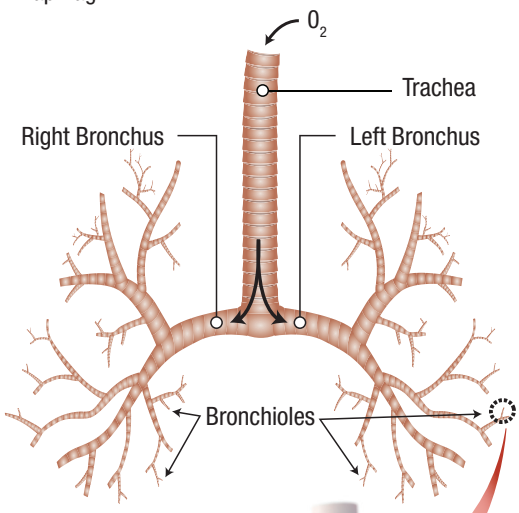


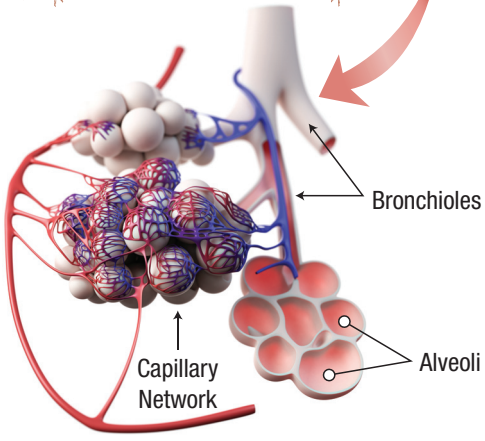
Breathing

During **inhalation**, the diaphragm contracts, and air is pulled through the conducting airways into the lungs. During **exhalation**, the diaphragm relaxes, and air is pushed from the lungs.









Bronchi, Bronchioles, and Alveoli

Air enters the lungs from the trachea through the right and left bronchus. These branching airways lead to bronchioles and end in microscopic air sacs called alveoli. The alveoli are the sites of gas exchange between the cardiovascular and respiratory systems.

CAROLINA®
www.carolina.com

Mechanism of Breathing :-

Breathing - Inhalation of oxygen and exhalation of Carbon-Dioxide is called Breathing. Breathing consists of Inhalation and Exhalation.

1) Inhalation - As we inhale, Ribs lift and Diaphragm moves downward the chest cavity becomes larger. Because of this, air is sucked into the lungs and fills the expanded alveoli.

- The oxygen in alveolar air is taken up by the alveolar blood vessels to be transported to all cells of body.
- The oxygen is carried in the blood by the respiratory pigment Haemoglobin Which can store high quantity of Oxygen.
- This pigment is present in the Red Blood Corpuscles.
- The oxygen reaches the cells where the process of respiration takes place producing Carbon-Dioxide.
- This Carbon-dioxide diffuses into blood which carries it to the lungs in dissolved form.

2) Exhalation - As we exhale, Ribs relax due to which Diaphragm moves upward. This decreases the space in our chest cavity pushing the air out of the lungs.

Ques) What advantage over an aquatic organism does a terrestrial have with regard to obtaining oxygen for respiration?

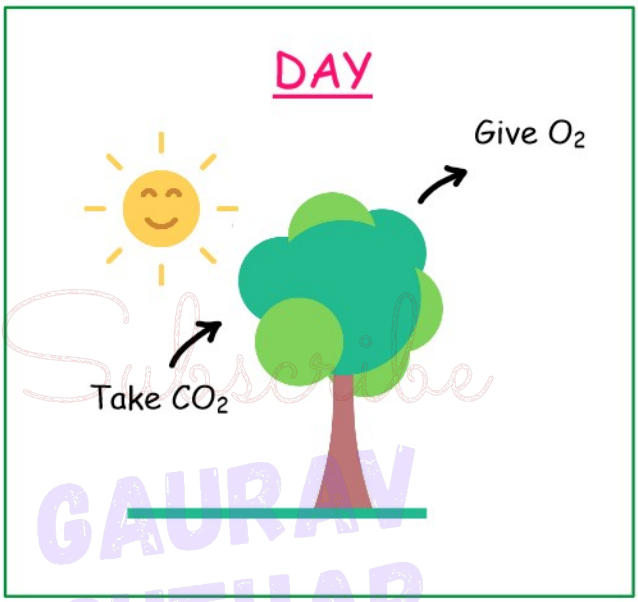
Since the amount of dissolved oxygen is fairly low compared to the amount of oxygen in the air. The rate of breathing in aquatic organisms is much faster than that of Terrestrial organisms.

