SCIENCE X

(Biology)

Specimen copy

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Chapter – 6 "Life Processes"

Nutrition in Plants and Animals – Life Processes

Nutrition: The process by which an organism takes food and utilizes it, is called nutrition.

Need for Nutrition: Organisms need the energy to perform various activities. The energy is supplied by the nutrients. Organisms need various raw materials for growth and repair. These raw materials are provided by nutrients

Nutrients: Materials which provide nutrition to organisms are called nutrients.
Carbohydrates, proteins and fats are the main nutrients and are called macronutrients.
Minerals and vitamins are required in small amounts and hence are called micronutrients.

Modes of Nutrition
1. Autotrophic Nutrition.
2. Heterotrophic Nutrition.

Autotrophic Nutrition – Life Processess
The mode of nutrition in which an organism prepares its own food is called autotrophic nutrition. Green plants and blue-green algae follow the autotrophic mode of nutrition.

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

Autotrophs $\xrightarrow{\text{Use}}$ Simple inorganic material $\xrightarrow{\text{Convert into}}$ Complex high energy molecules of carbohydrates

Autotrophic nutrition is fulfilled by the process, by which autotrophs intake CO_2 and H_2O, and convert these into carbohydrates in the presence of chlorophyll, sunlight is called photosynthesis.

Nutrition in Plants: Green plants prepare their own food. They make food in the presence of sunlight. Sunlight provides energy', carbon dioxide and water are the raw materials and chloroplast is the site where food is made

$$\underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{12H_2O} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2} + \underset{\text{Water}}{6H_2O}$$

Raw Materials for Photosynthesis:

Sunlight
Chlorophyll: Sunlight absorbed by chloroplast
CO2: Enters through stomata, and oxygen (O2) is released as a byproduct through stomata on the leaf.
Water: Water + dissolved minerals like nitrogen, phosphorous etc., are taken up by the roots from the soil.

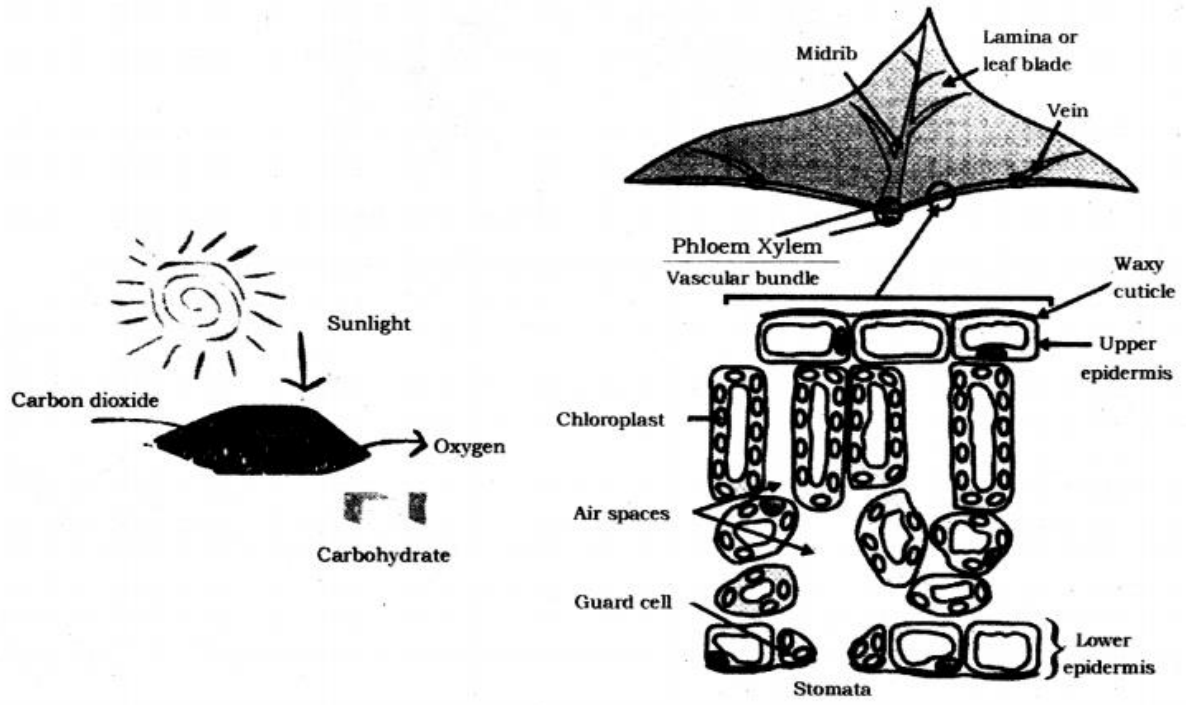
How do raw materials for photosynthesis become available to the plant?

