

BIOLOGY

REFERENCE STUDY MATERIAL

for

CLASS – X

2017 – 18

**CHAPTER WISE CONCEPTS, FORMULAS AND
QUESTIONS INCLUDING HOTS QUESTIONS**

Prepared by

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PREFACE

It gives me great pleasure in presenting the Reference Study Material in Biology for Class X Board Examination 2018. It is in accordance with the syllabus of the session 2017–18 as per CBSE guidelines.

Each chapter has a large number of questions along with all concepts and descriptions of topics in such a simple style that even the weak students will be able to understand the topic very easily. The most important feature of this material is that **NCERT book questions(intext questions) and exercises** included along with answers.

Keeping the mind the mental level of a child, every effort has been made to introduce simple questions in starting before HOTS questions so that the child solve them easily and gets confidence.

I avail this opportunity to convey my sincere thanks to respected sir, Shri U. N. Khaware, Additional Commissioner(Acad), KVS Headquarter, New Delhi, respected sir, Shri S. Vijay Kumar, Joint Commissioner(Admn), KVS Headquarter, New Delhi, respected sir Shri P. V. Sairanga Rao, Deputy Commissioner(Acad), KVS Headquarter, New Delhi, respected sir Shri. D. Manivannan, Deputy Commissioner, KVS RO Hyderabad, respected sir Shri Isampal, Deputy Commissioner, KVS RO Bhopal, respected sir Shri Jagdish Mohan Rawat, Director, KVS ZIET Chandigarh, respected sir Shri P. Deva Kumar, Deputy Commissioner, KVS RO Bangalore, respected sir Shri Nagendra Goyal, Deputy Commissioner, KVS RO Ranchi, respected sir Shri Y. Arun Kumar, Deputy Commissioner, KVS RO Agra,, respected sir Shri Sirimala Sambanna, Assistant Commissioner, KVS RO Jammu, respected sir Shri. K. L. Nagaraju, Retd-AC, KVS RO Bangalore and respected sir Shri M.K. Kulshreshtha, Retd-AC, KVS RO Chandigarh for their blessings, motivation and encouragement in bringing out this project in such an excellent form.

I also extend my special thanks to respected sir Shri. P. S. Raju, Principal, KV Gachibowli, respected madam Smt. Nirmala Kumari M., Principal, KV Mysore & respected sir Shri. M. Vishwanatham, Principal, KV Raichur for their kind suggestions and motivation while preparing this Question Bank. I would like to place on record my thanks to respected sir Shri. P. K. Chandran, Principal, presently working in KV Bambolim. I have started my career in KVS under his guidance, suggestions and motivation.

Inspite of my best efforts to make this notes error free, some errors might have gone unnoticed. I shall be grateful to the students and teacher if the same are brought to my notice. You may send your valuable suggestions, feedback or queries through email to kumarsir34@gmail.com that would be verified by me and the corrections would be incorporated in the next year Question Bank.

M. S. KUMARSWAMY

ISAMPAL
DEPUTY COMMISSIONER



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F. DO-DC./2013-KVS(BGR)

Dated:05.09.2013

Dear Shri M.S.Kumarswamy,

It has been brought to my notice the good work done by you with regard to making question bank and worksheets for classes VI to X in Mathematics. I am pleased to look at your good work. Mathematics is one discipline which unfortunately and wrongly perceived as a phobia. May be lack of motivation from teachers and inadequate study habits of students is responsible for this state of affairs. Your work in this regard assumes a great significance. I hope your own students as well as students of other Vidyalayas will benefit by your venture. You may mail the material to all the Kendriya Vidyalayas of the region for their benefit. Keep up the good work.

May God bless!,

Yours sincerely,



(Isampal)

Shri M.S.Kumarswamy
TGT (Maths)
Kendriya Vidyalaya
Donimalai

Copy to: the principals, Kendriya Vidyalayas, Bangalore Region with instructions to make use of the materials prepared by Mr. M.S.Kumarswamy being forwarded separately.

**DEDICATED
TO
MY FATHER
LATE SHRI. M. S. MALLAYYA**

CHAPTER – 6

LIFE PROCESSES

LIFE PROCESS

The maintenance of living organisms must go on even at the conditions, when they are not physically active. Even when we sit idle and during sleeping, this maintenance job through cells functioning has to go on. The life process includes the activities performed by the different organs to maintain the body.

Some of the life processes in the living beings are described below:

➤ **Nutrition**

The process of obtaining energy through consumption of food is called as nutrition.

➤ **Respiration**

The process of acquiring oxygen through breathing and make it available to cells for the process of breaking down of organic substances into simpler compounds is called as respiration.

➤ **Transportation**

Transportation is the process by which the food and oxygen is carried from one organ to other organs in the body.

➤ **Excretion**

It is the process by which the metabolic waste by-products are removed from the different organs and released out from the body.

INTEXT QUESTIONS PAGE NO. 95

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

Answer : Multicellular organisms such as humans possess complex body designs. They have specialised cells and tissues for performing various necessary functions of the body such as intake of food and oxygen. Unlike unicellular organisms, multicellular cells are not in direct contact with the outside environment. Therefore, diffusion cannot meet their oxygen requirements.

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

Answer : Any visible movement such as walking, breathing, or growing is generally used to decide whether something is alive or not. However, a living organism can also have movements, which are not visible to the naked eye. Therefore, the presence of life processes is a fundamental criterion that can be used to decide whether something is alive or not.

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

Answer : An organism uses outside raw materials mostly in the form of food and oxygen. The raw materials required by an organism can be quite varied depending on the complexity of the organism and its environment.

Question 4: What processes would you consider essential for maintaining life?

Answer : Life processes such as nutrition, respiration, transportation, excretion, etc. are essential for maintaining life.

NUTRITION

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

NEED OF NUTRITION

Organisms need 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.

TYPES OF NUTRITION:

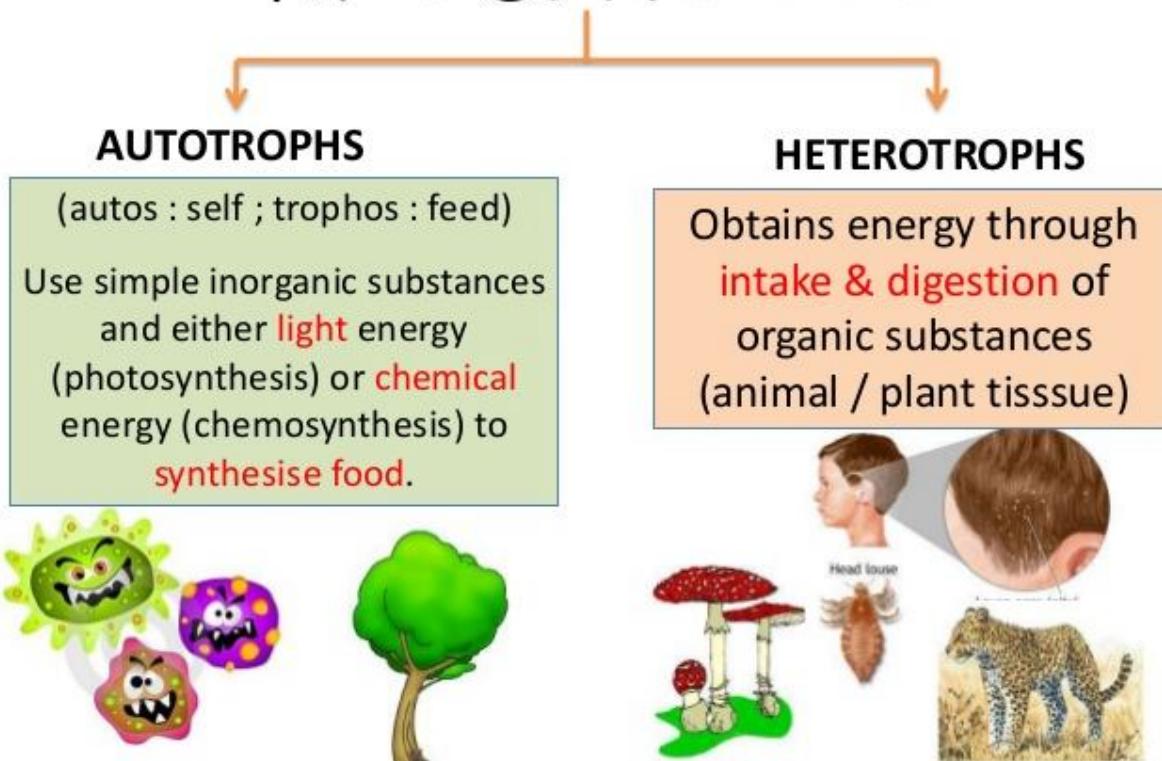
- **Autotrophic Nutrition:** The mode of nutrition in which an organism prepares its own food is called autotrophic nutrition. Green plants and blue-green algae follow the autotrophic mode of nutrition.
- **Heterotrophic Nutrition:** The mode of nutrition in which an organism takes food from another organism is called heterotrophic nutrition. Organisms; other than green plants and blue-green algae follow heterotrophic mode of nutrition.

AUTOTROPHIC NUTRITION

Autotrophic organisms are able to produce organic matter from simple inorganic materials. They consequently create their own food—but require a source of energy to do this.

- Photoautotrophs harvest energy from light to produce organic matter.
- Chemoautotrophs use energy from inorganic reactions in the environment to drive the creation of organic matter.

Types Of Nutrition



HETEROTROPHIC NUTRITION

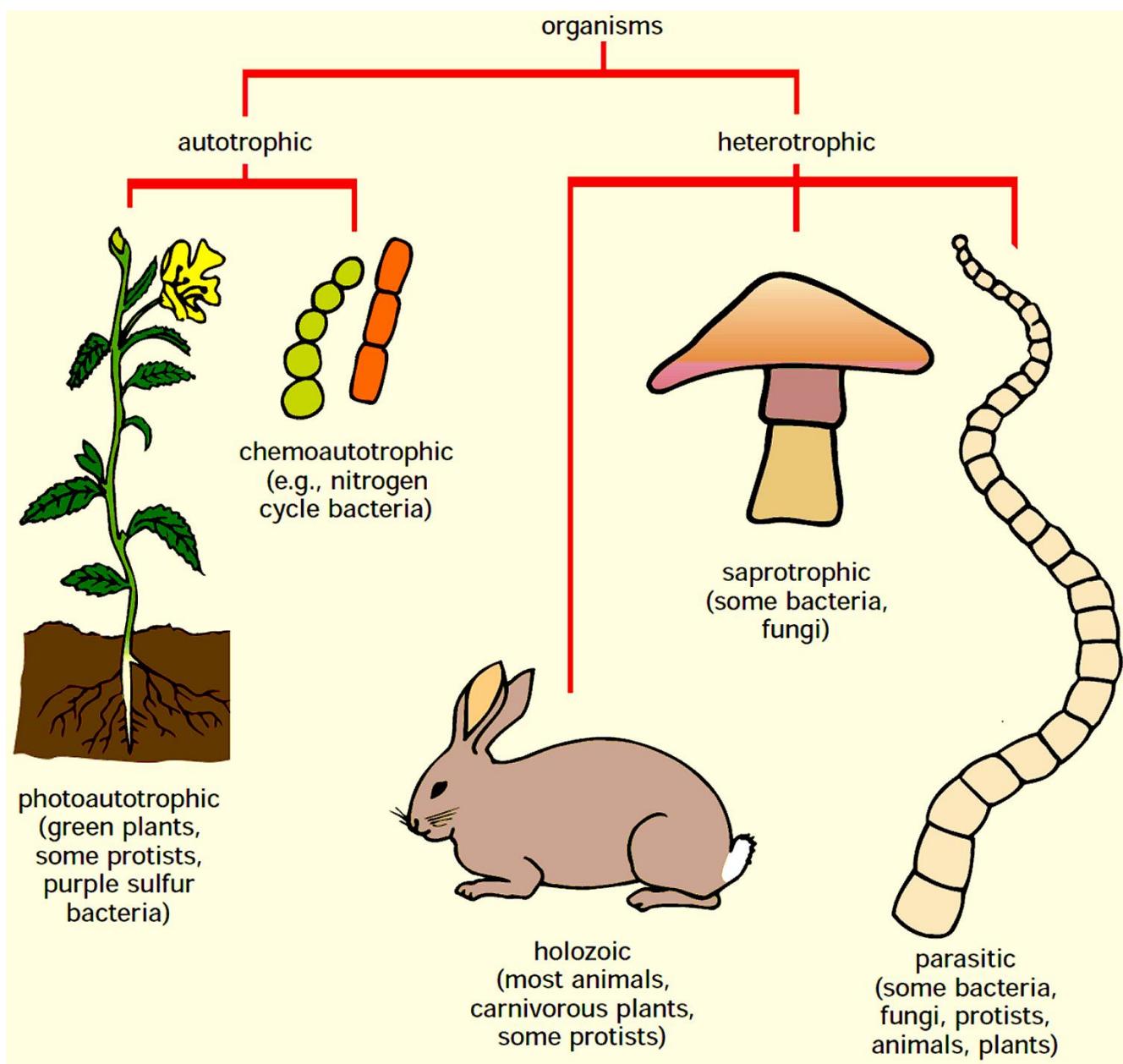
Heterotrophic nutrition is typical of animals. These organisms eat organic matter in other organisms—either alive (as hunters) or dead (as scavengers).

Saprotrophic organisms are the decay organisms. They digest dead materials using enzymes that they secrete externally. Fungi and many bacteria are saprotrophs.

Parasites (biotrophs) feed on living organisms without killing them.

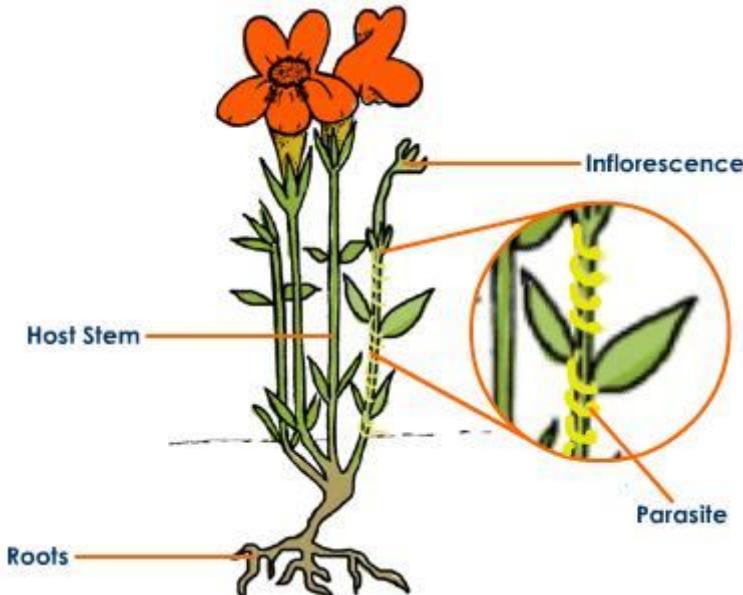
Heterotrophic nutrition can be further divided into two types, viz. saprophytic nutrition and holozoic nutrition.

