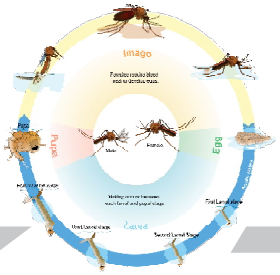


Chapter - 6

Life Processes

All living things perform certain life processes like growth, excretion, respiration, circulation etc.

All the processes like respiration, digestion, which together keep the living organisms alive and perform the job of body maintenance are called life processes.

Examples :

Life Processes

Growth | **Digestion** | **Respiration** | **Circulation** | **Excretion**

I. Nutrition

(The whole process by which an organism obtain its food)

Nutrition in Plants

↓

Plants are autotrophs.

↓

Can make their own food.

Nutrition in Animals

↓

Animals are hetrotrophs.

↓

Depends on plants or other animals for their food.

Modes of Nutrition

Autrotrophic	Hetrotrophic
Kind of nutrition in which inorganic materials like CO_2, water etc. are utilized to prepare organic food by the process of photosynthesis. *E.g.,* Green plants.	Kind of nutrition in which organisms do not possess the ability to synthesize their own food. They depend on autotrophs for their food supply directly or indirectly. *E.g.,* Animals, fungi.

Autotrophic Nutrition :

The organisms which carry out autotrophic nutrition are called autotrophs (green plants).

Autotrophs $\xrightarrow{Use}$ Simple inorganic material $\xrightarrow[ino]{Convert}$ Complex high energy molecules (Carbohydrates)

Autotrophic nutrition is the process by which autotrophs take in CO_2 and H_2O and convert these into carbohydrates in the presence of chlorophyll, sunlight is called **Photosynthesis.**

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

Raw Materials for Photosynthesis :

- Sunlight
- Chlorophyll → Sunlight absorbed by chlorophyll
- CO_2 → Enters through stomata and oxygen (O_2) is released as by-product through stomata on leaf.
- Water → Water + dissolved minerals like nitrogen, phosphorus etc. are taken up by the roots of the soil.

Site of Photosynthesis :

Chloroplast in the leaf, chloroplast contain chlorophyll (green pigment).

Main Events of Photosynthesis :

- Absorption of light energy by chlorophyll

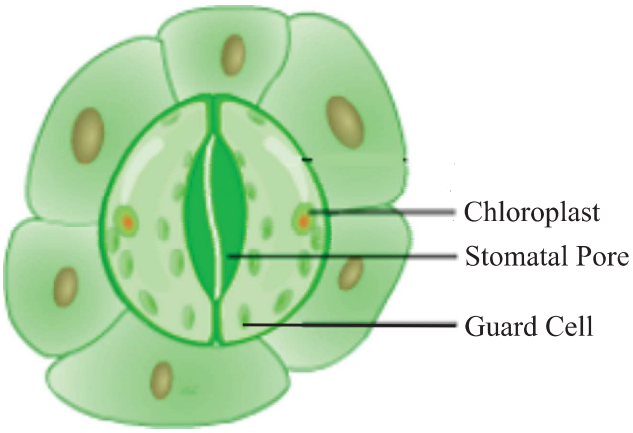
- Conversion of light energy into chemical energy + splitting (breaking) of water into hydrogen and oxygen
- Reduction of CO_2 to carbohydrates

Stomata : Tiny pores present on the surface of the leaves.

Functions :

(a) Exchange of gases O_2/CO_2.

(b) Loses large amount of water (water vapour) during transpiration.



Hetrotrophic Nutrition

Holozoic	Saprophytic	Parasitic
Animals take in solid food and breakdown inside the body. *E.g.,* Amoeba, animals.	Organisms feed on dead, decaying matter. *E.g.,* Fungi.	Parasites live inside or outside other organism (host) and derive nutrition from it. *E.g.,* Cuscuta (plant parasites), Ticks etc.