- Water comes from the soil, through the xylem tissue in roots and stems.
- Carbon dioxide comes in the leaves through stomata.

Site of Photosynthesis: Chloroplast in the leaf. Chloroplast contains chlorophyll (green pigment)

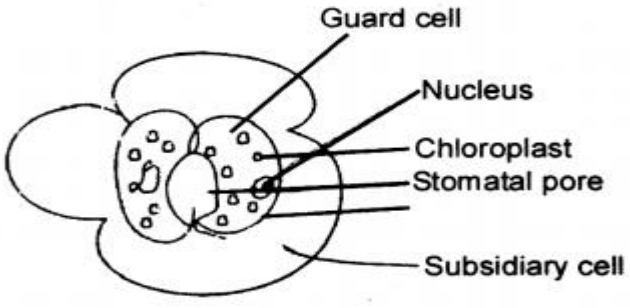
Main Events of Photosynthesis:

- Absorption of light energy by chlorophyll.
- Conversion of light energy into chemical energy + splitting (breaking) of water into hydrogen and oxygen.
- Reduction of CO2 to carbohydrates.
- Sunlight activates chlorophyll, which leads to splitting of the water molecule.
- The hydrogen, released by the splitting of a water molecule is utilized for the reduction of carbon dioxide to produce carbohydrates.
- Oxygen is the by-product of photosynthesis.



Stomata: These are tiny pores present in the epidermis of leaf or stem through which gaseous exchange and transpiration occur.

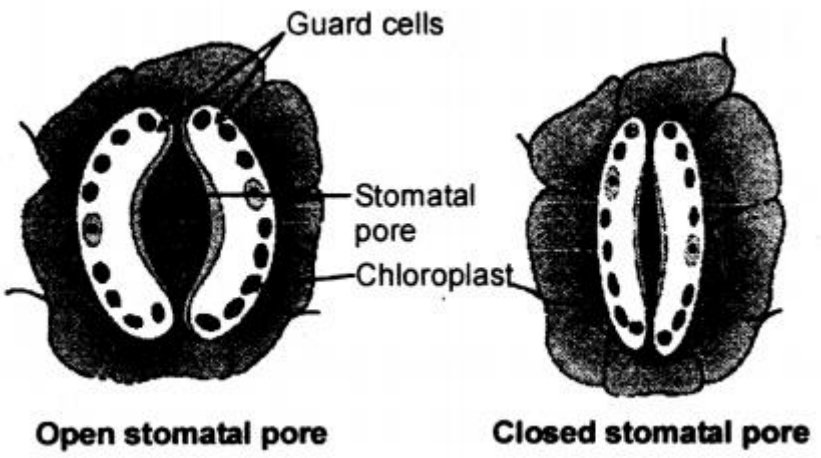
- Exchange of gases, O_2 and CO_2.
- Loses a large amount of water (water vapour) during transpiration.



Structure of stomata

Opening and closing of stomatal pores:

- The opening and closing of stomatal pores are controlled by the turgidity of guard cells.
- When guard cells uptake water from surrounding cells, they swell to become a turgid body, which enlarges the pore in between (Stomatal Opening).
- While, when water is released, they become flaccid shrinking to close the pore (Stomatal Closing)



Significance of Photosynthesis:

- Photosynthesis is the main way through which solar energy is made available for different living beings.
- Green plants are the main producers of food in the ecosystem. All other organisms directly or indirectly depend on green plants for food.
- The process of photosynthesis also helps in maintaining the balance of carbon dioxide and oxygen in the air.