- **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.

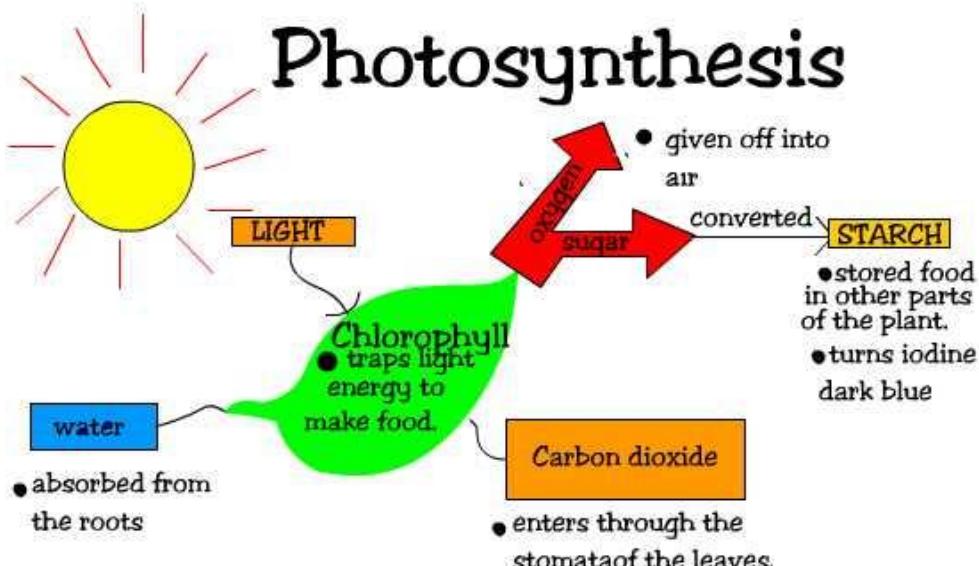
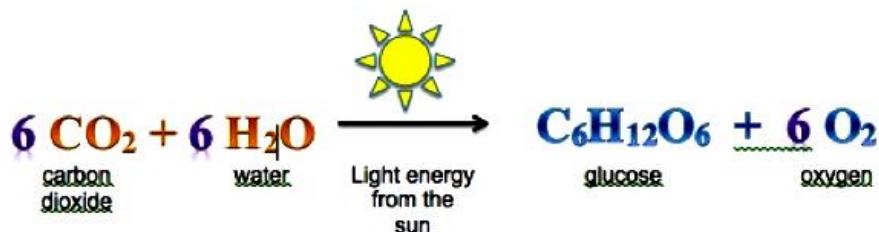


PLANT NUTRITION

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.



PHOTOSYNTHESIS: The process by which green plants prepare food is called photosynthesis. During this process; the solar energy is converted into chemical energy and carbohydrates are formed. Green leaves are the main sites of photosynthesis. The green portion of the plant contains a pigment chloroplast; which contains chlorophyll. The whole process of photosynthesis can be shown by following equation:



STEPS OF PHOTOSYNTHESIS:

- Sunlight activates chlorophyll; which leads to splitting of water molecule.

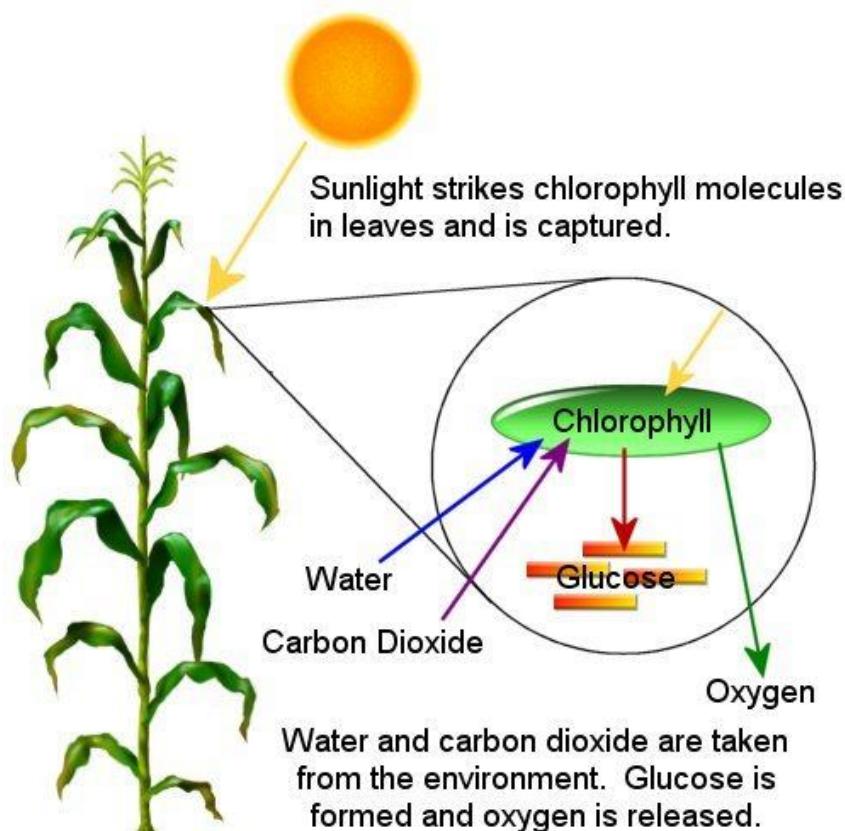
- The hydrogen released by splitting of water molecule is utilized for reduction of carbon dioxide to produce carbohydrates.
- Oxygen is the byproduct of photosynthesis.
- Carbohydrate is subsequently converted into starch and is stored in leaves and other storage parts.
- The splitting of water molecules is part of the light reaction.
- Other steps are part of the dark reaction during photosynthesis.

HOW DO RAW MATERIALS FOR PHOTOSYNTHESIS BECOME AVAILABLE TO THE PLANT?

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

SIGNIFICANCE OF PHOTOSYNTHESIS:

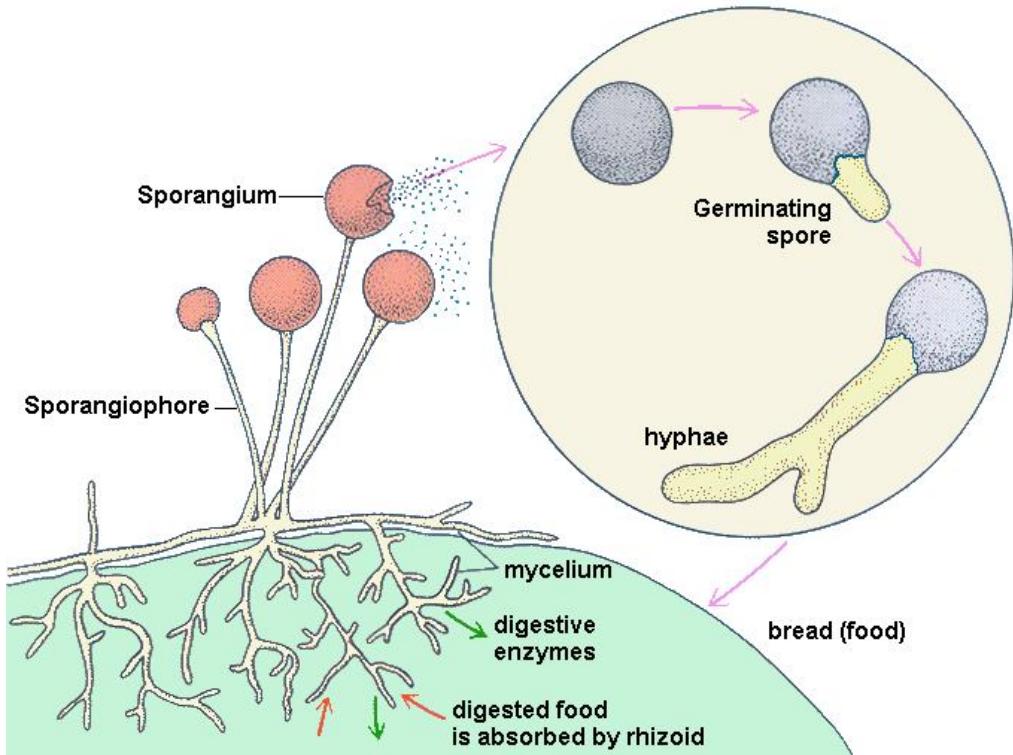
- Photosynthesis is the main way through which the solar energy is made available for different living beings.
- Green plants are the main producers of food in the ecosystem. All other organisms directly or indirectly depend on green plants for food.
- The process of photosynthesis also helps in maintaining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



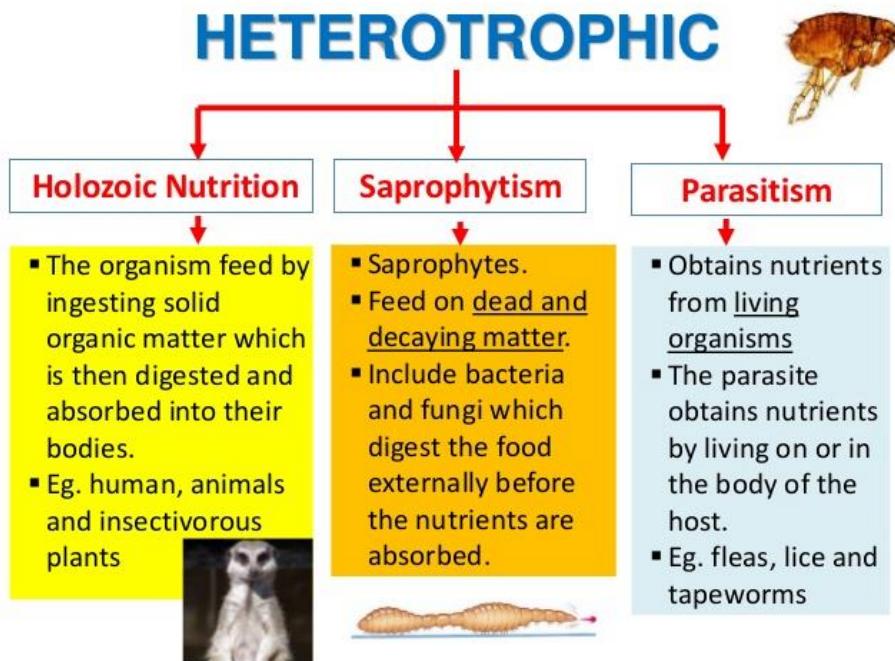
ANIMAL NUTRITION

Heterotrophic Nutrition: When an organism takes food from another organism, it is called heterotrophic nutrition. Different heterotrophic organisms follow different methods to take and utilize food. Based on this, heterotrophic nutrition can be divided into two types:

- **Saprophytic Nutrition:** In saprophytic nutrition, the digestion of food takes place before ingestion of food. This type of nutrition is usually seen in fungi and some other microorganisms. The organism secretes digestive enzymes on the food and then ingests the simple substances. Saprophytes feed on dead materials and thus help in decomposition dead remains of plants and animals.



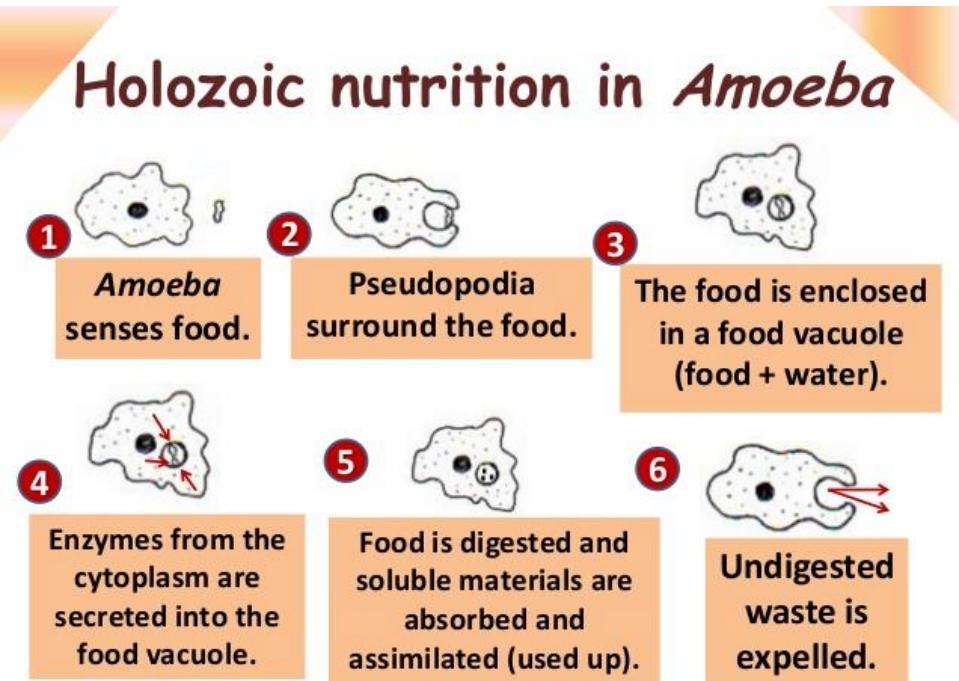
- **Holozoic Nutrition:** In holozoic nutrition, the digestion of food follows after the ingestion of food. Thus, digestion takes place inside the body of the organism. Holozoic nutrition happens in five steps, viz. ingestion, digestion, absorption, assimilation and egestion.



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.

NUTRITION IN AMOEBA:



Amoeba is a unicellular animal which follows holozoic mode of nutrition. The cell membrane of amoeba keeps on protruding into pseudopodia. Amoeba surrounds a food particle with pseudopodia and makes a food vacuole. The food vacuole contains the food particle and water. Digestive enzymes are secreted in the food vacuole and digestion takes place. After that, digested food is absorbed from the food vacuole. Finally, the food vacuole moves near the cell membrane and undigested food is expelled out.