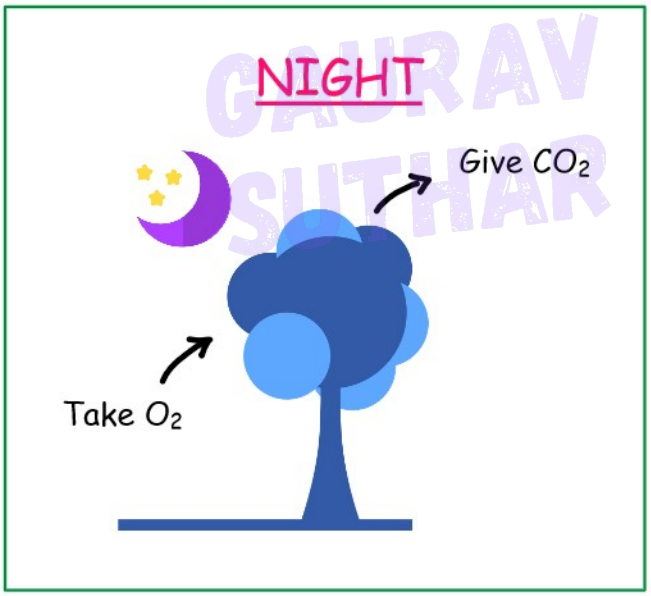
Respiration in Plants

Respiration in Leaves	⟶	Through Stomata
Respiration in Green Stem	⟶	Through Stomata
Respiration in Woody Stem	⟶	Through Lenticel

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

(ii) At night, When there is no photosynthesis occurring, CO_2 elimination is the major exchange activity going on.





Human Circulatory System

Blood - Blood is a fluid connective tissue which consists of :-

i) **Plasma** - It is the fluid medium in which cells are suspended.
- It transported food, carbon-dioxide and nitrogenous waste.

ii) **Red Blood Cells** - RBC contains haemoglobin which carries oxygen from lungs to all the cells of the body.

iii) **White Blood Cells** - They protect us from diseases by fighting infection.

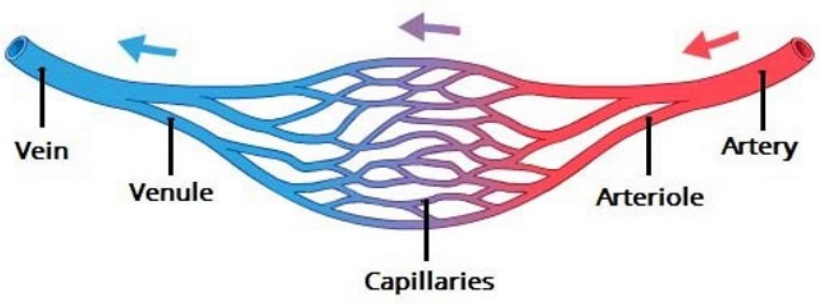
iv) **Platelets** - They help in clotting of the blood in the case of injury.

- The human blood circulatory system consists of the heart and blood vessels.
- There are three types of blood vessels:

i) **Arteries** - Carry blood from heart to all parts of the body.

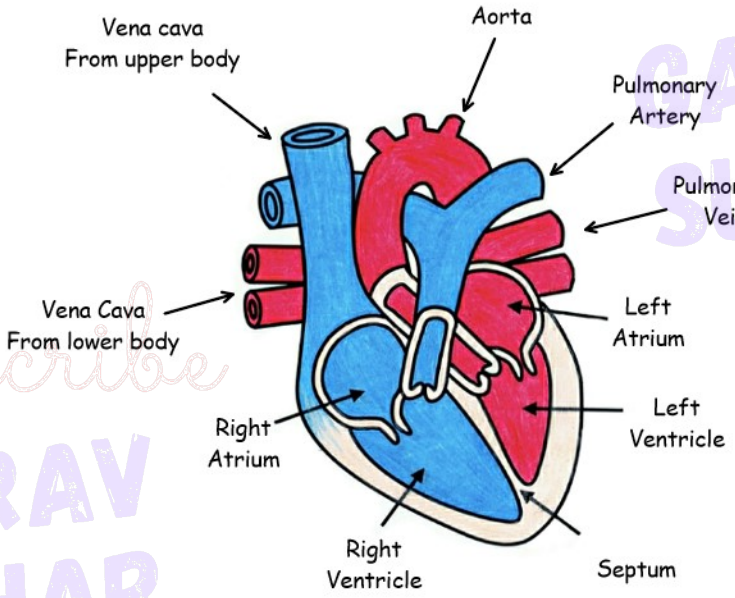
ii) **Veins** - RBC contains haemoglobin which carries oxygen from lungs to all the cells of the body.

iii) **Capillaries** - Narrow, Thin walled blood vessels that connects arteries to veins.
- The exchange of materials such as O2, CO2 and food between blood and cells takes place through capillaries.