Heterotrophic Nutrition – Life Processes

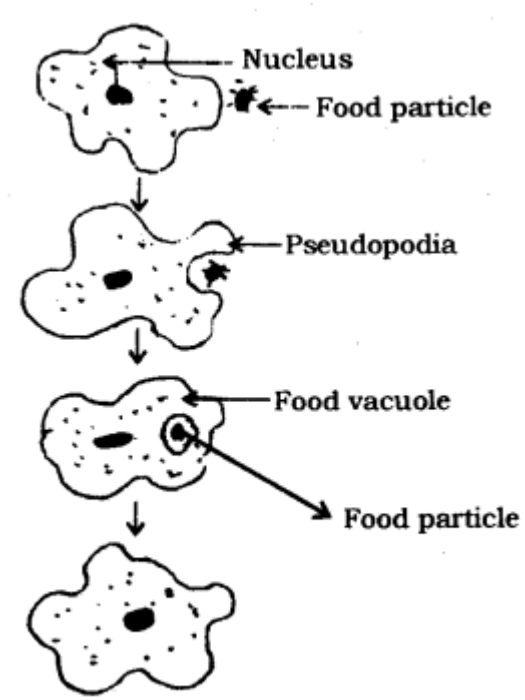
The mode of nutrition in which an organism takes food from another organism is called heterotrophic
nutrition. Organisms, other than green plants and blue-green algae follow the heterotrophic mode of n
nutrition. Heterotrophic nutrition can be further divided into three types, viz. saprophytic nutrition,
holozoic nutrition, and parasitic.

- **Saprophytic Nutrition:** In saprophytic nutrition, the organism secretes the digestive juices on the food. The food is digested while it is still to be ingested. The digested food is then ingested by the organism. All the decomposers follow saprophytic nutrition. Some insects, like houseflies, also follow this mode of nutrition.

- **Holozoic Nutrition:** In holozoic nutrition, the digestion happens inside the body of the organism. i.e., after the food is ingested. Most of the animals follow this mode of nutrition.
- **Parasitic Nutrition:** The organism which lives inside or outside another organism (host) and derives nutrition from it is known as parasites and this type of mode of nutrition is called parasitic nutrition. For example Cuscuta, tick etc.

Nutrition in Amoeba

- Amoeba is a unicellular animal which follows the holozoic mode of nutrition.
- In holozoic nutrition, the digestion of food follows after the ingestion of food. Thus, digestion takes place inside the body of the organism.
- Holozoic nutrition happens in five steps, viz. ingestion, digestion, absorption, assimilation and egestion.



Nutrition in Amoeba

Steps of Holozoic Nutrition:

- Ingestion: The process of taking in the food is called ingestion.
- Digestion: The process of breaking complex food substances into simple molecules is called digestion. Simple molecules, thus obtained, can be absorbed by the body.
- Absorption: The process of absorption of digested food is called absorption.
- Assimilation: The process of utilization of digested food, for energy and for growth and repair is called assimilation.
- Egestion: The process of removing undigested food from the body is called egestion.

Human beings are complex animals, which have a complex digestive system. The human digestive system is composed of an alimentary canal and some accessory glands. The alimentary canal is divided into several parts, like oesophagus, stomach, small intestine, large intestine, rectum and anus. Salivary gland, liver and pancreas are the accessory glands which lie outside the alimentary canal.

Structure of the Human Digestive System:

The human digestive system comprises of the alimentary canal and associated digestive glands. Alimentary Canal: It comprises of mouth, oesophagus, stomach, small intestine and large intestine.

- Associated Glands: Main associated glands are
  - Salivary gland
  - Gastric Glands
  - Liver
  - Pancreas

Mouth or Buccal Cavity:

- The mouth has teeth and tongue. Salivary glands are also present in the mouth.
- The tongue has gustatory receptors which perceive the sense of taste.
- The tongue helps in turning over the food so that saliva can be properly mixed in it.
- Teeth help in breaking down the food into smaller particles so that, swallowing of food becomes easier.
- There are four types of teeth in human beings. The incisor teeth are used for cutting the food.
- The canine teeth are used for tearing the food and for cracking hard substances.
- The premolars are used for the coarse grinding of food. The molars are used for fine grinding of food

1 Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans?

Ans. As in multicellular organisms, all the cells are not in direct contact with environment, simple diffusion does not meet the requirement of all the body cells to get sufficient oxygen.

2.What criteria do we use to decide whether something is alive?

Ans. All the living organism must have movement at molecular levels along with respiration and other life process like nutrition, respiration, transportation and excretion to be called alive.