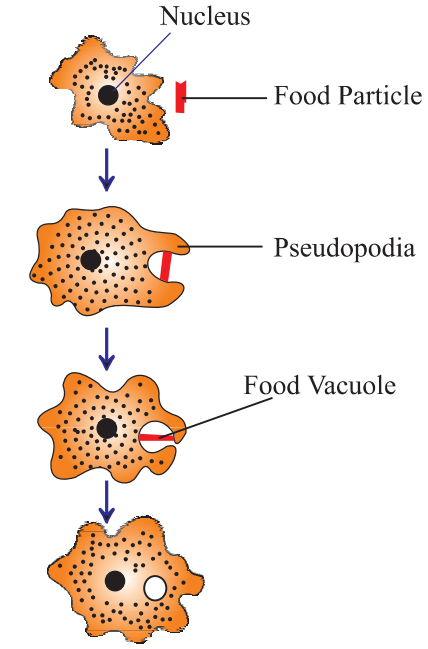
How do organisms obtain their food

Unicellular/Single celled organisms : Food is taken up through entire surface.

Example : (i) Amoeba

(ii) Paramaecium

(i) Amoeba



Amoeba → Pseudopodia
↓ extension of cell membrane
Capture food
↓
Take in | food vacuole |
↓
Digestion of food in food vacuole
← Diffusion (of simple substances in cytoplasm)
↓
Undigested food
↓
move to surface of cell and is thrown out.

Nutrition in Amoeba

(ii) Paramaecium

Paramaecium → Cilia (Present all over the body) → Take in food → At a specific spot

I. NUTRITION

NUTRITION

Ingestion (Intake of food)	**Digestion** (Breakdown of complex material into simple ones)	**Absorption** (Movement of digested food)	**Assimilation** (Utilisation of food)	**Egestion** (Removal of waste products)

Different organisms utilize different nutritional processes as it depends upon the source of carbon from where the food is taken.

1. Mouth → Intake of whole food.
   ↓
   Teeth → Chewing/grinding of food.
   ↓
   Tongue → Rolling of food +
   ↓ Tasting of food +
   Swallowing/Pushing down of the food.
   Salivary Glands → Secrete saliva + Mucus
   ↓ Starch $\xrightarrow[\text{amylase [Saliva]}]{\text{Salivay}}$ Sugar

2. Oesophagus → Taking food from mouth to stomach by **Peristaltic movements.** [Contraction and expansion of muscles of the oesophagus
   ↓

3. Stomach → Gastric glands $\xrightarrow{\text{Secrete}}$ Gastric juice

   Gastric Juice

PEPSIN	**HCl**	**MUCUS**
(Enzyme that breaks down proteins)	(Makes medium acidic)	(Protects inner lining of the stomach)

   ↓

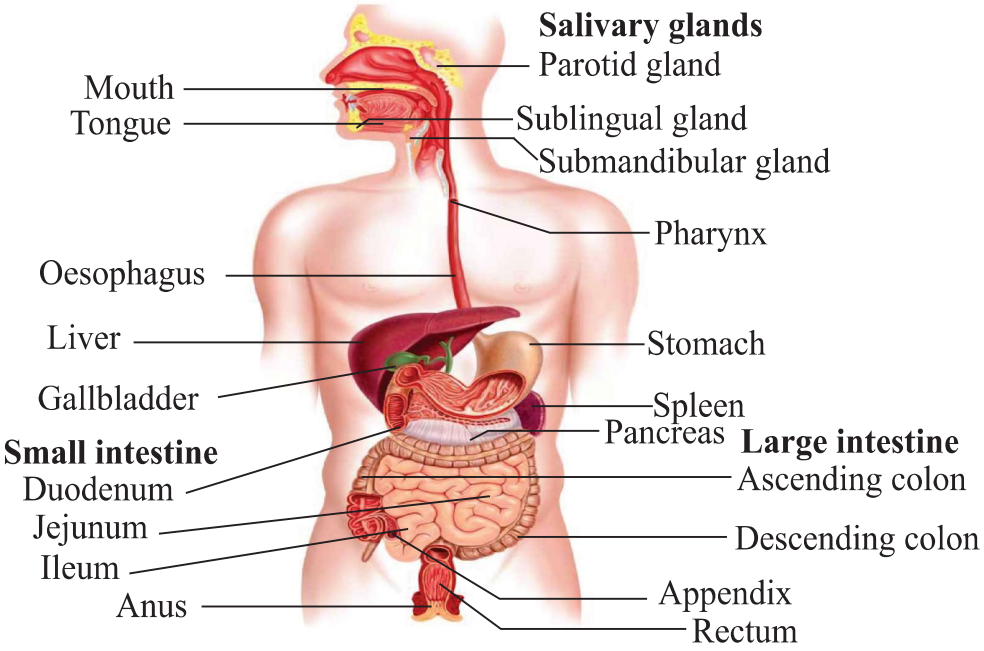
4. Small Intestine → (a) **Intestinal enzyme**
   ↓ convert