NUTRITION IN HUMAN BEINGS

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, viz. oesophagus, stomach, small intestine, large intestine, rectum and anus. Salivary gland, liver and pancreas are the accessory glands which lie outside the alimentary canal.

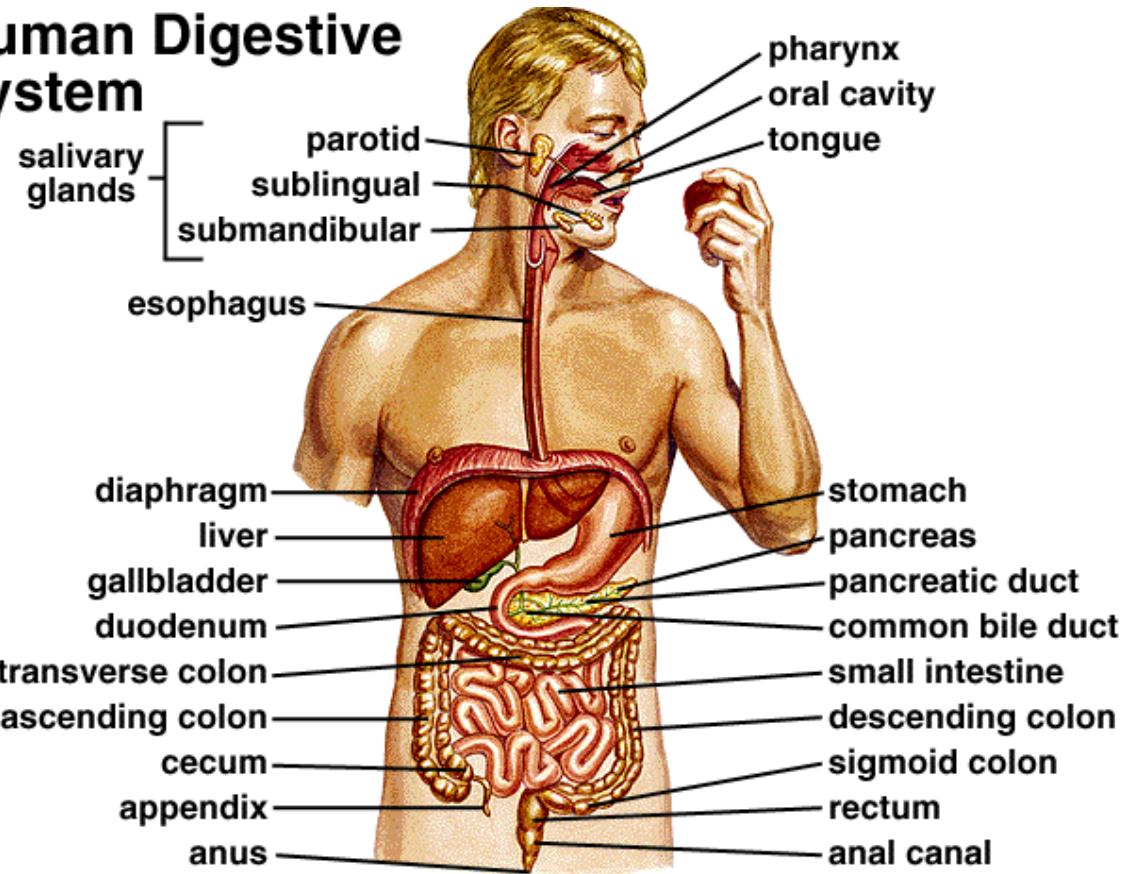
STRUCTURE OF THE HUMAN DIGESTIVE SYSTEM

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. 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 coarse grinding of food. The molars are used for fine grinding of food.

Salivary glands secrete saliva. Saliva makes the food slippery which makes it easy to swallow the food. Saliva also contains the enzyme salivary amylase or ptyalin. Salivary amylase digests starch and converts it into sucrose.

Human Digestive System



Stomach: Stomach is a bag-like organ. Highly muscular walls of the stomach help in churning the food. The walls of stomach secrete hydrochloric acid. Hydrochloric acid kills the germs which may be present in food. Moreover, it makes the medium inside stomach as acidic. The acidic medium is necessary for gastric enzymes to work. The enzyme pepsin; secreted in stomach; does partial digestion of protein. The mucus; secreted by the walls of the stomach saves the inner lining of stomach from getting damaged from hydrochloric acid.

Small Intestine: It is a highly coiled tube-like structure. The small intestine is longer than the large intestine but its lumen is smaller than that of the large intestine. The small intestine is divided into three parts, viz. duodenum, jejunum and ileum.

Liver: Liver is the largest organ in the human body. Liver manufactures bile; which gets stored in gall bladder. From the gall bladder, bile is released as and when required.

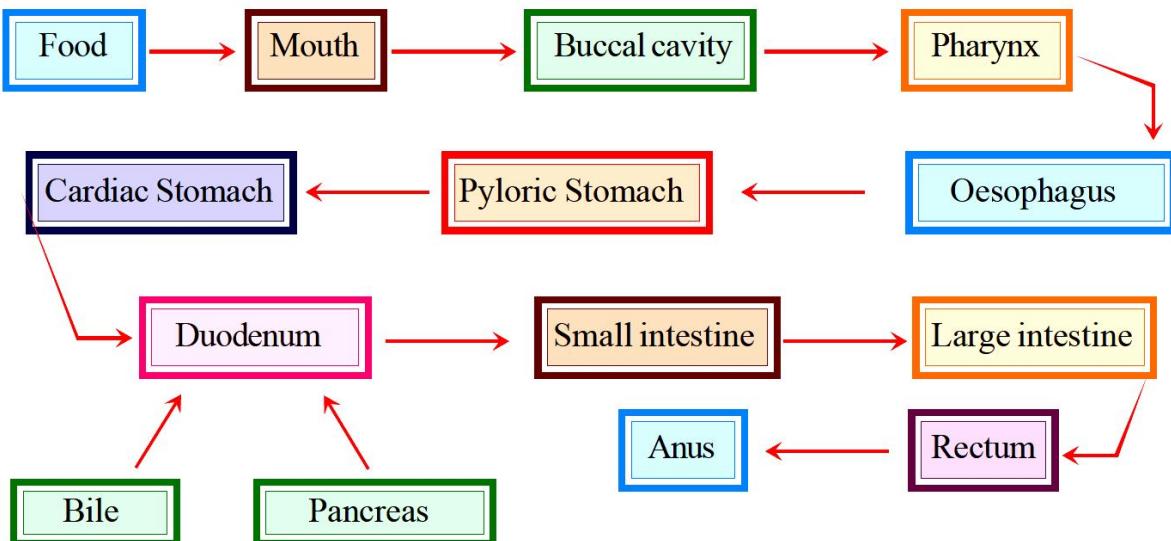
Pancreas: Pancreas is situated below the stomach. It secretes pancreatic juice which contains many digestive enzymes.

Bile and pancreatic juice go to the duodenum through a hepato-pancreatic duct. Bile breaks down fat into smaller particles. This process is called emulsification of fat. After that, the enzyme lipase digests fat into fatty acids and glycerol. Trypsin and chymotrypsin are enzymes which digest protein into amino acids. Complex carbohydrates are digested into glucose. The major part of digestion takes place in the duodenum.

No digestion takes place in jejunum. The inner wall in the ileum is projected into numerous finger-like structures; called villi. Villi increase the surface area inside the ileum so that optimum absorption can take place. Moreover, villi also reduce the lumen of the ileum so that food can stay for longer duration in it; for optimum absorption. Digested food is absorbed by villi.

Large Intestine: Large intestine is smaller than small intestine. Undigested food goes into the large intestine. Some water and salt are absorbed by the walls of the large intestine. After that, the undigested food goes to the rectum; from where it is expelled out through the anus.

Flow chart of human digestive system



Health aspects of the alimentary canal

INTEXT QUESTIONS PAGE NO. 101

Question 1: What are the differences between autotrophic nutrition and heterotrophic nutrition?

Answer :

Autotrophic nutrition	Heterotrophic nutrition
1. Food is synthesised from simple inorganic raw materials such as CO ₂ and water.	1. Food is obtained directly or indirectly from autotrophs. This food is broken down with the help of enzymes.
2. Presence of green pigment (chlorophyll) is necessary.	2. No pigment is required in this type of nutrition.
3. Food is generally prepared during day time.	3. Food can be prepared at all times.
4. All green plants and some bacteria have this type of nutrition.	4. All animals and fungi have this type of nutrition.

Question 2: Where do plants get each of the raw materials required for photosynthesis?

Answer : The following raw materials are required for photosynthesis:

- The raw material CO₂ enters from the atmosphere through stomata.
- Water is absorbed from the soil by the plant roots.
- Sunlight, an important component to manufacture food, is absorbed by the chlorophyll and other green parts of the plants.

Question 3: What is the role of the acid in our stomach?

Answer : Following are the roles of acid in our stomach:

1. The hydrochloric acid present in our stomach dissolves bits of food and creates an acidic medium. In this acidic medium, enzyme pepsinogen is converted to pepsin, which is a protein-digesting enzyme.

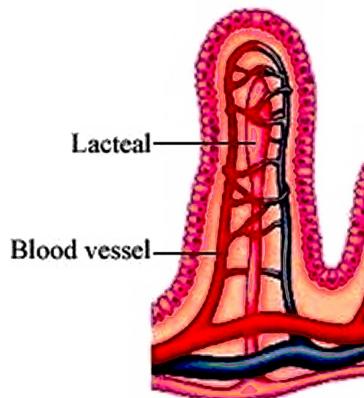
2. The hydrochloric acid kills the harmful microbes that enter with food and thus prevents infection of digestive tract.

Question 4: What is the function of digestive enzymes?

Answer : Digestive enzymes such as amylase, lipase, pepsin, trypsin, etc. help in the breaking down of complex food particles into simple ones. These simple particles can be easily absorbed by the blood and thus transported to all the cells of the body.

Question 5: How is the small intestine designed to absorb digested food?

Answer : The small intestine has millions of tiny finger-like projections called villi. These villi increase the surface area for more efficient food absorption. Within these villi, many blood vessels are present that absorb the digested food and carry it to the blood stream. From the blood stream, the absorbed food is delivered to each and every cell of the body.



RESPIRATION

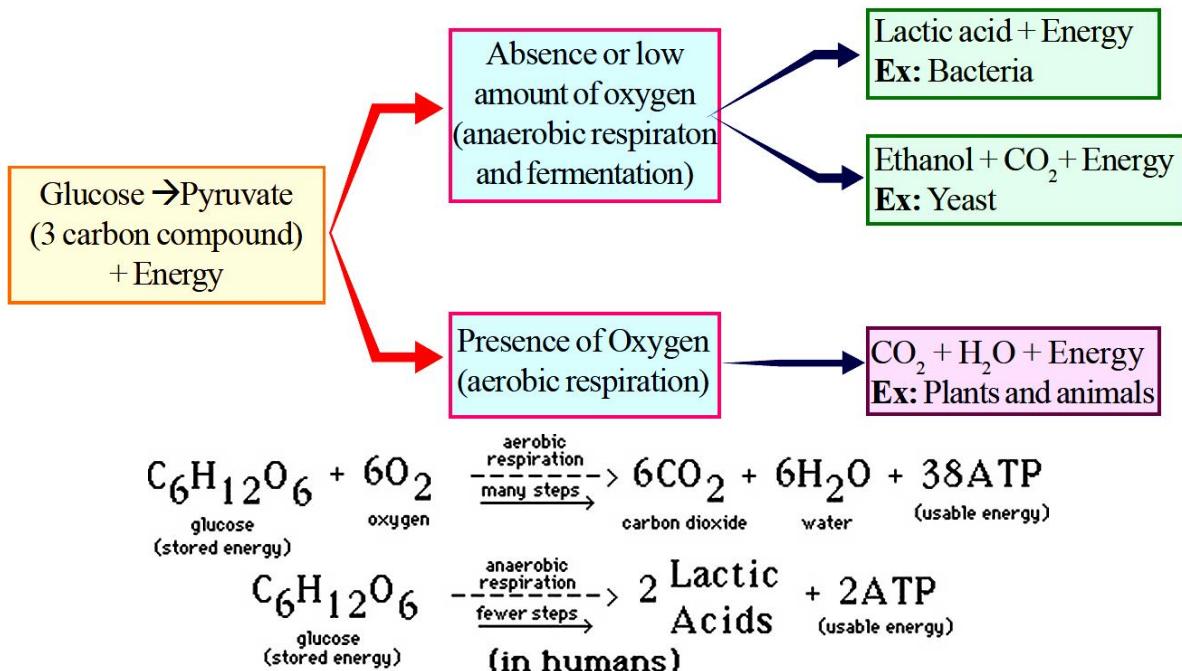
The process by which a living being utilizes the food to get energy is called respiration. Respiration is an oxidation reaction in which carbohydrate is oxidized to produce energy. Mitochondrion is the site of respiration and the energy released is stored in the form of ATP (Adenosine triphosphate). ATP is stored in mitochondria and is released as per need.

STEPS OF RESPIRATION:

- **Breaking down glucose into pyruvate:** This step happens in the cytoplasm. Glucose molecule is broken down into pyruvic acid. Glucose molecule is composed of 6 carbon atoms, while pyruvic acid is composed of 3 carbon atoms.
- **Fate of Pyruvic Acid:** Further breaking down of pyruvic acid takes place in mitochondria and the molecules formed depend on the type of respiration in a particular organism. Respiration is of two types, viz. aerobic respiration and anaerobic respiration.

TYPES OF RESPIRATION:

- **Aerobic Respiration:** This type of respiration happens in the presence of oxygen. Pyruvic acid is converted into carbon dioxide. Energy is released and water molecule is also formed at the end of this process.
- **Anaerobic Respiration:** This type of respiration happens in the absence of oxygen. Pyruvic acid is either converted into ethyl alcohol or lactic acid. Ethyl alcohol is usually formed in case of anaerobic respiration in microbes; like yeast or bacteria. Lactic acid is formed in some microbes as well as in the muscle cells.



Pain in Leg Muscles on Running: When someone runs too fast, he may experience a throbbing pain in the leg muscles. This happens because of anaerobic respiration taking place in the muscles. During running, the energy demand from the muscle cells increases. This is compensated by anaerobic respiration and lactic acid is formed in the process. The deposition of lactic acid causes the pain in the leg muscles. The pain subsides after taking rest for some time.