3.What are outside raw materials used for by an organism?

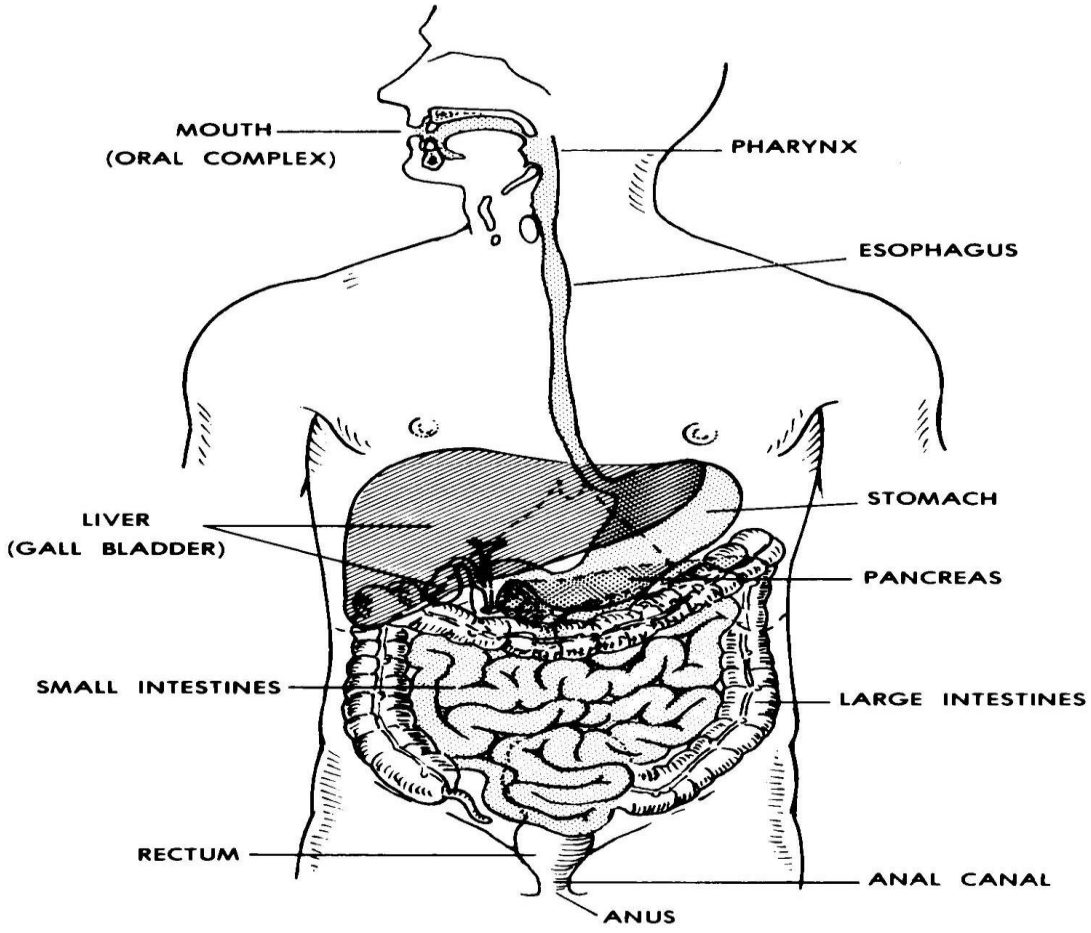
Ans. Outside raw materials used for by an organism includes:

a. Food Water oxygen

4. What processes would you consider essential for maintaining life?

Ans. The processes essential for maintaining life are

a. Nutrition , b. Respiration c. Transportation d. Excretion



5 What are difference between autotrophic and

heterotrophic nutrition?

Ans. Difference between autotrophic and heterotrophic

Autotrophic Nutrition	**Heterotrophic Nutrition**
The mode of nutrition in which an organism makes its own food from the simple inorganic materials like carbon dioxide and water present in the surroundings with the help of sunlight energy. All green plants.	The mode of nutrition in which an organism cannot makes its own food from the simple inorganic materials like carbon dioxide and water present in the surroundings and depends on other organisms for food. All non- green plants.

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

Ans. (a) Carbon dioxide from atmosphere.

(b) Light from Sun

(c) Water from Soil

(d) Chlorophyll from chloroplast of green plants.