Human Heart-

- Heart pumps blood around the body.
- It is triangular in shape and roughly the size of our 'closed fist'.
- Human heart has four chambers .
- The upper two chambers are called Atrium and lower two chambers are called Ventricles.
- These chambers are separated by a partition called "Septum".
- Valves present inside heart prevents the backflow of blood.



Blood Circulation -

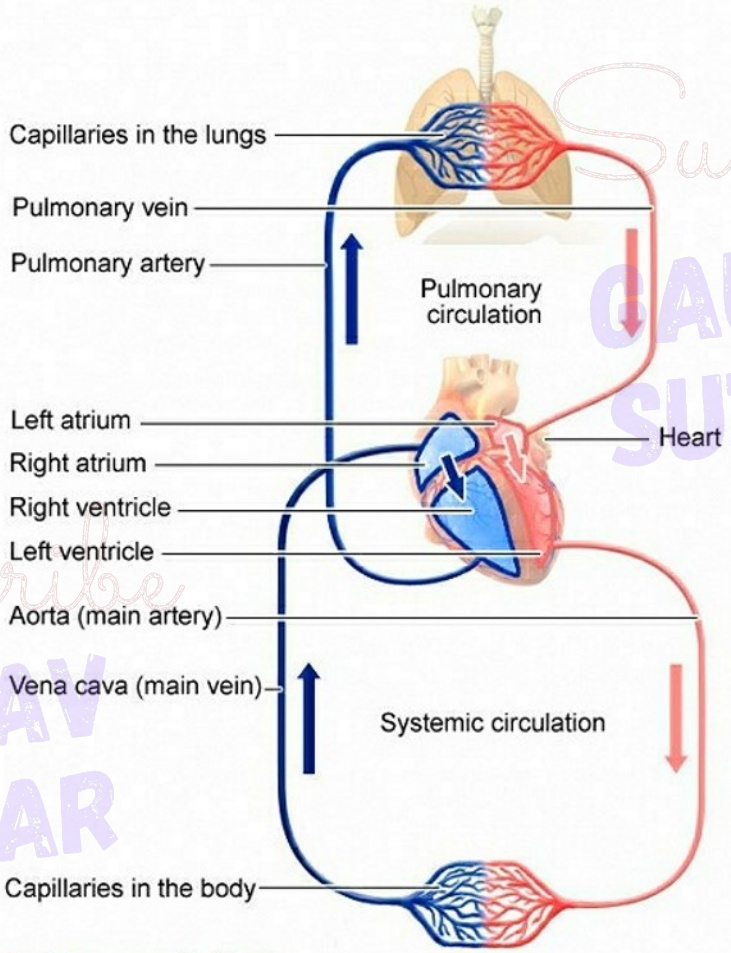
1) When the muscle of all the four chambers are in relaxed state, the pulmonary vein brings oxygenated blood from the lungs into the left atrium.
2) Oxygenated blood is pushed from the left atrium to left ventricle.
3) The muscles of left ventricle contract and the blood is pushed through Aorta (largest artery) to the whole body (except lungs).
   The oxygenated blood reaches the cells of the different body organs where the process of respiration takes place. Due to this oxygenated blood converts into deoxygenated blood.

4) Deoxygenated blood reaches right atrium through vena cava (largest vein).

5) When the right atrium contracts, deoxygenated blood is pushed into right ventricle.

6) When the right ventricle contracts, the deoxygenated blood is pumped into lungs through pulmonary artery.

In lungs, the deoxygenated blood becomes oxygenated. This oxygenated blood is again sent to left atrium by pulmonary vein for circulation in the body.



Double Circulation-

- In human circulatory system, the circulation of blood from heart to lungs and back to the heart is called Pulmonary Circulation and the circulation of blood from heart to rest of the body and back to heart is called Systemic Circulation.
- In such circulatory system in which blood travels twice through the heart is one complete cycle is called Double Circulation.

- Eg. Humans

Single Circulation-

- Fishes have a two-chambered heart and thus show single circulation.