Exchange of Gases: For aerobic respiration; organisms need a continuous supply of oxygen, and carbon dioxide produced during the process needs to be removed from the body. Different organisms use different methods for intake of oxygen and expulsion of carbon dioxide. Diffusion is the method which is utilized by unicellular and some simple organisms for this purpose. In plants also, diffusion is utilized for exchange of gases. In complex animals, respiratory system does the job of exchange of gases. Gills are the respiratory organs for fishes. Fishes take in oxygen; which is dissolved in water; through gills. Since availability of oxygen is less in the aquatic environment so the breathing rate of aquatic organisms is faster. Insects have a system of spiracles and tracheae which is used for taking in oxygen.

Terrestrial organisms have developed lungs for exchange of gases. Availability of oxygen is not a problem in the terrestrial environment so breathing rate is slower compared to what it is in fishes.

HUMAN RESPIRATORY SYSTEM:

The human respiratory system is composed of a pair of lungs. These are attached to a system of tubes which open on the outside through the nostrils. Following are the main structures in the human respiratory system:

Nosstrils: There are two nostrils which converge to form a nasal passage. The inner lining of the nostrils is lined by hairs and remains wet due to mucus secretion. The mucus and the hairs help in filtering the dust particles out from inhaled air. Further, air is warmed up when it enters the nasal passage.

Pharynx: It is a tube like structure which continues after the nasal passage.

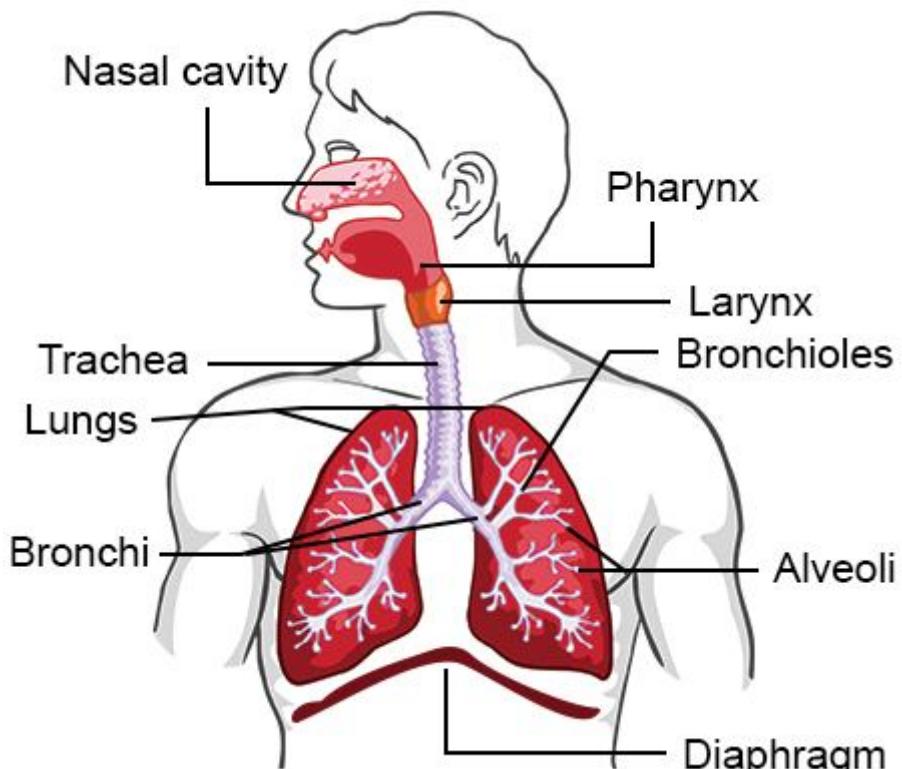
Larynx: This part comes after the pharynx. This is also called the voice box.

Trachea: This is composed of rings of cartilage. Cartilaginous rings prevent the collapse of trachea in the absence of air.

Bronchi: A pair of bronchi comes out from the trachea; with one bronchus going to each lung.

Bronchioles: A bronchus divides into branches and sub-branches; inside the lung.

Alveoli: These are air-sacs at the end of bronchioles. Alveolus is composed of a very thin membrane and is the place where blood capillaries open. This is alveolus; where oxygen mixes with the blood and carbon dioxide exits from the blood. The exchange of gases; in alveoli; takes place due to pressure differential.



Breathing Mechanism: The breathing mechanism of lungs is controlled by the diaphragm and the intercostalis muscles. Diaphragm is a membrane which separates the thoracic chamber from the abdominal cavity. When diaphragm moves down, the lungs expand and air is inhaled. When diaphragm moves up, the lungs contract and air is exhaled.

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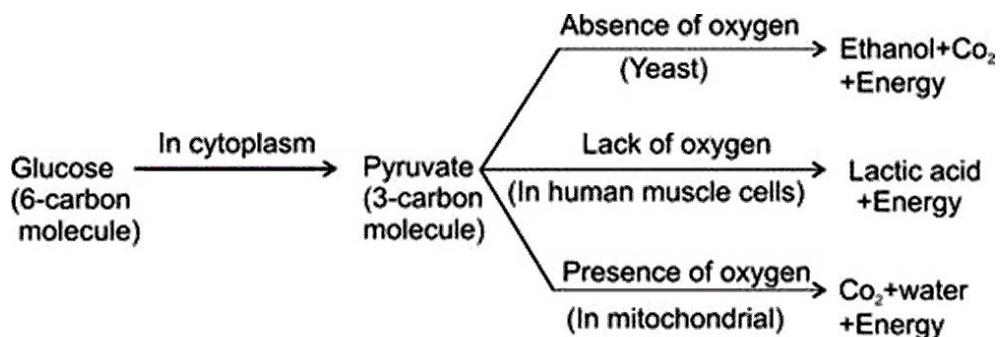
Question 1: What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

Answer : Terrestrial organisms take up oxygen from the atmosphere whereas aquatic animals need to utilize oxygen present in the water. Air contains more O₂ as compared to water. Since the content of O₂ in air is high, the terrestrial animals do not have to breathe faster to get more oxygen. Therefore, unlike aquatic animals, terrestrial animals do not have to show various adaptations for better gaseous exchange.

Question 2: What are the different ways in which glucose is oxidized to provide energy in various organisms?

Answer : Glucose is first broken down in the cell cytoplasm into a three carbon molecule called pyruvate. Pyruvate is further broken down by different ways to provide energy.

The breakdown of glucose by different pathways can be illustrated as follows.



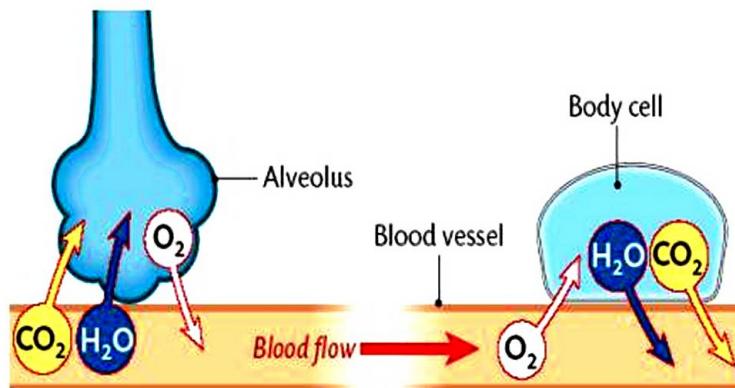
(Break down of glucose by various pathways)

In yeast and human muscle cells, the breakdown of pyruvate occurs in the absence of oxygen whereas in mitochondria, the breakdown of pyruvate occurs in the presence of oxygen.

Question 3: How is oxygen and carbon dioxide transported in human beings?

Answer : Haemoglobin transports oxygen molecule to all the body cells for cellular respiration. The haemoglobin pigment present in the blood gets attached to four O₂ molecules that are obtained from breathing. It thus forms oxyhaemoglobin and the blood becomes oxygenated. This oxygenated blood is then distributed to all the body cells by the heart. After giving away O₂ to the body cells, blood takes away CO₂ which is the end product of cellular respiration. Now the blood becomes de-oxygenated.

Since haemoglobin pigment has less affinity for CO₂, CO₂ is mainly transported in the dissolved form. This de-oxygenated blood gives CO₂ to lung alveoli and takes O₂ in return.



Question 4: How are the lungs designed in human beings to maximize the area for exchange of gases?

Answer : The exchange of gases takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli. Thus, alveoli are the site for exchange of gases. The lungs get filled up with air during the process of inhalation as ribs are lifted up and diaphragm is flattened. The air that is rushed inside the lungs fills the numerous alveoli present in the lungs.

Each lung contains 300-350 million alveoli. These numerous alveoli increase the surface area for gaseous exchange making the process of respiration more efficient.

TRANSPORTATION IN ANIMALS

Circulatory System: The circulatory system is responsible for transport of various substances in human beings. It is composed of the heart, arteries, veins and blood capillaries. Blood plays the role of the carrier of substances.

HEART

Heart is a muscular organ; which is composed of cardiac muscles. It is so small that it can fit inside an adult's fist. The heart is a pumping organ which pumps the blood. The human heart is composed of four chambers, viz. right auricle, right ventricle, left auricle and left ventricle.

Systole: Contraction of cardiac muscles is called systole.

Diastole: Relaxation of cardiac muscles is called diastole.

Arteries: These are thick-walled blood vessels which carry oxygenated blood from the heart to different organs. Pulmonary arteries are exceptions because they carry deoxygenated blood from the heart to lungs; where oxygenation of blood takes place.

Veins: These are thin-walled blood vessels which carry deoxygenated blood from different organs to the heart. Pulmonary veins are exceptions because they carry oxygenated blood from lungs to the heart. Valves are present in veins to prevent backflow of blood.

Capillaries: These are the blood vessels which have single-celled walls.

Blood: Blood is a connective tissue which plays the role of the carrier for various substances in the body. Blood is composed of plasma, blood cells and platelets.

Blood Plasma: Blood plasma is a pale coloured liquid which is mostly composed of water. Blood plasma forms the matrix of blood.

Blood Cells: There are two types of blood cells, viz. Red Blood Cells (RBCs) and White Blood Cells (WBCs).

Red Blood Corpuscles (RBCs): These are of red colour because of the presence of haemoglobin which is a pigment. Haemoglobin readily combines with oxygen and carbon dioxide. The transport of oxygen happens through haemoglobin. Some part of carbon dioxide is also transported through haemoglobin.

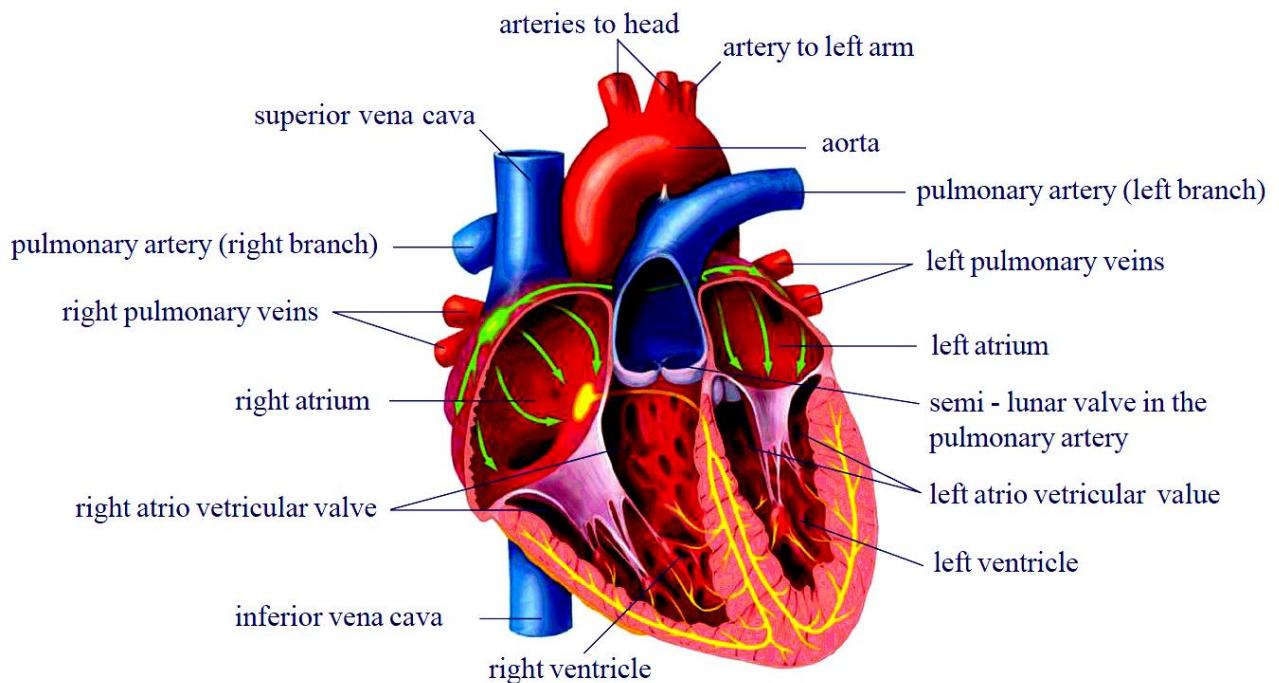
White Blood Corpuscles (WBCs): These are of pale white colour. They play important role in the immunity.

Platelets: Platelets are responsible for blood coagulation. Blood coagulation is a defense mechanism which prevents excess loss of blood; in case of an injury.

Lymph: Lymph is similar to blood but RBCs are absent in lymph. Lymph is formed from the fluid which leaks from blood capillaries and goes to the intercellular spaces in the tissues. This fluid is collected through lymph vessels and finally returns to the blood capillaries. Lymph also plays an important role in the immune system.