7 **What is the role of the acids in our stomach?**

Ans. HCl plays following role in our stomach:

(a) Make the medium acidic for action of enzyme pepsin.

(b) Kills the harmful bacteria present in food

(c) Prevents fermentation of food

8. What is the function of digestive enzymes?

Ans. Enzymes break-down the various complex components of food in to simple and soluble components so that they can be absorbed easily.

9. How is small intestine deigned to absorb digested food?

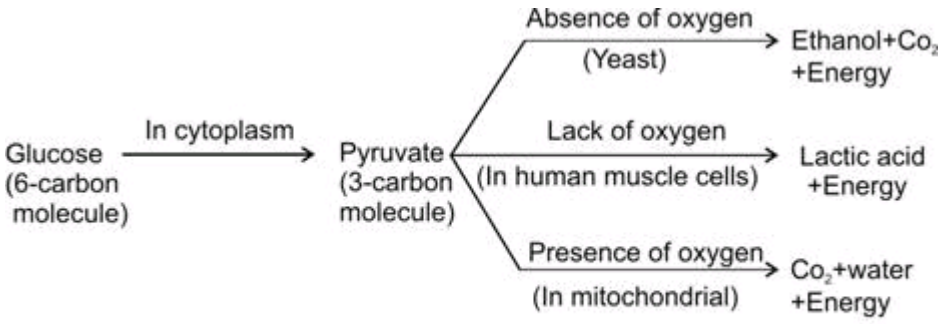
Ans. The inner lining of small intestine has numerous finger-like projections called villi which increase the surface area for absorption. The villi are richly supplied with blood vessels which transport the absorbed food to each and every cells of the body. Where, it is utilized to obtaining energy and repair of old tissues.

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

Ans. The rate of breathing is slower in terrestrial organisms as compared to aquatic organisms. This is due to the fact that in water, the amount of oxygen is less as compared to air so, in aquatic organisms the rate of breathing is faster.

11 What are different ways in which glucose is oxidized to provide energy in various organisms?

Ans. The pathways of break-down of glucose in various organisms are as below:



(Break down of glucose by various pathways)

12. How is oxygen and carbon dioxide transported in human beings?

Ans. In human beings, a pigment hemoglobin is present in RBC which has high affinity for oxygen. RBC takes up the oxygen from the air in the lungs and carry it to tissues which are deficient in oxygen. Some oxygen is carried in dissolved state in blood plasma. Carbon dioxide is more soluble in water than oxygen is mostly transported in the dissolved form in our blood.

13. **What are the components of the transport system in human beings? What are the functions of these components?**

Ans. The components of human transport system include:

(a) Heart- receives and pumps the blood.

(b) Arteries- carry oxygenated blood away from the heart to various organs.

(c) Veins- Bring back blood to heart.

(d) Capillaries- exchange of various materials and gases between blood and tissues.

14. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

Ans. The separation of the right and left side of heart is useful to prevent oxygenated blood and deoxygenated blood from mixing. Such separation allows a highly efficient supply of oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals that constantly use the energy to maintain their body temperature.

15. What are the components of transport system in highly organized plants?

Ans. The transport system of higher plants consists of xylem and phloem. Xylems have vessels and trachieds to transport water and minerals from root to other part of the plants.

Phloem, which consists of sieve tubes and companion cells, transport food from leaves to storage organs and other parts of plant.

16. How are water and minerals transported in plants?

Ans. Water and minerals are transported in plants through xylem which consists of tracheid's and vessels. Water and minerals absorbed by root hairs present in root by osmosis is passed to xylem tissues of root. From root xylem it passes to stem xylem and thus water reaches to leaves.