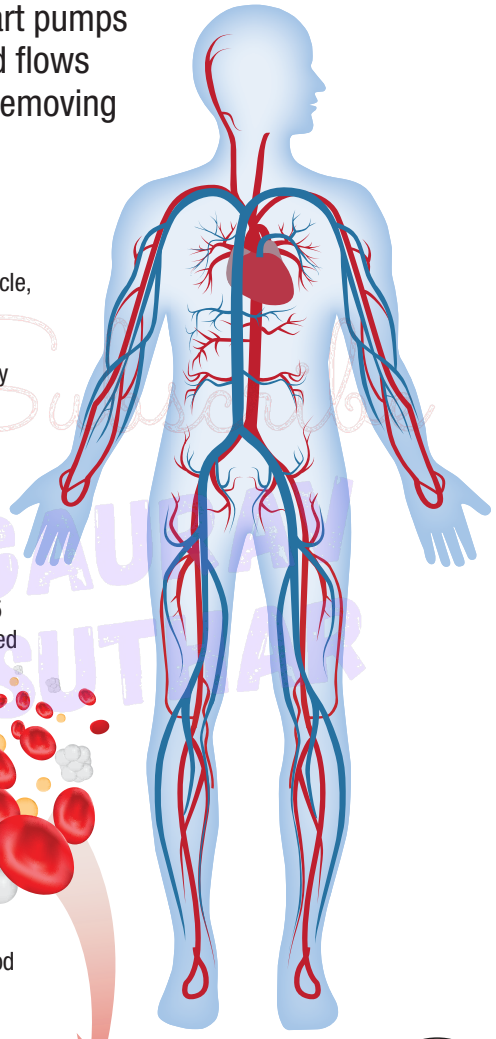
Lymphatic System-

- Lymphatic system contains lymph which is another type of fluid involved in transportation.
- Lymph is colourless and contains less protein than blood.
- Lymphatic system carries digested and absorbed fat from intestine and drains excess fluid from cellular space back into the blood.
- Lymphatic system plays role in the immunity of our body.

Detailed Diagram of
Human Circulatory System
On Next Page

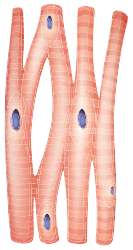
Human Body: Cardiovascular System

The cardiovascular system circulates blood through the body. The heart pumps blood through blood vessels—arteries, capillaries, and veins. As blood flows through these vessels, it delivers oxygen and nutrients to cells while removing carbon dioxide and waste products from them.

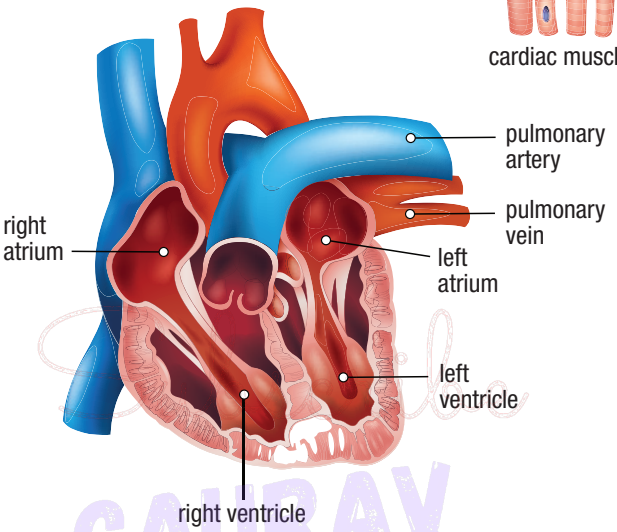


The human heart

The human heart is a muscular pump about the size of a human fist. It has 4 chambers—2 atria and 2 ventricles. It has 4 heart valves. Two are located between the chambers and 2 exit the heart, preventing the backflow of blood.



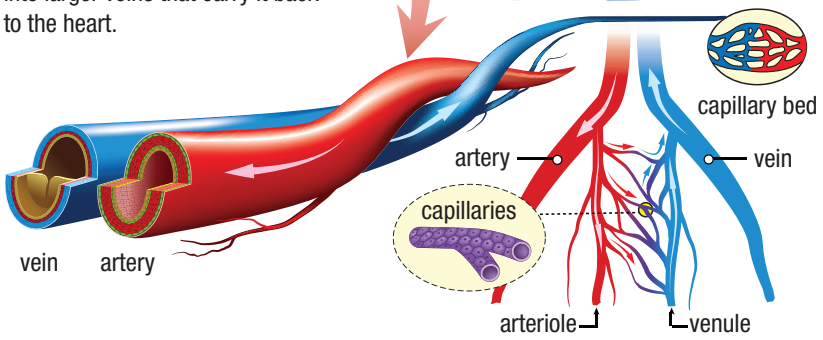
The heart consists of cardiac muscle, a striated and involuntary muscle. Individual cardiac muscle cells (cardiomyocytes) are connected by intercalated discs that coordinate synchronized muscle contraction.