Double Circulation: In the human heart, blood passes through the heart twice in one cardiac cycle. This type of circulation is called double circulation. One complete heart beat in which all the chambers of the heart contract and relax once is called cardiac cycle. The heart beats about

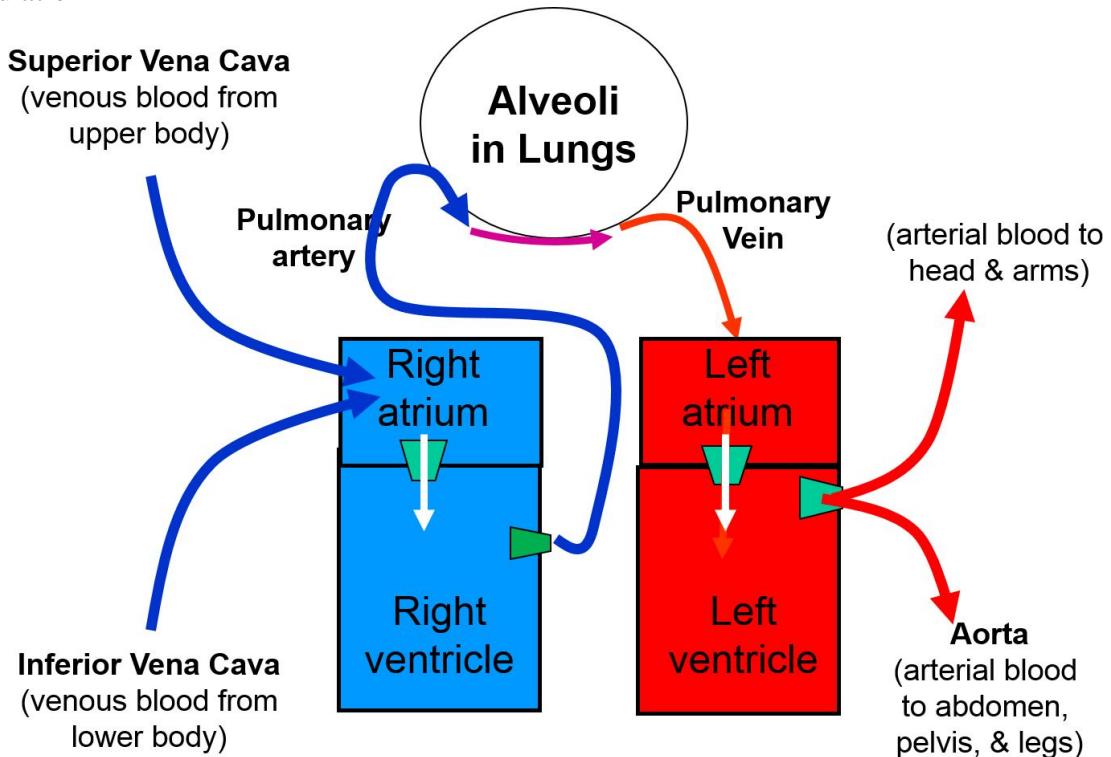
72 times per minute in a normal adult. In one cardiac cycle, the heart pumps out 70 mL blood and thus about 4900 mL blood in a minute. Double circulation ensures complete segregation of oxygenated and deoxygenated blood which is necessary for optimum energy production in warm-blooded animals.



Internal structure of heart

Circulation of Blood through the heart:

Systemic Vein → Sinus Venosus → Right Auricle → Right Ventricle → Pulmonary Artery → Lungs → Pulmonary Vein → Left Auricle → Left Ventricle → Truncus Arteriosus → Systemic Circulation



TRANSPORTATION IN PLANTS

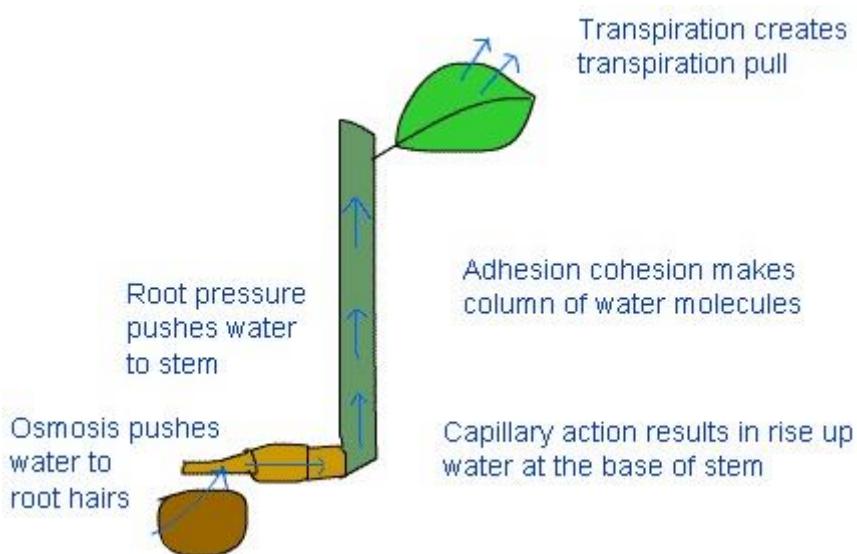
Plants have specialized vascular tissues for transportation of substances. There are two types of vascular tissues in plants, viz. xylem and phloem.

Xylem: Xylem is responsible for transportation of water and minerals. It is composed of tracheids, xylem vessels, xylem parenchyma and xylem fibre. Tracheids and xylem vessels are the conducting elements. The xylem makes a continuous tube in plants which runs from roots to stem and right up to the veins of leaves.

Phloem: Phloem is responsible for transportation of food. Phloem is composed of sieve tubes, companion cells, phloem parenchyma and bast fibres. Sieve tubes are the conducting elements in phloem.

Ascent of Sap

The upward movement of water and minerals from roots to different plant parts is called ascent of sap. Many factors are at play in ascent of sap and it takes place in many steps. They are explained as follows:



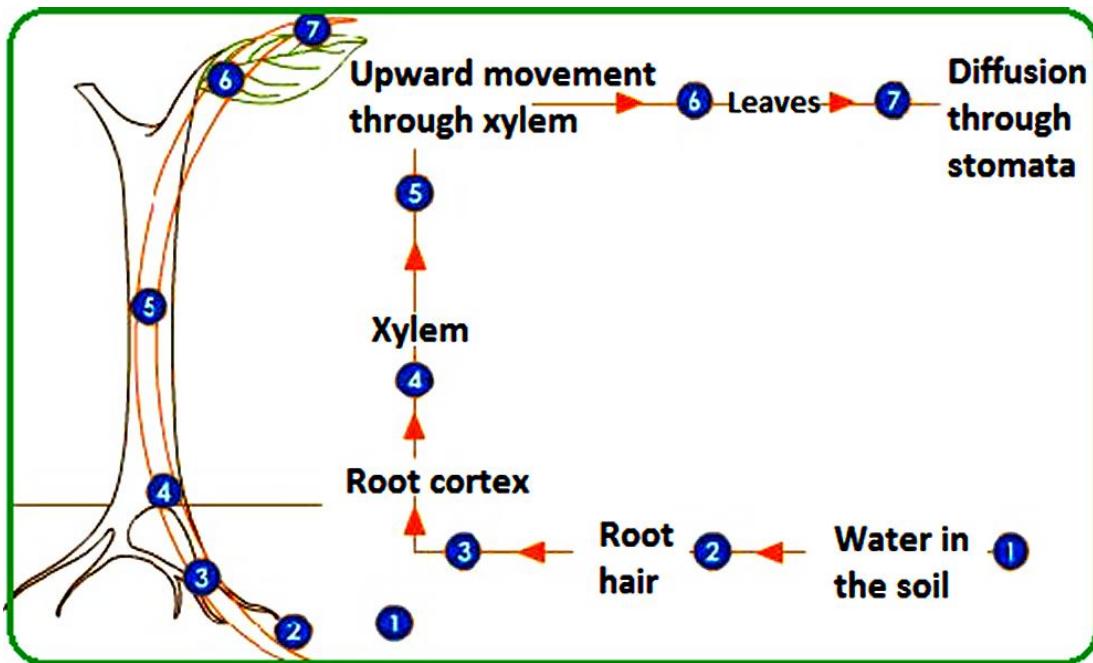
Root Pressure: The walls of cells of root hairs are very thin. Water; from soil; enters the root hairs because of osmosis. Root pressure is responsible for movement of water up to the base of the stem.

Capillary Action: A very fine tube is called capillary. Water; or any liquid; rises in the capillary because of physical forces and this phenomenon is called capillary action. Water; in stem; rises up to some height because of capillary action.

Adhesion-cohesion of Water Molecules: Water molecules make a continuous column in the xylem because of forces of adhesion and cohesion among the molecules.

Transpiration Pull: Loss of water vapour through stomata and lenticels; in plants; is called transpiration. Transpiration through stomata creates vacuum which creates a suction; called transpiration pull. The transpiration pull sucks the water column from the xylem tubes and thus water is able to rise to great heights in even the tallest plants.

Transport of Food: Transport of food in plants happens because of utilization of energy. Thus, unlike the transport through xylem; it is a form of active transport. Moreover, the flow of substances through phloem takes place in both directions, i.e. it is a two-way traffic in phloem.



INTEXT QUESTIONS PAGE NO. 110

Question 1: What are the components of the transport system in human beings? What are the functions of these components?

Answer : The main components of the transport system in human beings are the heart, blood, and blood vessels.

Heart pumps oxygenated blood throughout the body. It receives deoxygenated blood from the various body parts and sends this impure blood to the lungs for oxygenation.

Being a fluid connective tissue, blood helps in the transport of oxygen, nutrients, CO₂, and nitrogenous wastes.

The blood vessels (arteries, veins, and capillaries) carry blood either away from the heart to various organs or from various organs back to the heart.

Question 2: Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

Answer : Warm-blooded animals such as birds and mammals maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, these animals require more oxygen (O₂) for more cellular respiration so that they can produce more energy to maintain their body temperature.

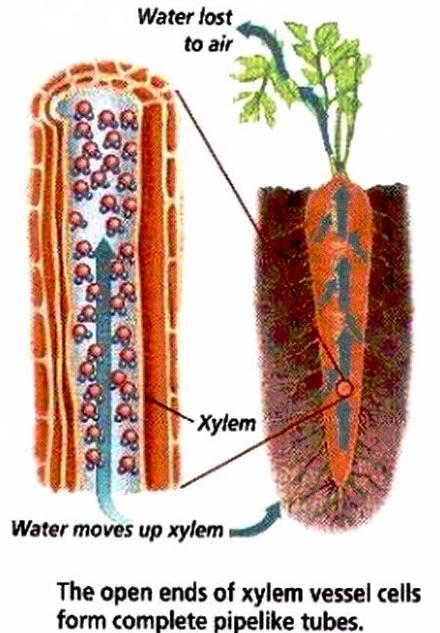
Thus, it is necessary for them to separate oxygenated and de-oxygenated blood, so that their circulatory system is more efficient and can maintain their constant body temperature.

Question 3: What are the components of the transport system in highly organised plants?

Answer : In highly organised plants, there are two different types of conducting tissues – xylem and phloem. Xylem conducts water and minerals obtained from the soil (via roots) to the rest of the plant. Phloem transports food materials from the leaves to different parts of the plant body.

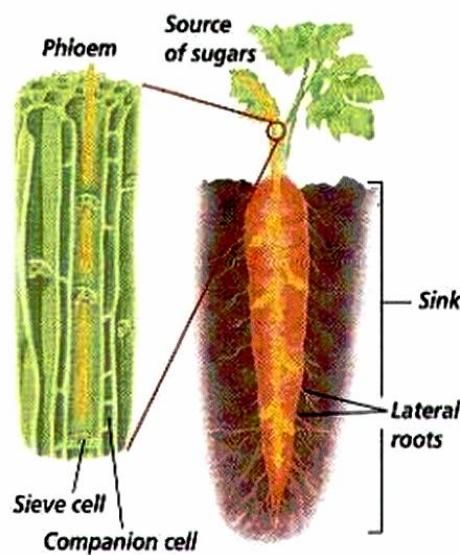
Question 4: How are water and minerals transported in plants?

Answer : The components of xylem tissue (tracheids and vessels) of roots, stems, and leaves are interconnected to form a continuous system of water-conducting channels that reaches all parts of the plant. Transpiration creates a suction pressure, as a result of which water is forced into the xylem cells of the roots. Then there is a steady movement of water from the root xylem to all the plant parts through the interconnected water-conducting channels.



Question 5: How is food transported in plants?

Answer : Phloem transports food materials from the leaves to different parts of the plant body. The transportation of food in phloem is achieved by utilizing energy from ATP. As a result of this, the osmotic pressure in the tissue increases causing water to move into it. This pressure moves the material in the phloem to the tissues which have less pressure. This is helpful in moving materials according to the needs of the plant. For example, the food material, such as sucrose, is transported into the phloem tissue using ATP energy.



Sugars in the phloem of this
carrot plant are moving to sinks.

EXCRETION

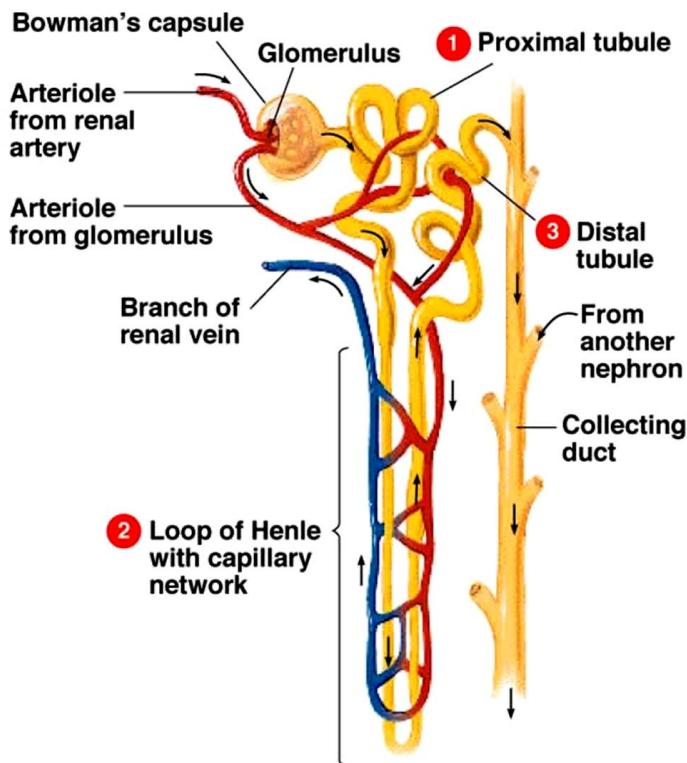
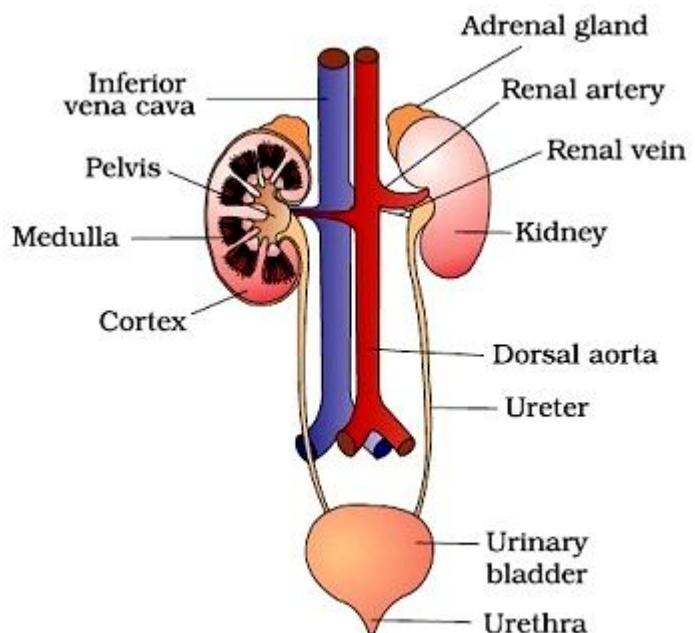
Removal of harmful waste from the body is called excretion. Many wastes are produced during various metabolic activities. These need to be removed in time because their accumulation in the body can be harmful and even lethal for an organism.