Carbohydrate	**Fats**	**Proteins**
↓	↓	↓
Glucose	Fatty acid + Glycerol	Amino acids

5. Small Intestine → (b) Villi (finger like projections) → Helps in absorption of food into the blood

Small Intestine → (c) Receives secretion from
- Liver → Bile
- Large fat Globules → Emulsifi small globules
- Pancreas → Pancreatic juice
  - Trypsin: Proteins → Peptones
  - Lipase: Fats → Lipids

6. Large Intestine → Absorb excess of water
→ The rest of the material is removed from the body via the anus.



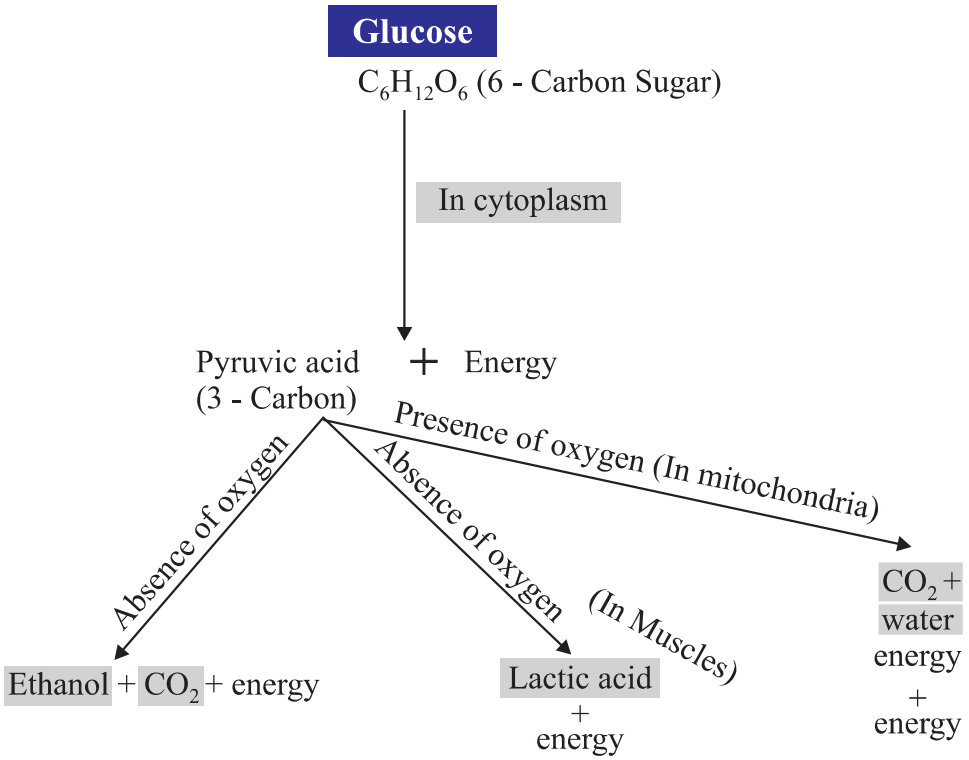
Human Digestive System

RESPIRATION

Respiration involves : (i) Gaseous exchange : Intake of oxygen from the atmosphere and release of CO_2 → **Breathing**