17. How is food transported in plants?

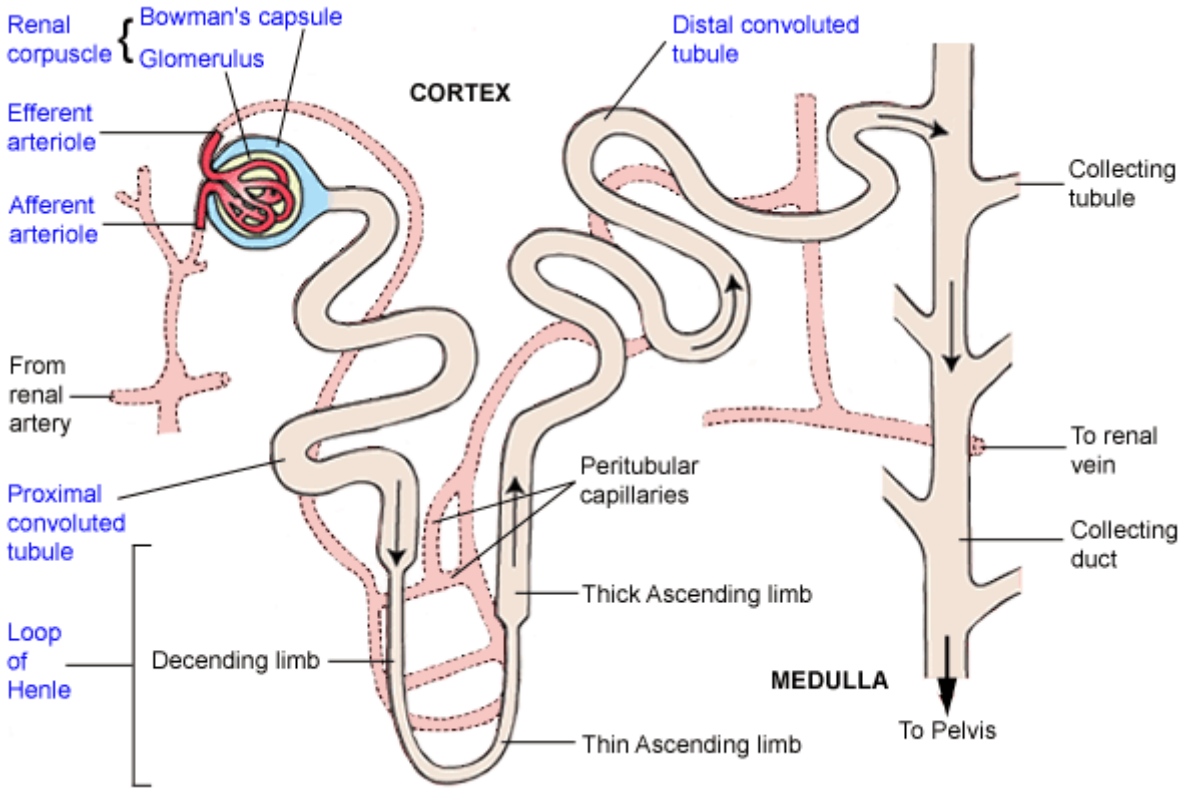
Ans. Food is transported in plants through phloem which consists of sieve tubes, sieve and companion cells. The food prepared in leaves in soluble form transported to leaves phloem.

Active transport of food passes to all other parts of plants.

18. **Describe the structure and functioning of nephron.**

ns. Each nephron is a cluster of very thin-walled blood capillaries. Each capillary cluster in the kidney called glomerulus is associated with the cup shaped Bowman's capsule that collects the filtered urine. Nephron filters the

blood in order to remove nitrogenous waste. They also absorb some useful substance such as glucose, amino acids, minerals and major amount of water from filtrate.



19. Whatare the methods used by the plants to get rid of excretory products?

Ans. (i) Plant produces carbon dioxide as wastes during respiration and oxygen as waste during photosynthesis.
(ii) Excess of water is removed through transpiration.
(iii) Some waste products like gums and resins are stored in older xylem tissue.

20 How is amount of urine produced regulated?

Ans. The amount of urine depends on how much excess of water is in the body and how much a water soluble waste is to be excreted. If the amount of water and dissolved wastes in boy are more than amount of urine will be more and if amount of wastes is less the amount of urine produced will be less.

21. How are fats digested in our bodies? Where does this process take place?

Ans. Digestion of fats takes place in small intestine. Fats entering in intestine are in the form of large globules. Bile juice breaks down these large globules into smaller globules. After that fat digesting enzyme lipase present in pancreatic juice and intestinal juice converts it into fatty acids and glycerol.

22. What is the role of saliva in the digestion of food?

Ans. The saliva contains an enzyme called salivary amylase that breaks down starch which is complex molecule into glucose.

23.What are the necessary conditions for autotrophic nutrition and what are its by- products.