HUMAN EXCRETORY SYSTEM

The human excretory system is composed of a pair of kidneys. A tube; called ureter; comes out of each kidney and goes to the urinary bladder. Urine is collected in the urinary bladder, from where it is expelled out through urethra as and when required.

Kidney: Kidney is a bean-shaped organ which lies near the vertebral column in the abdominal cavity. The kidney is composed of many filtering units; called nephrons. Nephron is called the functional unit of kidney.

Nephron: It is composed of a tangled mess of tubes and a filtering part; called glomerulus. Glomerulus is a network of blood capillaries to which renal artery is attached. The artery which takes blood to the glomerulus is called afferent arteriole and the one receiving blood from the glomerulus is called efferent arteriole. Glomerulus is enclosed in a capsule like portion; called Bowman's capsule. The Bowman's capsule extends into a fine tube which is highly coiled. Tubes from various nephrons converge into collecting duct; which finally goes to the ureter.



Filtration in Glomerulus: Filtration happens because of very high pressure inside the glomerulus. The lumen of efferent arteriole is smaller than that of afferent arteriole. Due to this, the blood entering the glomerulus experiences very high pressure and due to this, the waste products are filtered out through the thin membrane of capillaries in the glomerulus. The filtered blood is sent to the systemic circulation through efferent arteriole and the filtrate goes to the Bowman's capsule. That is how urine is formed inside the kidneys. Reabsorption of water and some other filtrates takes place in the tubular part of the nephron. This increases the concentration of urine. The human urine is mainly composed of water and urea.

EXCRETION IN PLANTS

Plants have no special organs for removal of wastes. The waste products of respiration and photosynthesis are used as raw materials for each other. Oxygen gas produced as a by-product of photosynthesis is used up during respiration and carbon dioxide produced during respiration is used up during photosynthesis.

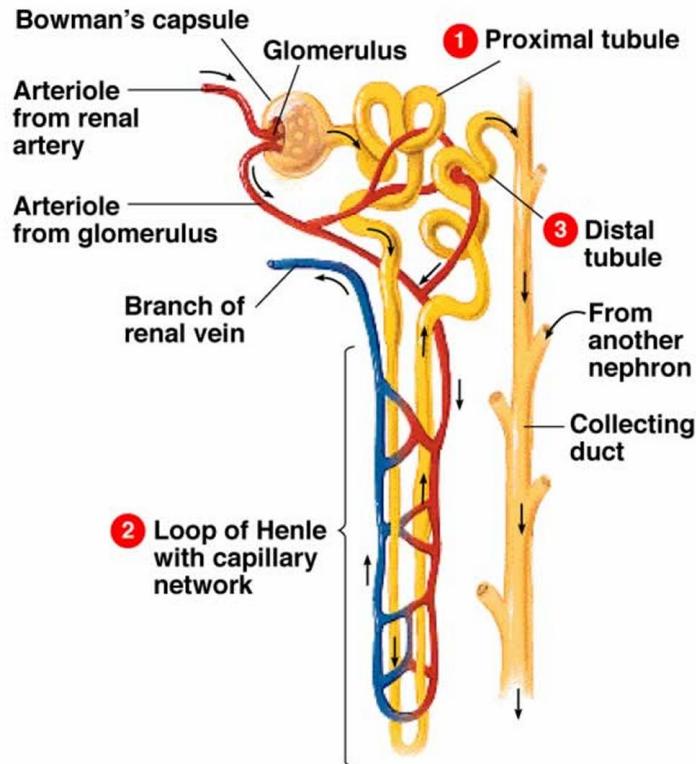
Excretion is carried out in the plants in the following ways:

- The gaseous wastes, oxygen, carbon dioxide and water vapour are removed through stomata of leaves and lenticels of stems.
- Some waste products collect in the leaves and bark of trees. When the leaves and bark are shed, the wastes are eliminated.
- Some waste products are rendered harmless and then stored in the plant body as solid bodies. Raphides, tannins, resins, gum, rubber and essential oils are some such wastes.

INTEXT QUESTIONS PAGE NO. 112

Question 1: Describe the structure and functioning of nephrons.

Answer : Nephrons are the basic filtering units of kidneys. Each kidney possesses large number of nephrons, approximately 1-1.5 million. The main components of the nephron are glomerulus, Bowman's capsule, and a long renal tubule.



Functioning of a nephron:

The blood enters the kidney through the renal artery, which branches into many capillaries associated with glomerulus.

The water and solute are transferred to the nephron at Bowman's capsule.

In the proximal tubule, some substances such as amino acids, glucose, and salts are selectively reabsorbed and unwanted molecules are added in the urine.

The filtrate then moves down into the loop of Henle, where more water is absorbed.

From here, the filtrate moves upwards into the distal tubule and finally to the collecting duct. Collecting duct collects urine from many nephrons.

The urine formed in each kidney enters a long tube called ureter. From ureter, it gets transported to the urinary bladder and then into the urethra.

Question 2: What are the methods used by plants to get rid of excretory products?

Answer : Plants can get rid of excess of water by transpiration. Waste materials may be stored in the cell vacuoles or as gum and resin, especially in old xylem. It is also stored in the leaves that later fall off.

Question 3: How is the amount of urine produced regulated?

Answer : The amount of urine produced depends on the amount of excess water and dissolved wastes present in the body. Some other factors such as habitat of an organism and hormone such as Anti-diuretic hormone (ADH) also regulates the amount of urine produced.

EXERCISE QUESTIONS PAGE NO. 113

Question 1: The kidneys in human beings are a part of the system for

- (a) nutrition.**
- (b) respiration.**
- (c) excretion.**
- (d) transportation.**

Answer : (c) In human beings, the kidneys are a part of the system for excretion.

Question 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.**

Answer : (a) In a plant, the xylem is responsible for transport of water.

Question 3: The autotrophic mode of nutrition requires

- (a) carbon dioxide and water.**
- (b) chlorophyll.**
- (c) sunlight.**
- (d) all of the above.**

Answer : (d) The autotrophic mode of nutrition requires carbon dioxide, water, chlorophyll and sunlight.

Question 4: The breakdown of pyruvate to give carbon dioxide, water and energy takes place in

- (a) cytoplasm.
- (b) mitochondria.
- (c) chloroplast.
- (d) nucleus.

Answer : (b) The breakdown of pyruvate to give carbon dioxide, water and energy takes place in mitochondria.

Question 5: How are fats digested in our bodies? Where does this process take place?

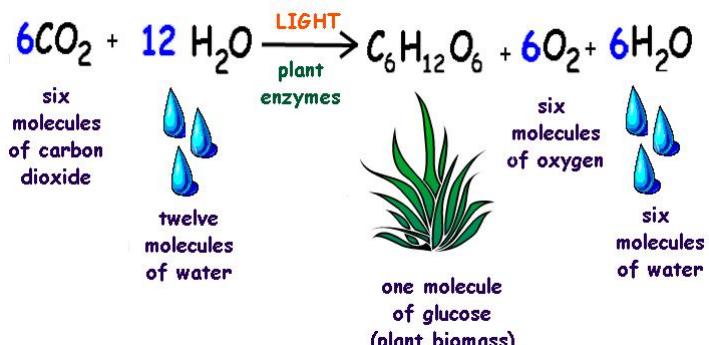
Answer : Fats are present in the form of large globules in the small intestine. The small intestine gets the secretions in the form of bile juice and pancreatic juice respectively from the liver and the pancreas. The bile salts (from the liver) break down the large fat globules into smaller globules so that the pancreatic enzymes can easily act on them. This is referred to as emulsification of fats. It takes place in the small intestine.

Question 6: What is the role of saliva in the digestion of food?

Answer : Saliva is secreted by the salivary glands, located under the tongue. It moistens the food for easy swallowing. It contains a digestive enzyme called salivary amylase, which breaks down starch into sugar.

Question 7: What are the necessary conditions for autotrophic nutrition and what are its by-products?

Answer : Autotrophic nutrition takes place through the process of photosynthesis. Carbon dioxide, water, chlorophyll pigment, and sunlight are the necessary conditions required for autotrophic nutrition. Carbohydrates (food) and O₂ are the by-products of photosynthesis.



Question 8: What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.

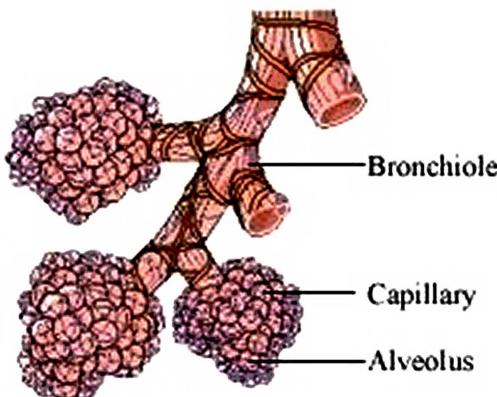
Answer :

Aerobic respiration	Anaerobic respiration
1. It occurs in the presence of O ₂ .	1. It occurs in the absence of O ₂ .
2. It involves the exchange of gases between the organism and the outside environment.	2. Exchange of gases is absent.
3. It occurs in cytoplasm and mitochondria.	3. It occurs only in cytoplasm.
4. It always releases CO ₂ and H ₂ O.	4. End products vary.
5. It yields 36 ATPs.	5. It yields only 2 ATPs.

Anaerobic respiration occurs in the roots of some waterlogged plants, some parasitic worms, animal muscles, and some micro-organisms such as yeasts.

Question 9: How are the alveoli designed to maximise the exchange of gases?

Answer : The alveoli are the small balloon-like structures present in the lungs. The walls of the alveoli consist of extensive network of blood vessels. Each lung contains 300–350 million alveoli, making it a total of approximately 700 million in both the lungs. The alveolar surface when spread out covers about 80 m² area. This large surface area makes the gaseous exchange more efficient.



Question 10: What would be the consequences of a deficiency of haemoglobin in our bodies?

Answer : Haemoglobin is the respiratory pigment that transports oxygen to the body cells for cellular respiration. Therefore, deficiency of haemoglobin in blood can affect the oxygen supplying capacity of blood. This can lead to deficiency of oxygen in the body cells. It can also lead to a disease called anaemia.

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

Answer : The human heart is divided into four chambers – the right atrium, the right ventricle, the left atrium, and the left ventricle.

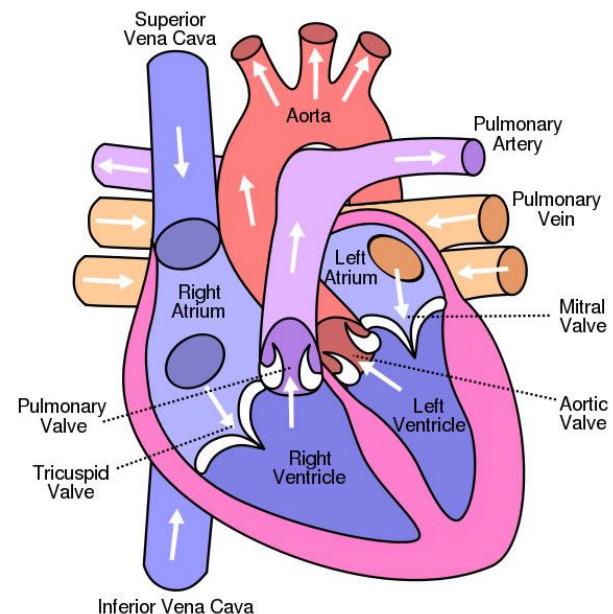
Flow of blood in the heart:

The heart has superior and inferior vena cava, which carries de-oxygenated blood from the upper and lower regions of the body respectively and supplies this de-oxygenated blood to the right atrium of the heart.

The right atrium then contracts and passes the de-oxygenated blood to the right ventricle, through an auriculo-ventricular aperture.

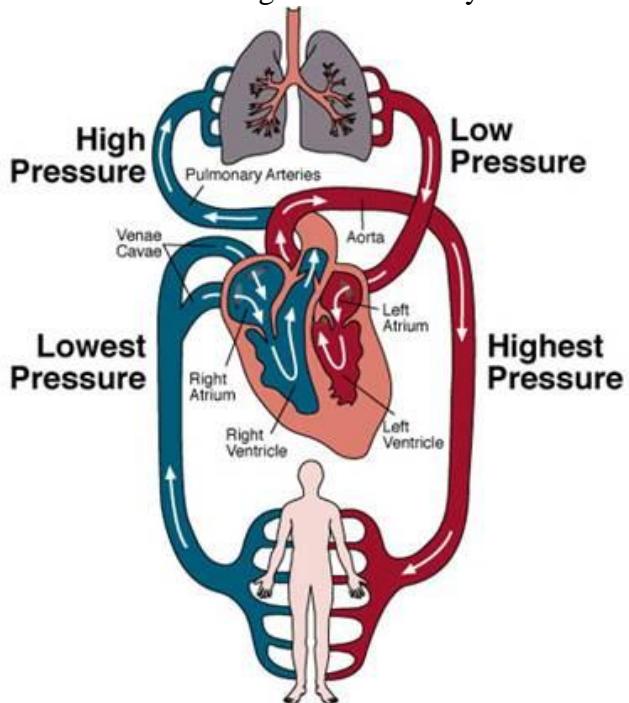
Then the right ventricle contracts and passes the de-oxygenated blood into the two pulmonary arteries, which pumps it to the lungs where the blood becomes oxygenated.

From the lungs, the pulmonary veins transport the oxygenated blood to the left atrium of the heart.



Then the left atrium contracts and through the auriculo-ventricular aperture, the oxygenated blood enters the left ventricle.

The blood passes to aorta from the left ventricle. The aorta gives rise to many arteries that distribute the oxygenated blood to all the regions of the body.



Therefore, the blood goes twice through the heart. This is known as double circulation.