(ii) Breakdown of simple food in order to release energy inside the cell → **Cellular respiration**

Breakdown of Glucose by Various Pathways



Respiration

Aerobic	Anaerobic
• Takes place in the presence of oxygen	• Takes place in the absence of oxygen
• Occurs in mitochondria	• Occurs in cytoplasm
• End products are CO_2 and H_2O	• End products are alcohol or lactic acid
• More amount of energy is released	• Less amount of energy is released

Human Respiratory System

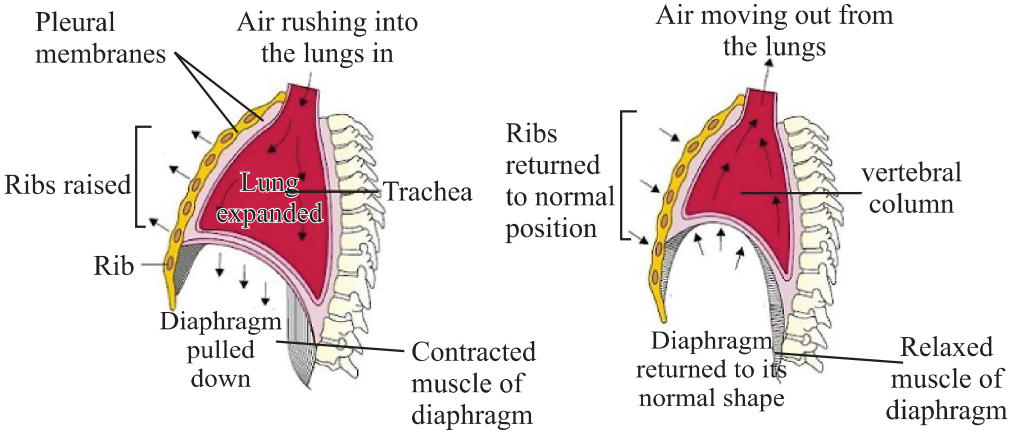
Passage of air through the respiratory system :

Nostril
↓
Nasal Passage
↓
Nasal Cavity
↓
Pharynx
↓
Larynx
↓
Trachea
↓
Bronchi
↓
Bronchioles
↓
Alveoli
↓
Blood capillaries

Lungs

Mechanism of Breathing

Inhalation	Exhalation
• During inhalation the thoracic cavity (chest cavity) expands.	• Thoracic cavity contracts.
• Ribs lift up.	• Ribs move downwards.
• Diaphragm become flat in shape.	• Diaphragm becomes dome shaped.
• Volume of lungs increases and air enters the lungs	• Volume of lungs decreases and air exits from the lungs.



(a) Inhalation **(b) Exhalation**

Exchange of gases between alveolus, blood and tissues

(i) Air (rich in O_2) → Blood → Binds with haemoglobin in RBC → O_2 is released in (in alveolus) (through blood vessels) tissues

(ii) CO_2 → Released in blood → Dissolved in blood → Blood vessels → Released in alveolar sac → Sent out through nostrils

(from tissue) (in alveoli)

Terrestial organisms : Use atmospheric oxygen for respiration

Aquatic organisms : Use dissolved oxygen for respiration

Respiration in plants

Respiration in plants is simpler than the respiration in animals. Gaseous exchange occur through :

(a) Stomata in leaves

(b) Lenticels in stems

(c) General surface of the root

Transportation

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

The circulatory system in human beings consists of

Heart	Arteries and Veins	Blood and lymph
(A pumping organ)	(Blood vessels)	(A circulatory medium)