Ans. Conditions necessary for autotrophic nutrition are:
(i) Light (ii) Chlorophyll (iii) Water and (iv) Carbon dioxide
By-products are: (i) Oxygen and (ii) Water

24. What are differences between aerobic and anaerobic respiration? Name some organisms that use anaerobic mode of respiration.

Ans. Difference between aerobic and anaerobic respiration:

Aerobic respiration	Anaerobic respiration
(i) Takes place in presence of oxygen.	(i) Takes place in absence of oxygen
(ii) Complete oxidation of glucose occurs.	(ii) Incomplete oxidation of glucose occurs.
(iii) More energy is produced.	(iii) Less energy is produced

25. How are the alveoli designed to maximize the exchange of gases?

Ans. The walls of the alveoli is folded and has large surface areas. It contain an extensive network of blood vessels which provide a surface where the exchange of gases can take place.

26. What would be the consequence of a deficiency of hemoglobin in our bodies?
Ans. Haemoglobin is a pigment present in RBC. It has a high affinity for oxygen. It carries oxygen from lungs to various tissues which are deficient in oxygen. Presence of less hemoglobin will result in less supply of oxygen to tissues. A person having less hemoglobin will get tired soon and will have a pale look.

11. Describe double circulation in human beings. Why is it necessary?

Ans. In mammals and birds the blood goes through the heart twice during each cycle. This is known as double circulation. Deoxygenated blood which enters right auricle and then it enters the right ventricle from where it is pumped to lungs for oxygenation. From lungs after oxygenation it comes to left auricle and then enters left ventricle from where it is pumped to various parts of body.

Such system of circulation does not allow mixing of oxygenated and deoxygenated blood which allows efficient supply of oxygen to the body.

12. What are differences between the transport of materials in xylem and phloem?

Ans. Difference between transport in xylem and phloem:

Xylem	Phloem
a. Xylem transport minerals and water from root to leaves. b. Transport is unidirectional. c. Xylem consists of trachieds and vessels.	a. Phloem transport food from leaves to root and storage organs. b. Transport is bidirectional. c. Phloem consists of sieve tubes and companion cells.

13. Compare the functioning of alveoli in the lungs and nephron in the kidneys with respect to their structure and functioning

Alveoli	Nephron
They have thin-walled balloon-like structure. The alveoli provide a surface extensively supplied with blood capillaries for exchange of gases in lungs. Carbon dioxide released in the cavity of alveoli and oxygen is taken by hemoglobin present in RBC of blood.	Nephron is a cluster of very thin walled blood capillaries found in kidney. Each capillaries cluster remains associated with the cup-shaped end of a tube called Bowman's capsule that collects the filtered urine, at the same time the useful substance are reabsorbed.

- **Multiple choice questions**

1. The kidneys in human beings are parts of the system for

(a) nutrition (b) respiration (c) excretion (d) transpiration

Ans. (c) excretion

2. The xylem in plants are responsible for

(a) transport of water b) transport of food c) transport of amino acids

(d) transport of oxygen
Ans. transport of water

3. The autotrophic mode of nutrition requires

(a) carbon dioxide and water (b) chlorophyll (c) sunlight

(d) all of the above

Ans. (d) all of the above

4. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in
(a) cytoplasm b) mitochondria (c) chloroplast (d) nucleus

Ans. (b) mitochondria

5 Which of the following is not a digestive enzyme contained in the pancreatic juice?
i. Lipase
ii. Hydrochloric acid
iii. Mucus
iv. Trypsin

a) (i) and (ii)
b) (i) and (iv)
c) (ii) and (iii)
d) (i) and (iii)

Answer: (c) (ii) and (iii)

Explanation: The enzymes lipase and trypsin are present in the pancreatic juice that breakdown emulsified fats and degrade proteins respectively.

6. The enzymes pepsin and trypsin are secreted respectively by
a) Stomach and pancreas
b) Salivary gland and stomach
c) Liver and pancreas
d) Liver and salivary gland

Answer: (a) Stomach and pancreas

Explanation: Stomach secretes the enzyme pepsin and pancreas produces trypsin. Both of them breakdown protein.