Importance of double circulation:

The separation of oxygenated and de-oxygenated blood allows a more efficient supply of oxygen to the body cells. This efficient system of oxygen supply is very useful in warm-blooded animals such as human beings.

As we know, warm-blooded animals have to maintain a constant body temperature by cooling themselves when they are in a hotter environment and by warming their bodies when they are in a cooler environment. Hence, they require more O₂ for more respiration so that they can produce more energy to maintain their body temperature. Thus, the circulatory system of humans is more efficient because of the double circulatory heart.

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

Answer :

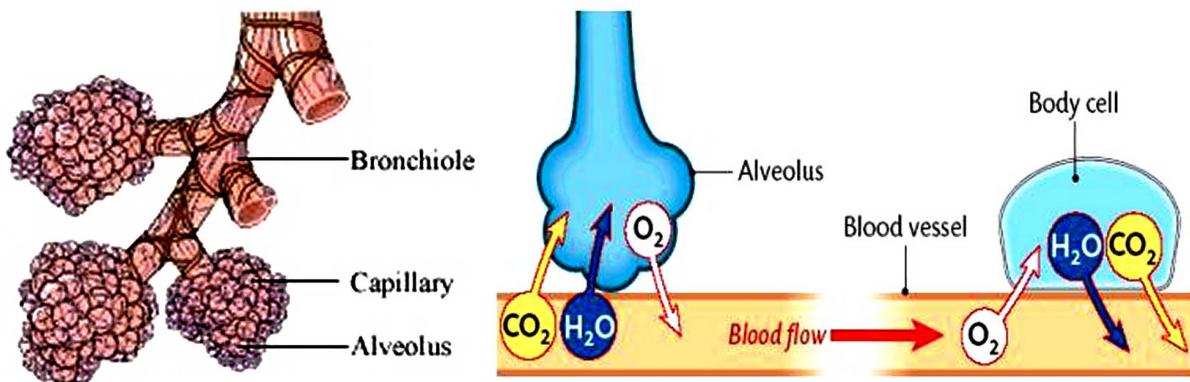
Transport of materials in xylem	Transport of materials in phloem
1. Xylem tissue helps in the transport of water and minerals.	1. Phloem tissue helps in the transport of food.
2. Water is transported upwards from roots to all other plant parts.	2. Food is transported in both upward and downward directions.
3. Transport in xylem occurs with the help of simple physical forces such as transpiration pull.	3. Transport of food in phloem requires energy in the form of ATP.

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

Answer : ALVEOLI

Structure

- (i) Alveoli are tiny balloon-like structures present inside the lungs.
- (ii) The walls of the alveoli are one cell thick and it contains an extensive network of blood capillaries.



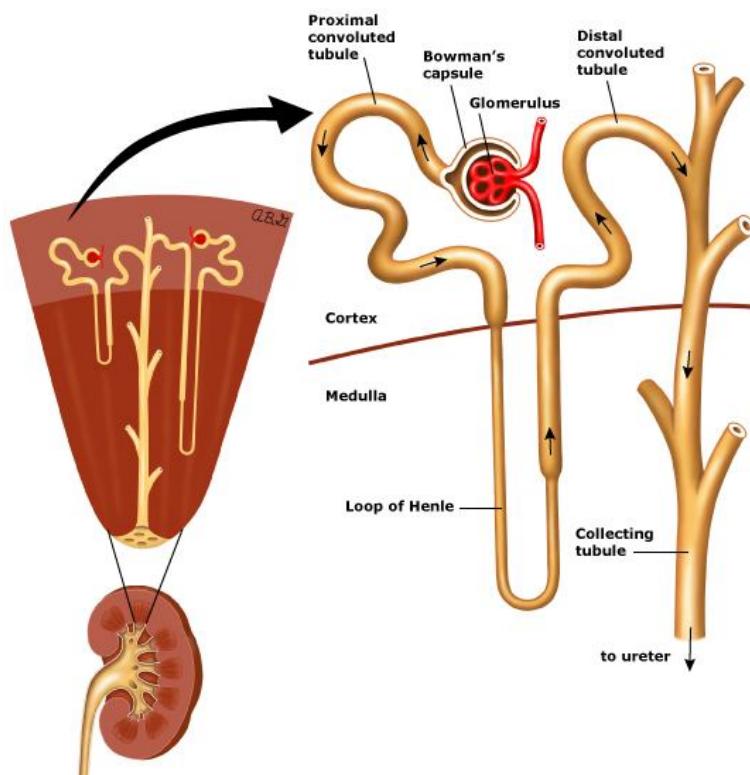
Function

- (i) The exchange of O_2 and CO_2 takes place between the blood of the capillaries that surround the alveoli and the gases present in the alveoli.
- (ii) Alveoli are the site of gaseous exchange.

NEPHRON

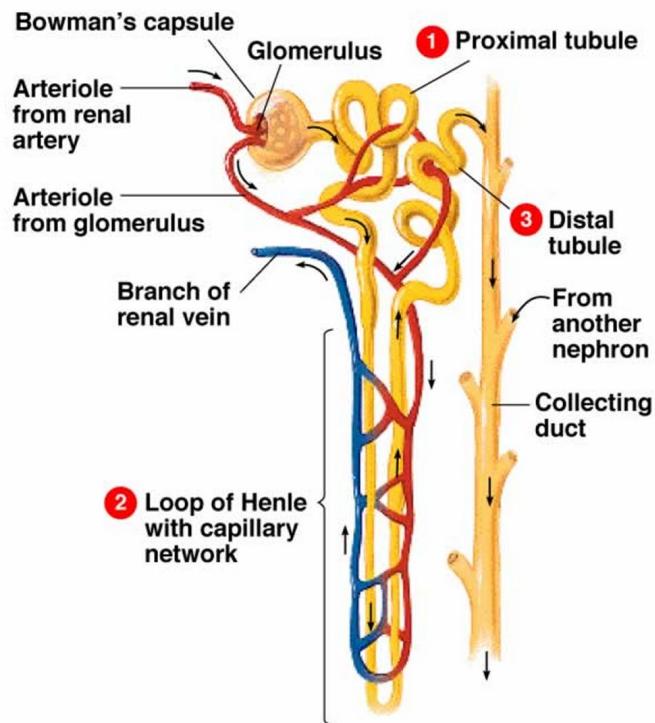
Structure

- (i) Nephrons are tubular structures present inside the kidneys.
- (ii) Nephrons are made of glomerulus, bowman's capsule, and a long renal tube. It also contains a cluster of thin-walled capillaries.



Function

(i) The blood enters the kidneys through the renal artery which branches into many capillaries in the glomerulus. The water and solute are transferred to the nephron at Bowman's capsule. Then the filtrate moves through the proximal tubule and then down into the loop of Henle. From Henle's loop, filtrate passes into the distal tubule and then to the collecting duct. The collecting duct collects the urine from many nephrons and passes it to the ureter. During the flow of filtrate, some substances such as glucose, amino acids, and water are selectively re-absorbed.



(ii) Nephrons are the basic filtration unit.

.....

ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 6
LIFE PROCESSES

- 1.** Define nutrition? What are the different modes of nutrition?
- 2.** What is the mode of nutrition in fungi?
- 3.** Name the pigment, which can absorb solar energy.
- 4.** Name the two stages in photosynthesis.
- 5.** Name the factors, which affect photosynthesis.
- 6.** Define a herbivore and a carnivore.
- 7.** What is compensation point?
- 8.** Other than chlorophyll, which other pigment is necessary for photosynthesis?
- 9.** Where does digestion begin?
- 10.** What is the name given to the process of using the absorbed food for producing energy?
- 11.** What happens to visible light of the Sun when it falls on chlorophyll?
- 12.** Name the product and by product of photosynthesis.
- 13.** In which biochemical form the photosynthetic moves in phloem tissue?
- 14.** What are the raw materials of photosynthesis?
- 15.** What is the similarity between chlorophyll and hemoglobin?
- 16.** Name the products of photolysis of water.
- 17.** What are the end products of light dependant reaction?
- 18.** Which cell organelle is the site of photosynthesis?
- 19.** What is the difference between digestion of heterotrophs and saprotrophs?
- 20.** Give example of two plants and two animal parasites.
- 21.** Name the enzyme present in saliva, what is its role in digestion?
- 22.** Which chemical is used to test for starch? Which colour shows the presence of starch?
- 23.** How does amoeba engulf its food?
- 24.** Name the parts of the digestive system of a grasshopper.

- 25.** What are the functions of the liver and the pancreas?
- 26.** Define breathing.
- 27.** How is respiration different from breathing?
- 28.** In which kind of respiration is more energy released?
- 29.** Which part of the roots is involved in exchange of respiratory gases?
- 30.** What are (i) stomata and (ii) lenticels?
- 31.** Give two points of differences between respiration in plants and respiration in animals.
- 32.** Name the respiratory organs of
(i) fish
(ii) mosquito
(iii) earthworm
(iv) dog
- 33.** From where do the following take in oxygen? (i) prawn (ii) rat.
- 34.** State the function of epiglottis.
- 35.** Define photolysis.
- 36.** What are the living organisms that cannot make their own food called?
- 37.** What are chemotrophs?
- 38.** Give the term- rhythmic contraction of alimentary canal muscle to propel food.
- 39.** Name the three secretions of gastric glands.
- 40.** What is the function of mucus in gastric gland?
- 41.** Name the sphincter which regulates the exit of food from the stomach.
- 42.** Give the functions of hydrochloric acid for the body.
- 43.** What is the role of pepsin in stomach?
- 44.** Why pancreas is called mixed gland?
- 45.** Give two functions of bile juice, from which organ it is released?
- 46.** Name the largest gland of our body.
- 47.** Name any three important enzymes of pancreas and the food component on which they act.\
- 48.** Where from intestinal juice come to the small intestine?

- 49.** What is the function of intestinal juice?
- 50.** What are the simplest digestive product of carbohydrate, fats and protein?
- 51.** Name the finger like projections of small intestine and what is the necessity of such type of projections in digestive system?
- 52.** Why are intestinal villi highly vascular?
- 53.** What is the function of anal sphincter?
- 54.** Name the site of anaerobic and aerobic respiration in a cell.
- 55.** A three carbon compound is the common product of both aerobic and anaerobic pathway. What is that?
- 56.** Why do we get muscle cramp after vigorous exercise?
- 57.** Distinguish between lactic acid and alcoholic fermentation?
- 58.** Name the energy currency molecule of cell?
- 59.** The breathing rate of aquatic animals is high, why?
- 60.** What is the function of mucus and fine hair in nostrils?
- 61.** Give the function of network of capillaries on alveoli.
- 62.** Name the main carrier of oxygen and carbon dioxide in man.
- 63.** Why does haemoglobin molecule act as efficient carrier of oxygen than diffusion process?
- 64.** Give example of any three substances transported by plasma.
- 65.** Name the organ that- (a) pushes blood around body (b) make blood to reach to tissues.
- 66.** Name the blood vessel that carries blood from heart to lungs and from lungs to heart.
- 67.** How many heart chambers are there in (a) fish (b) frog (c) lizard (d) crocodile (e) birds (f) man?
- 68.** Name the device that measures blood pressure.
- 69.** What is the normal blood pressure of man?
- 70.** Why capillaries are thin walled?
- 71.** Which cell of blood help in wound healing?
- 72.** What is the other name of lymph?
- 73.** Give two function of lymph.

- 74.** What is the direction of flow of water in xylem and food in phloem?
- 75.** Why do plants need less energy than animals?
- 76.** Which process acts as suction to pull water from xylem cells of roots.
- 77.** Mention two functions of transpiration.
- 78.** What are the two substances transported through phloem tissue?
- 79.** Name the food component whose digestion produce nitrogenous waste?
- 80.** Which is the functional unit of kidney?
- 81.** What is the cup shaped structure of nephron called?
- 82.** Which materials are selectively reabsorbed by nephron tubule?
- 83.** What are the two important functions of kidney.
- 84.** What is the other name of artificial kidney?
- 85.** A key molecule NOT found in a chloroplast is...
i. Chlorophyll
ii. Carbon dioxide
iii. Water
iv. Steroids
- 86.** Photosynthesis is a good example of...
i. Catabolism
ii. Anabolism
- 87.** Chloroplasts are found in heterotrophic cells.
i. True
ii. False
- 88.** Which of these choices is NOT in the structure of a chloroplast?
i. Granum
ii. Stroma
iii. Cristae
iv. Thylakoid
- 89.** Only plants can conduct photosynthesis with chloroplasts.
i. True
ii. False
- 90.** Chloroplasts convert solar energy into physical energy.
i. True
ii. False
- 91.** What are nutrients?
- 92.** Name the life process that provides energy.

93. Which process provides all living things with raw materials for energy and growth?

94. Name the essential pigment that absorbs light.

95. Can you name the gaseous raw material of photosynthesis?

96. If grana of a chloroplast are removed then, which of the reaction of will not be carried out?

97. Name the gas that is produced as a by-product during photosynthesis.

98. Tick the correct statement.

- i. Arteries carry blood away from the heart while veins carry blood towards heart.
- ii. Veins carry blood away from the heart while arteries carry blood towards heart.
- iii. Both of them carry blood in the same direction.
- iv. Either of them can carry blood away from the blood.

99. Artificial removal of nitrogenous wastes from the human body in the event of kidney failure is

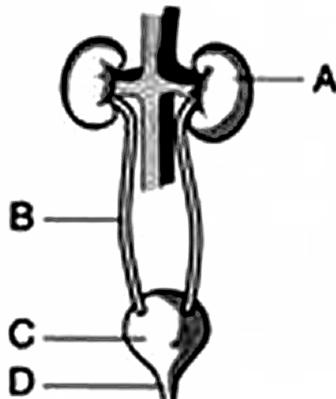
- i. Plasmolysis
- ii. Dialysis
- iii. Diffusion
- iv. Osmosis

100. The function of salivary amylase is to convert

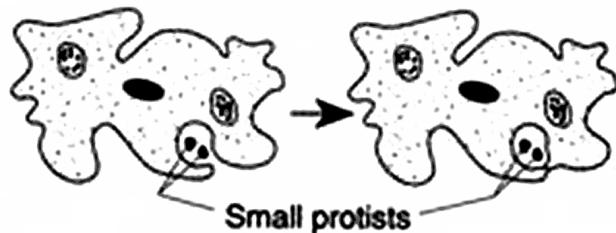
- i. Fats into fatty acids.
 - ii. Proteins into amino acids.
 - iii. Starch into sugar.
 - iv. Sugar into starch
-

ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 6
LIFE PROCESSES

1. Name the pore through which gaseous exchange takes place in older stems.
2. Why the blood is red ?
3. What is the functional unit of kidney?
4. Define translocation.
5. Name the vessel that brings oxygenated blood from lungs to heart.
6. Why the colour of lymph is yellow?
7. Name the reagent which is used to test the presence of starch.
8. Why walls of articles are thinner than ventricles?
9. The mode of nutrition in which digestive enzymes are secreted out side the body.
10. What is ATP?
11. The diagram below represents urinary system in the human body. Identify the structure through which urine leaves the urinary bladder.