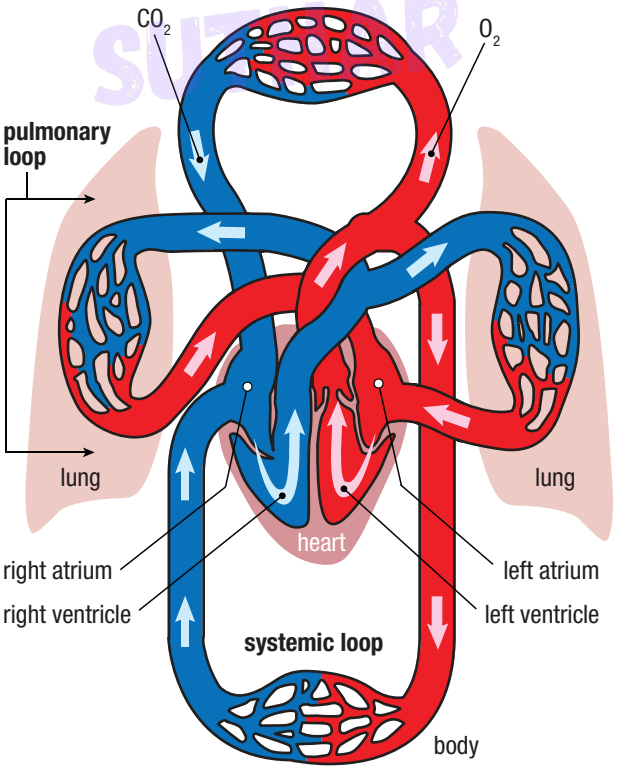


Blood composition

The human body contains about 5 liters of blood. Blood consists of red blood cells, white blood cells, platelets, and plasma.

Arteries carry oxygenated blood away from the heart to arterioles and then to capillaries. Capillary walls are thin—only a single cell thick—allowing O_2 and nutrients to enter tissues while waste products are removed. Blood then travels through venules and into larger veins that carry it back to the heart.





The 2 circulation loops

Pulmonary
The right side of the heart pumps oxygen-deficient blood to the lungs where it releases CO_2 and becomes oxygenated. This blood then returns to the heart.
Pathway: right atrium → right ventricle → lungs → left atrium

Systemic
The left side of the heart pumps oxygenated blood to body tissues where it delivers O_2 and picks up CO_2 and other waste products. This deoxygenated blood then travels back to the heart where it begins the pulmonary loop.
Pathway: left atrium → left ventricle → body → right atrium

CAROLINA®
www.carolina.com

Transport in Plants

- Plants have two transport systems :

1) Transport of water & minerals --> Conducted by Xylem (Xylem vessels &Xylem tracheids)

2) Transport of food --> Conducted by Phloem (Primarily by Sieve tubes helped by companion Cells)

Transport of water and Minerals

Root Pressure

- At the roots, cells in contact with the soil actively take up ions.
- This creates a difference in concentration of ions between the root and the soil.
- Water moves into the root from the soil to eliminate this difference which results in steady movement of water.
- Root pressure occurs mostly at night and can transport water over short distances only.