7. Among the following choose the correct option which includes the organisms that have a holozoic mode of nutrition:
a) Plasmodium and Amoeba
b) Parakeet and Amoeba

c) Paramecium and Plasmodium
d) Paramecium and Parasite

Answer: (b) Parakeet and Amoeba

Explanation: Holozoic nutrition involves the ingestion of organic food particles and later its assimilation for the purpose of supplying energy to the whole body.

8. Raw materials required in the autotrophic mode of nutrition involves:
i. Carbon dioxide and water
ii. Chlorophyll
iii. Nitrogen
iv. Sunlight

a) (i), (ii) and (iii)
b) (i) and (ii)
c) (i), (ii) and (iv)
d) All (i), (ii), (iii) and (iv)

Answer: (c) (i), (ii) and (iv)

Explanation: Autotrophic mode of nutrition involves the use of sunlight, chlorophyll, carbon dioxide and water to produce starch.

9. The enzymes contained in pancreatic juices help in the digestion of:
a) Fats and carbohydrates
b) Proteins and fats
c) Proteins and carbohydrates
d) Proteins, fats and carbohydrates

Answer: (d) Proteins, fats and carbohydrates

Explanation: The pancreas contains all kinds of enzymes that can digest proteins, fats and carbohydrates.

10. Which of the following help in protecting the inner lining of the stomach from the harmful effect of hydrochloric acid?
a) Mucus b) Pepsin c) Trypsin d) Bile

Answer: (a) Mucus

Explanation: Mucus is a viscous secretion that protects the inner lining of the stomach from the action of HCl.

11. Sometimes we get painful cramps in our leg muscles after running for a long time due to the accumulation of:
a) Hydrochloric acid
b) Fat
c) Carbon dioxide
d) Lactic acid

Answer: (d) Lactic acid

Explanation: The build-up of lactic acid in our muscles while running (less oxygen conditions) causes cramps.

12.The vein which brings clean blood from the lungs into the heart is known as:
a) Pulmonary vein
b) Hepatic vein
c) Superior vena cava
d) Pulmonary artery

Answer: (a) Pulmonary vein

Explanation: The pulmonary vein is responsible for bringing oxygenated and pure blood into the heart.

13 Movement of the synthesized products from the leaves to the roots and other parts of a plant's body takes place through the phloem. This process is known as:
a) Translocation
b) Transpiration
c) Transportation
d) Excretion

Answer: (a) Translocation

Explanation: The transport of soluble products of photosynthesis through all parts of the plant by specialized structures called phloem is translocation.

14. The process of diffusion of solvent particles from the region of less solute concentration to a region of high solute concentration through semi-permeable membrane is known as
a) Diffusion
b) Osmosis
c) Translocation
d) Transpiration

Answer: (b) Osmosis

Explanation: The diffusion of solvent particles from a region of less concentration to high concentration (concentration gradient) through a semi permeable membrane is called osmosis.

15. Which among the following procedures is used for cleaning the blood of a person by separating the waste substance from it?
a) Kidney transplant
b) Blood transfusion
c) Dialysis
d) Hydrolysis

Answer: (c) Dialysis Explanation: Dialysis is the procedure of detoxifying the blood by isolating the waste and unwanted constituents in it.

16. The excretory unit of the human excretory system is known as:
a) Nephridia
b) Neuron
c) Nephron
d) kidneys

Answer: (c) Nephron

Explanation: Each kidney has large numbers of the filtration units called nephrons.

17. Plants use the energy stored in ATP to accomplish the process of transportation of:
a) Water and minerals
b) Oxygen
c) Water, minerals and food
d) Food

Answer: (d) Food

Explanation: Translocation of food by phloem is achieved by utilizing energy from ATP.

18. Which among the following is necessary to carry out the blood coagulation in a cut or wound?
a) White Blood Cells
b) Blood plasma
c) Platelets
d) Red blood cells

Answer: (c) Platelets

Explanation: Platelets coagulate blood whenever there is a cut or a wound. This stops excess flow of blood or haemorrhagic conditions.

19. Arteries and veins are connected by a network of extremely narrow tubes called:
a) Sieve tubes
b) Capillaries
c) Vena cava
d) Valves

Answer: (b) Capillaries

Explanation: Blood capillaries are vessels that connect arteries and veins and help in blood circulation.

- **Draw and label the diagrams**

1) Digestive system
2) Excretory system
3) Structure of heart
4)Bowmen'scapsule