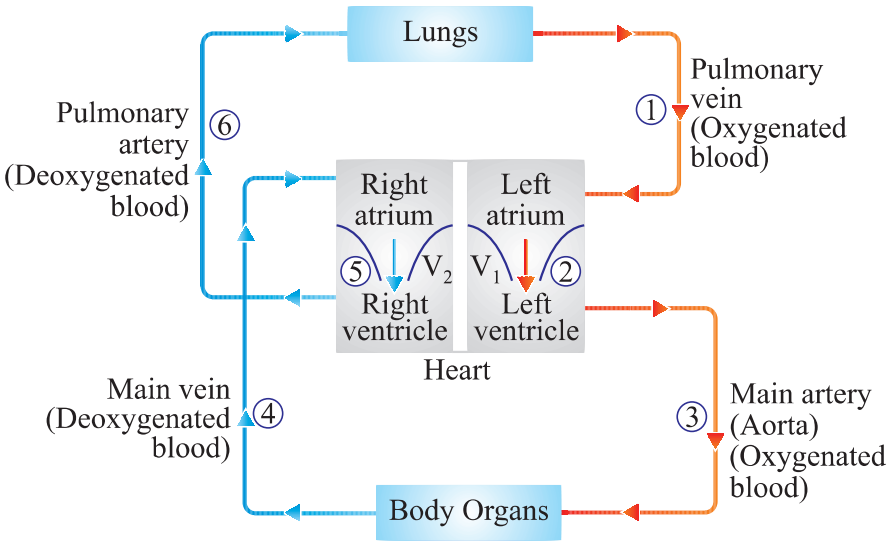
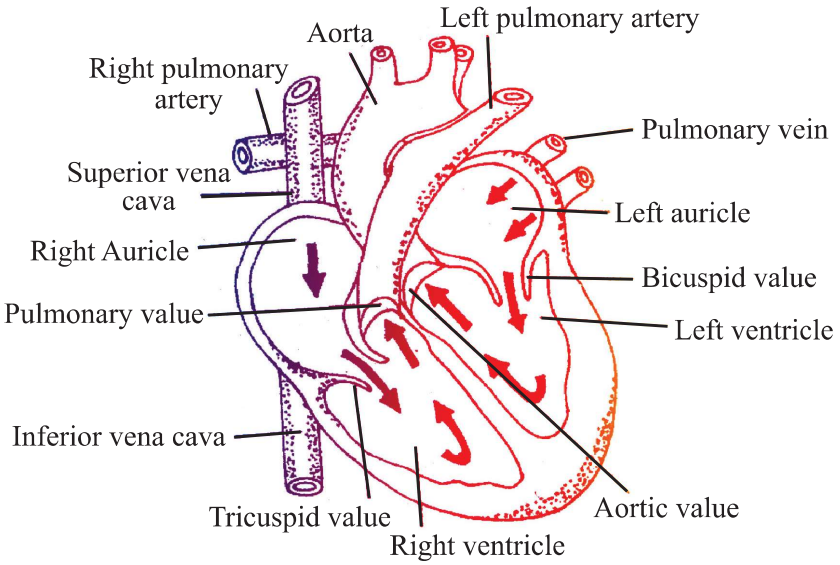


Diagram to show blood circulation in human body

Double circulation

Blood travels twice through the heart in one complete cycle of the body.



Direction of blood flow through human heart

- **Pulmonary Circulation :** Blood moves from the heart to the lungs and back to the heart.
- **Systemic Circulation :** Blood moves from the heart to rest of the body and back to the heart.

Blood

(A fluid connective tissue)

Solid Component — Blood Corpuscles

R. B. C.s	Blood Platelets	W. B. C.
• Carries gas, (O_2, CO_2) • Contain Hb, impart red colour to the blood	helps in Blood Clotting	Provide body defence by engulfing the germs & producing antibodies

Liquid Component — Plasma

A yellow colour fluid contain 90% water & 10% organic substances like
- plasma, proteins viz. albumin, globulin,
inorganic - mineral ions.