Transpiration

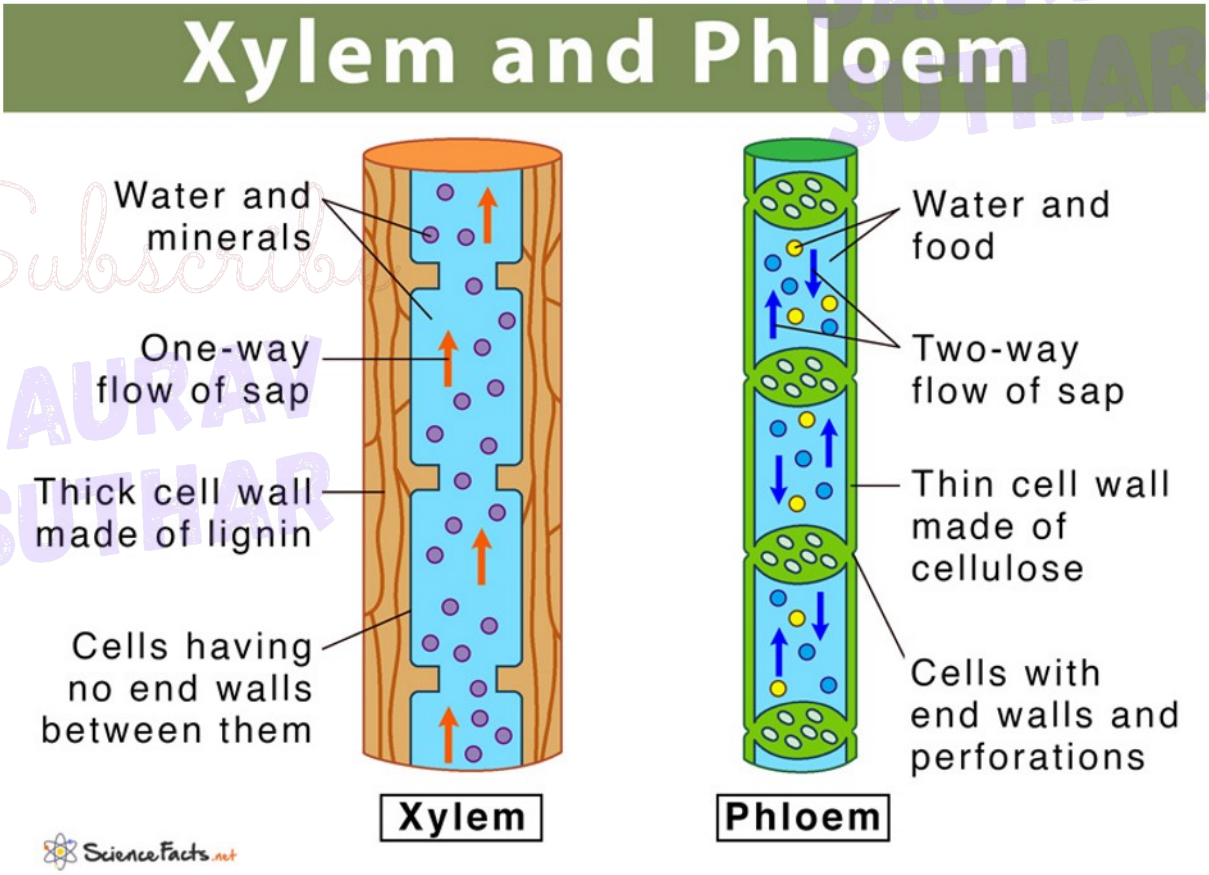
- The loss of water in the form of water vapour from aerials parts of the plant is known as transpiration.
- Evaporation of water molecules from stomata creates a suction which pulls water from the Xylem cells of roots.
- It also helps in temperature regulation.
- Transpiration occurs mostly during the day and can transport water over highest points of plant body.

Transport of food

Translocation

- Translocation in phloem is achieved by utilising energy.
- Material like sucrose is transferred into phloem tissue using energy from ATP.
- This increase the osmotic pressure of the tissue causing water to move into it. This pressure moves the material in the phloem to tissues which have less pressure.
- This allows the phloem to move material according to plant's needs.
- Eg: In the spring, sugar stored in root or stem tissue would be transported to the buds which need energy to grow.

Xylem v/s Phloem



Ques) What are the differences between the transport of material in Xylem and Phloem?

Xylem	Phloem
1) It transports water and Minerals.	1) It transports food.
2) It only transports in upward direction.	2) It transports in both upward and downward directions
3) Its transport occurs due to the suction force produced due to evaporation of water in the form of water vapours	3) Food is transported by utilizing energy from ATP.

Excretion

- The process of removal of toxic wastes from the body of an organism is called Excretion.

Human Excretory System

1) Kidney
   - Kidney are bean shaped organ.
   - We have a pair of kidney.
   - Function of kidneys is to clean our blood by filtering it to remove unwanted substances present in it.

2) Ureter
   - The Ureter is a long tube which collects urine from kidneys.

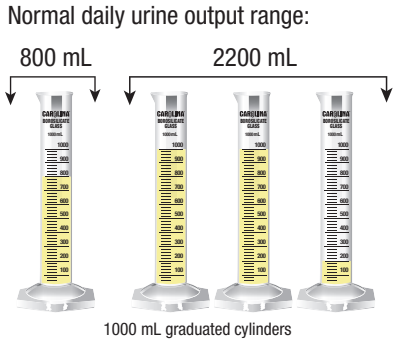
3) Urinary Bladder
   - Urine is stored in the urinary bladder

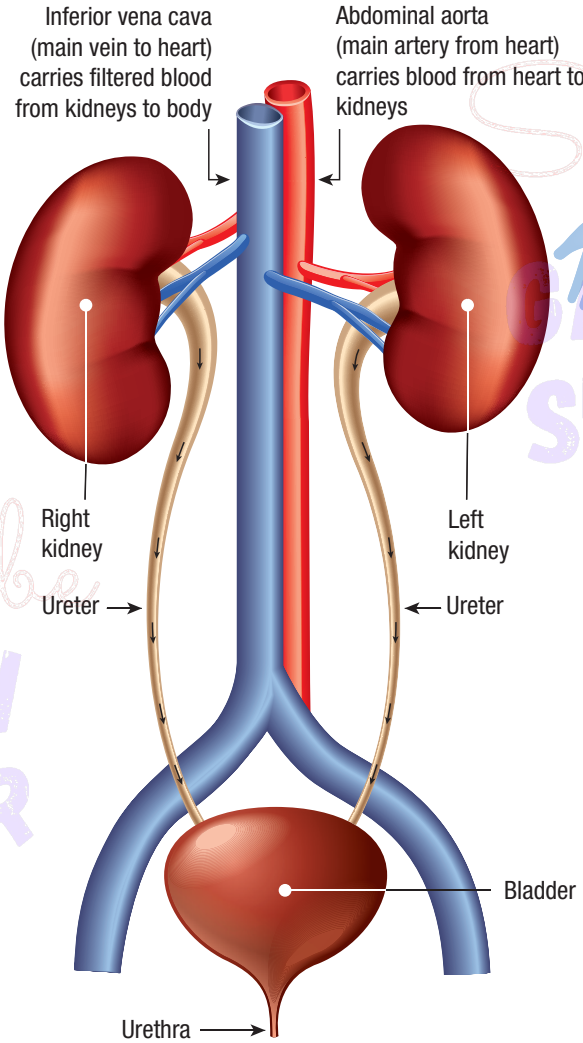
4) Urethra
   - The collected urine is passed out from the body through urethra.

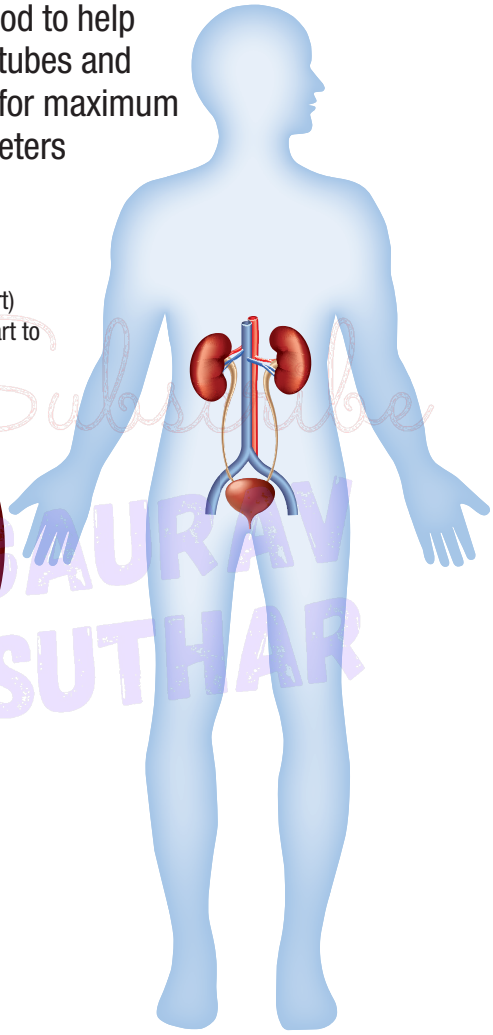
Detailed Diagram of Human Excretory System On Next Page

Human Body: Urinary System

The urinary system filters extra water and waste products from the blood to help maintain proper fluid balance inside the body. An elaborate system of tubes and tubules intertwines with arteries and veins within the kidneys to allow for maximum excretion of waste products, such as various salts and proteins. The ureters carry this waste to the bladder, where it is stored until excretion.







Urinary System

Ureters are long, thin tubes that carry urine from the kidneys (where it is produced) to the bladder.

The **bladder** is a muscular sac that stores urine.

The **urethra** is a narrow tube connected to the bladder that removes urine from the body.