Lymph : A yellowish fluid escapes from the blood capillaries into the intercellular spaces contain less proteins than blood. Lymph flows from the tissues to the heart assisting in transportation and destroying germs.

Blood Vessels

Arteries	Veins
1. Carry oxygenated blood from heart to body parts except pulmonary artery.	1. Carry deoxygenated blood from body parts to heart except pulmonary vein.
2. Also called distributing vessel.	2. Also called collecting vessel.
3. Thick and elastic.	3. Thin and less elastic.
4. Deepseated	4. Superficial as compared to arteries

Transportation in Plants

There are two main conducting pathways in a plant.

Xylem	Phloem
1. Carries water & minerals from the roots to other parts of the plant.	1. Carries product of photosynthesis from leaves to the other parts of the plant.
2. No energy is used.	2. Energy is used from ATP.

Transpiration is the process of loss of water as vapour from aerial parts of the plant.

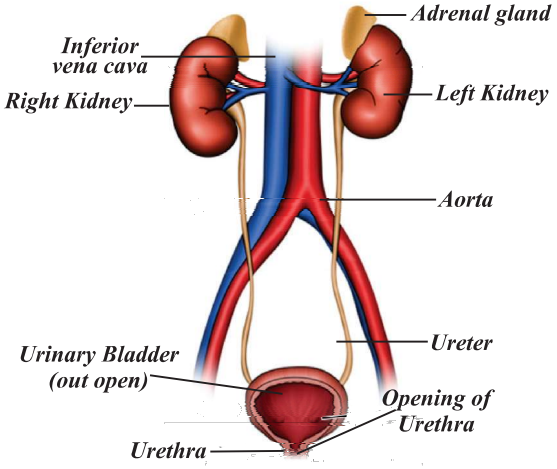
Function :

(a) Absorption and upward movement of water and minerals by creating PULL.
(b) Helps in temperature regulation in plant.
Transport of food from leaves (food factory) to different part of the plant is called **Translocation**.

EXCRETORY SYSTEM IN MAN

Excretory/urinary system consists of :

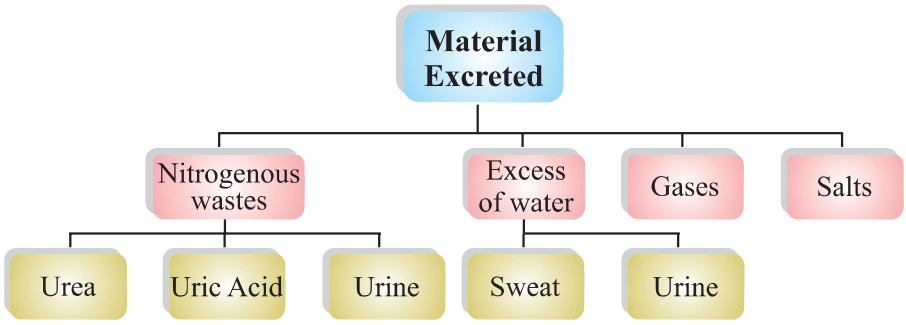
(1) The kidneys : The excretory organ
(2) The ureters : The ducts which drain out urine from the kidneys
(3) The urinary bladder : The urinary reservoir
(4) The urethra : The channel to the exterior



The human excretory system

EXCRETION

1. The metabolic activities in the body generates many kinds of wastes including nitrogenous wastes which are harmful for the body and hence needed to be removed. Excretion is a process by which these wastes are removed from our body.



2. Unicellular organisms remove these wastes by simple diffusion.

Human Excretory System

Formation of Urine

- 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.
- 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 :
  * How much excess of water is there in the body and,
  * 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.
- 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.

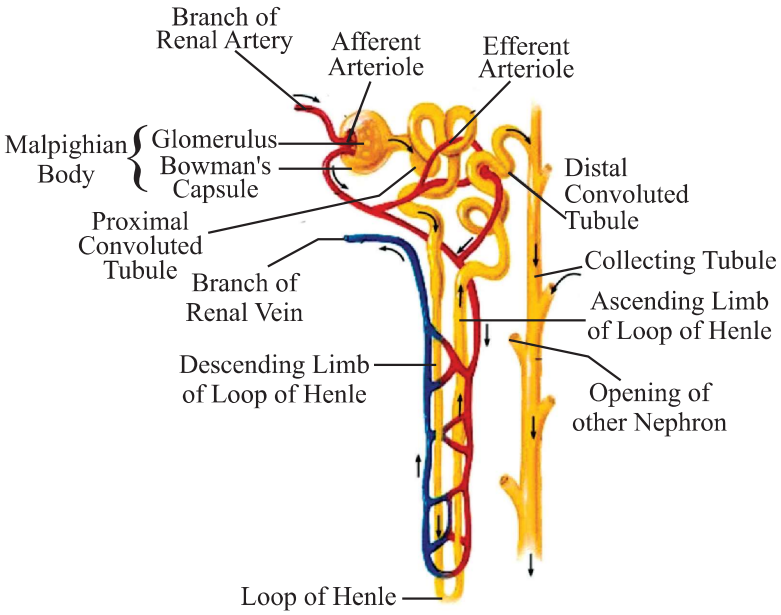
Functions of Nephron

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

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.



Structure of a Nephron

The urine formation involves three steps :

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

2. **Tubular reabsorption :** Now, useful substances from the filtrate are reabsorbed back by capillaries surrounding the nephron.
3. **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.

QUESTIONS

VERY SHORT QUESTIONS (1 Mark)

1. State one difference between autotrophic and hetrotrophic mode of nutrition.
2. Define peristaltic movement.
3. What is the role of saliva in the digestion of food ?
4. Name the tissue that transports water and minerals in plants.
5. What is the role of acid in our stomach ?
6. What is emulsification ?
7. Name the cell organelle in which photosynthesis occur.
8. Name the largest artery in the human body.
9. Define transpiration.
10. What is the structural and functional unit of kidney called ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. How is small intestine designed to absorb digested food ?
2. What are stomata ? Draw a labeled diagram of stomata.
3. Write the equation for the process of breakdown of glucose in a cell :
   (a) in the presence of oxygen.
   (b) in the absence of oxygen.

4. Write the differences between inhalation and exhalation.
5. List the three events which occur during photosynthesis.
6. How does transpiration help in upward transport of substances.
7. Write the functions of the components of blood.
8. Why is small intestine longer in herbivores than in carnivores ?
9. Explain the cause of cramps after excessive physical exercise.
10. Why is the rate of breathing in aquatic organisms much faster than that seen in terrestrial organisms.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. Describe the process of double circulation in human beings.
2. What are the methods used by plants to get rid of their waste products ?
3. Give reason for the following :
   (a) Arteries are thick walled blood vessels.
   (b) Veins are thin walled blood vessels.
   (c) Veins have valves in them.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. If you chew chapatti for long, after some time it taste sweet ? Why is this so?
2. What is the benefit of residual volume of air in the respiratory process ?
3. Why is the energy needs in plants is very less as compared to animals ? Explain.
4. Draw a well-labelled diagram of Nephron. Explain the process of formation of urine in the human kidney.
5. Draw a diagram showing Human Respiratory System. Label the following parts :
   (a) Alveolus (b) Trachea
   (c) Bronchus (d) Lungs

Hints to Long Answer Type Questions

1. Chapati will taste sweet as saliva breaks down starch which is a complex molecule to give sugar.
2. The lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.
3. Plant gets most of energy during photosynthesis.
4. See the given diagram.
5. See the given diagram.