Kidneys

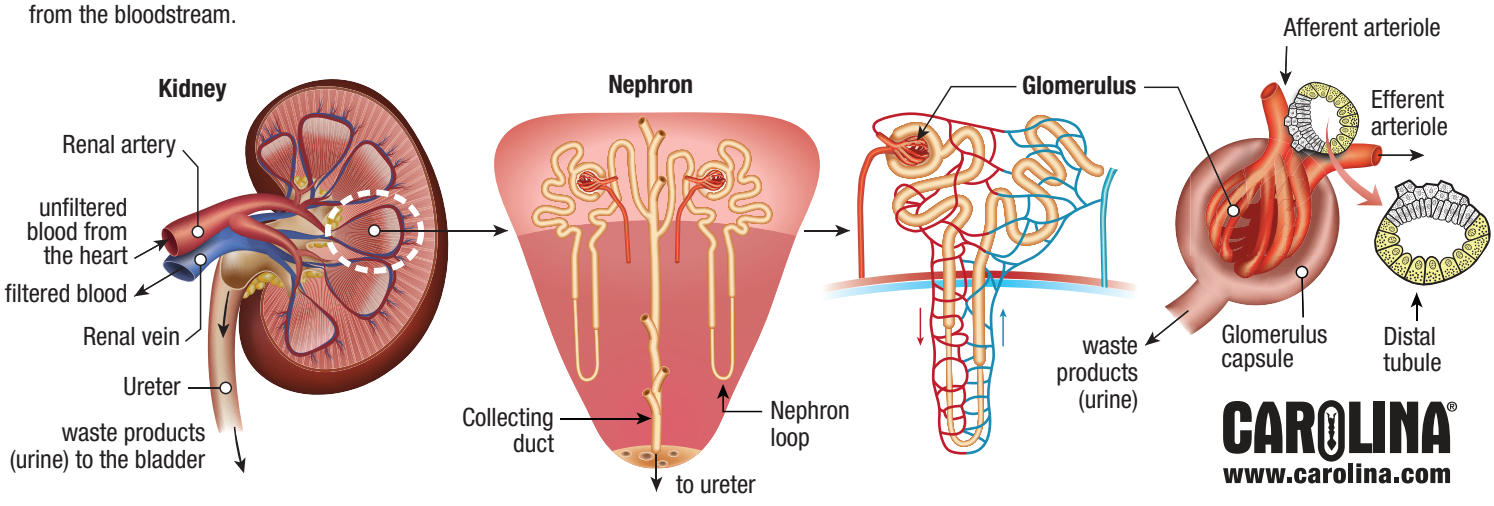
The kidneys are found in the upper abdomen on each side of the spine. These fist-size organs filter waste products out of the bloodstream and produce urine.

Nephrons

Nephrons contain a network of tubes, veins, and arteries that intertwine to exchange salts, wastes, and fluids to remove them from the bloodstream.

Glomerulus

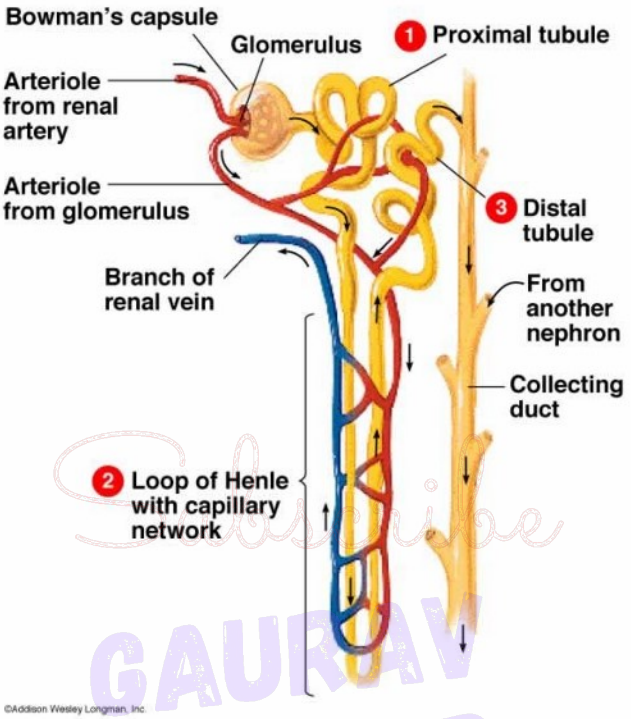
A glomerulus is a small, round pocket within the kidneys that uses concentration gradients to remove nitrogenous waste and salts from the blood vessels that pass through it.



CAROLINA®
www.carolina.com

Nephron

- Nephron is the filtration unit of kidney.
- Nephron has a cup shaped structure at its upper end called Bowman's capsule.
- The Bowman's capsule contains a bundle of blood capillaries called glomerulus.
- The renal artery brings dirty blood containing urea which passes through glomerulus.
- Glomerulus filters the blood passing through it.
- Small molecules like Urea, Uric Acid, Extra glucose, Amino acid, Salt and Water is filtered out and reaches the tubular part of nephron.
- In the tubular part of nephron, selective reabsorption of useful substances such as Glucose, Amino acid, Salt and water takes place.



- The remaining liquid from various nephrons forms urine which is collected in the collecting duct.
- From collecting duct, urine is passed into ureter. From ureter, urine passes into urinary bladder where it is stored for some time and ultimately passed out of the body through Urethra.

Ques) Name the nitrogenous waste that is removed from the blood in our Kidney.

Ans - Urea

Excretion in Plants

- **Plants excrete:**
  - Gaseous waste ⟶ through stomata/ lenticels
  - Solid/ liquid waste ⟶ through shedding of leaves
  - In the form of Gum and Resins.
  - In the surrounding soil.