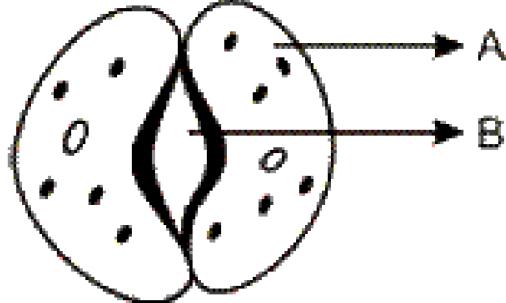
12. Which activity is illustrated in the diagram of an Amoeba shown below?



13. Why is the rate of breathing in terrestrial animals slower than aquatic animals?

14. A student covered a leaf from a destarched plant with a black paper strip and kept it in the garden outside his house in fresh air. In the evening, he tested the covered portion of the leaf for presence of starch. What the student was trying to show? Comment.

15. The parts shown as A and B in the given diagram are



The parts shown as A and B in the given diagram are

- A) A is epidermal cell, B is stomatal pore
 - B) A is guard cell, B is stomatal pore
 - C) A is epidermal cell, B is guard cell
 - D) A is guard cells, B is epidermal cell
16. The kidneys in human beings are a part of the system for
- (a) nutrition.
 - (b) respiration.
 - (c) excretion.
 - (d) transportation.
17. The xylem in plants are responsible for
- (a) transport of water.
 - (b) transport of food.
 - (c) transport of amino acids.
 - (d) transport of oxygen.
18. The autotrophic mode of nutrition requires
- (a) carbon dioxide and water.
 - (b) chlorophyll.
 - (c) sunlight.
 - (d) all of the above.
19. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in
- (a) cytoplasm.
 - (b) mitochondria.
 - (c) chloroplast.
 - (d) nucleus.
20. Movement of food through oesophagus is due to
- (a) Lubrication by saliva
 - (b) Peristalsis
 - (c) Gravitational Pull
 - (d) All of the above
21. Where is bile produced?
- (a) Gall bladder
 - (b) Blood
 - (c) Liver
 - (d) Spleen

22. In normal expiration, the diaphragm is
(a) Arched
(b) Flattened
(c) Perforated
(d) None of these
23. The correct pathway of blood in circulatory system is
(a) atria → ventricles → arteries → veins
(b) ventricles → atria → veins → arteries
(c) ventricles → veins → arteries → atria
(d) veins → ventricles → atria → arteries
24. Respiration is a process in which
(a) Energy is stored in the form of ADP
(b) Energy is released and stored in the form of ATP
(c) Energy is used up
(d) Energy is not released at all.
25. In Photosynthetic process, atmospheric carbon di oxide is _____ to carbohydrates
a) oxidised
b) Reduced
c) Neutralised
d) Burnt
26. When water enters the guard cells the stomata
a) Opens
b) Closes
c) Open or closes
d) No effect
27. Wastes concentrated in the tubules of Bowman's capsule are called _____.
(a) salts.
(b) juices
(c) urine
(d) amino acids
28. On seeing good food our mouth waters. This fluid is actually
a) Water
b) Hormone
c) Enzyme
d) None of the above
29. The enzyme Pepsin is inactive in stomach without the presence of
a) Nitric Acid
b) Hydrochloric acid
c) Acetic acid
d) Butyric acid
30. Villi present on the inner lining of the intestinal wall
a) Secretes enzymes for digestion
b) Secretes hormones
c) Decreases the surface area for absorption
d) Increases the surface area for absorption

- 31.** During cellular respiration one molecule of glucose is first broken down into two molecules of _____
a) Acetic acid
b) Pyruvic acid
c) Lactic acid
d) None of the above
- 32.** Rajib was absent in the class because of muscle pain which he claims to be due to excess physical exercise he had done yesterday. This pain is due to
a) Formation of lactic acid
b) Formation of acetic acid
c) Formation of Pyruvic acid
d) Formation of Hydrochloric acid
- 33.** Right part of the human heart contains
a) Oxygenated blood
b) Mixed blood
c) Deoxygenated blood
d) No blood
- 34.** The transport of soluble products of photosynthesis is called translocation and it occurs in the part of the vascular tissue called
a) Xylem
b) Sclerenchyma
c) Phloem
d) Collenchyma
- 35.** In human each kidney has large numbers of filtration units called ____
a) Neutrons
b) Neurons
c) Neptune
d) Nephrons
- 36.** Haemoglobin is a type of
(a) Carbohydrate
(b) Skin Pigment
(c) Vitamin
(d) Respiratory Pigment
- 37.** If kidney fails to reabsorb water, the tissues would
(a) remain unaffected
(b) shrink to shrivel
(c) absorb water from blood
(d) take more oxygen from blood
- 38.** Name an organ which is part of two body systems.
- 39.** Why do raw bread taste sweeter on mastication?
- 40.** How are fats digested in our bodies? Where does this process take place?
- 41.** What is the role of saliva in the digestion of food?

42. Why will simple diffusion not meet the requirement of human beings?
43. What criteria do we use to decide whether something is alive?
44. After long running, you may experience cramps in your leg muscles. What's the reason behind this?
45. What processes would you consider essential for maintaining life?
46. How do villi enhance absorption of food in the intestine?
47. Why bile juice is considered important even though it does not contain any digestive enzymes?
48. Which organs secrete the following enzymes:
(i) Trypsin
(ii) Pepsin
49. Name the factors that affect photosynthesis.
50. Name the vestigial part of human alimentary canal?
51. What is the name given to rhythmic wave like manner occurring in alimentary canal?
52. The bark of woody plants is dead but the inner layers inside the bark are living. How do they get oxygen and release carbon dioxide?
53. What are lenticels?
54. How does photosynthesis occur?
55. Name the mode of nutrition in an organism that uses simple substances like CO₂ and water to prepare food inside its body?
56. What are the differences between autotrophic nutrition and heterotrophic nutrition?
57. Read following statements from A to E and identify the relevant life process from the following word list.
growth, transport, synthesis, regulation, nutrition
A. A butterfly sucking the nectar from the flowers in a garden.
B. A boy shouts with excitement when his school team wins the match on the last ball.
C. After finishing lunch, Mohan's blood distributes the food molecules to different cells of his body.
D. Green plants prepares starch (complex substance) from simpler chemicals.
E. Radha finds her height has increased by 4 cm since her last birthday.
58. What is osmoregulation?
59. What are the different ways in which glucose is oxidized to provide energy in various organisms?
60. Which organ of the plant body helps in osmo-regulation?

61. Which organelle of the cell in animals helps in osmo-regulation?
62. How does transpiration pull help in ascent of sap?
63. In what form excretion takes place in plants?
64. What are the components of the transport system in highly organised plants?
65. What is meant by double circulation? Mention its advantages.
66. Who has longer small intestine tiger or cow?
67. Leaves of a healthy potted plant are coated with Vaseline to block the stomata. Will this plant remain healthy for long? State three reasons to support your answer.
68. Outline inhalation-exhalation cycle.
69. What are the components of the transport system in human beings? What are the functions of these components?
70. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?
71. Why is there extra air in our lungs after exhaling?
72. Which cell are the site of exchange of gases?
73. How are the lungs designed in human beings to maximize the area for exchange of gases?
74. Why blood is necessary for oxygen delivery to all parts of the body in larger animals?
75. Define homeostasis.
76. Name the organ systems that help us maintain homeostasis.
77. What in kidneys is analogous to alveoli in lungs?
78. State the role and function of lymph in human transport system.
79. What is the basic reason of urine production?
80. State the role of kidneys in human transport system.
81. Who discovered systemic blood circulation system in human body?
82. What is pulmonary circulation and systemic circulation?
83. Which fluid is also known as tissue fluid?
84. What is sphygmomanometer?
85. What is the function of ureter?

86. Assertion and Reason Type

Assertion: Bile is essential for fat digestion

Reason: Fats cannot be digested without emulsification

Use the following Key to choose the appropriate answer.

(a) Both Assertion & Reason are True & Reason is a correct explanation of the Assertion.

(b) If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.

(c) If Assertion is True but the Reason is False.

(d) If both Assertion and Reason are False

87. Chyme is ____.

(a) Digestive enzyme secreted by stomach.

(b) Hormone secreted by islets of Pancreas

(c) food which enters into intestine from stomach.

(d) Part of bile juice which stores in gall bladder.

88. What is the nature of Chyme? Acidic or Basic or Neutral?

89. During daytime transpiration and photosynthesis are interlinked. What do you mean by this statement?

90. 'Sweating in animals' is equivalent to what in plants?

91. What factor contribute to rate of transpiration?

92. How does transpiration help plants?

93. Name the mineral required for healthy growth of teeth.

94. Name the chemical used to detect presence of starch.

95. What is the function of mucus secreted in stomach during digestion?

96. What is the optimum temperature for photosynthesis?

97. Differentiate between Blood and Lymph

98. How does diaphragm help in inhalation?

99. Which activity is basic to living?

100. Give one term-science that deals with life processes.

101. What is the similarity between chlorophyll and haemoglobin?

102. Define Chemosynthesis.

103. What is photolysis of water? What are its products?

104. What are the important enzymes of pancreatic juice and their function?

105. Give reasons of dental caries in people.

- 106.** With schematic diagram explain double circulation in man.
- 107.** Explain mechanism of urine formation.
- 108.** Why is diffusion insufficient to meet oxygen requirement of multicellular organisms like us?
- 109.** Explain the role of HCl in our stomach.
- 110.** What is the advantage of terrestrial organisms over aquatic organisms for obtaining oxygen for respiration?
- 111.** How are lungs designed to maximize area for gaseous exchange?
- 112.** Describe fat digestion in human body and the organ where it occurs.
- 113.** How are water and minerals transported in plants?
- 114.** How are food and other substances transported in plants?
- 115.** Give labeled Diagrams for the following.
- a. Digestive system of man.
 - b. Respiratory system of man.
 - c. Structure of Nephron.
 - d. Structure of Stomata.
 - e. Structure of Heart.
 - f. Parts of Brain.
 - g. Reflex action and reflex arc.
- 116.** Due to availability of less water, how does the plant cope up with lack of water in desert conditions?
- 117.** After a vigorous exercise, you may experience cramps in your leg muscles. Why does this happen?
- 118.** What will happen if carbon monoxide combines with haemoglobin?
- 119.** Food moves down the gut by peristalsis. Which region of brain controls peristalsis?
- 120.** Name the pigment present in plants, which can absorb solar energy.
- 121.** Name the respiratory organs of (i) fish (ii) mosquito (iii) earthworm.
- 122.** Which of the four chambers of the human heart has the thickest muscular walls?
- 123.** What will be the outcome if a farmer floods his field everyday?
- 124.** Which part of visible spectrum is absorbed by chlorophyll pigments?
- 125.** How does respiration in plants differ from that in animals?

- 126.** Name the cartilaginous flap which closes the glottis to check the entry of food into it during swallowing.
- 127.** Which equipment is used to facilitate breathing during serious breathing problems?
- 128.** Chloroplast are called energy convertors. Explain.
- 129.** Why is the rate of breathing much faster in aquatic organisms than those of terrestrial organisms?
- 130.** Why are glomeruli considered as dialysis bags?
- 131.** Autotrophs synthesise food for the living world. Justify this statement in one sentence only interconnecting autotrophs and heterotrophs.
- 132.** Veins and arteries carry blood. Which of these carry blood?
- Away from the heart?
 - Back to the heart?
- 133.** Which of the organs perform the following functions in humans?
- Absorption of food.
 - Absorption of water
- 134.** Name the areas in a woody stem through which respiratory exchange of gases take place.
- 135.** Tooth enamel is one of the hardest substances in our body. How does it undergo damage due to eating chocolates and sweets?
- 136.** A certain tissue in a green plant somehow get blocked and the leaves wilted. What was the tissue that got blocked?
- 137.** Write one feature which is common to each of the following pairs of the term/organs.
- glycogen and starch
 - chlorophyll and haemoglobin
 - gills and lungs
 - arteries and veins.
- 138.** Why doesn't the lungs collapse even after forceful expiration?
- 139.** The two openings of the pharynx, one leading to trachea and the other leading to oesophagus, lie very close to each other. Yet food we swallow normally does not enter into our trachea. Why?
- 140.** How would it affect the digestion of proteins and carbohydrates if the duodenum of man if there is a blockade in the pancreatic duct?
-

ASSIGNMENT QUESTIONS SET – 3
CHAPTER – 6
LIFE PROCESSES

1. Which of the following statements about the autotrophs is incorrect?
 - (a) They synthesise carbohydrates from carbon dioxide and water in the presence of sunlight and chlorophyll
 - (b) They store carbohydrates in the form of starch
 - (c) They convert carbon dioxide and water into carbohydrates in the absence of sunlight
 - (d) They constitute the first trophic level in food chains
2. In which of the following groups of organisms, food material is broken down outside the body and absorbed?
 - (a) Mushroom, green plants, *Amoeba*
 - (b) Yeast, mushroom, bread mould
 - (c) *Paramecium*, *Amoeba*, *Cuscuta*
 - (d) *Cuscuta*, lice, tapeworm
3. Select the correct statement
 - (a) Heterotrophs do not synthesise their own food
 - (b) Heterotrophs utilise solar energy for photosynthesis
 - (c) Heterotrophs synthesise their own food
 - (d) Heterotrophs are capable of converting carbon dioxide and water into carbohydrates
4. Which is the correct sequence of parts in human alimentary canal?
 - (a) Mouth → stomach → small intestine → oesophagus → large intestine
 - (b) Mouth → oesophagus → stomach → large intestine → small intestine
 - (c) Mouth → stomach → oesophagus → small intestine → large intestine
 - (d) Mouth → oesophagus → stomach → small intestine → large intestine
5. If salivary amylase is lacking in the saliva, which of the following events in the mouth cavity will be affected?
 - (a) Proteins breaking down into amino acids
 - (b) Starch breaking down into sugars
 - (c) Fats breaking down into fatty acids and glycerol
 - (d) Absorption of vitamins
6. The inner lining of stomach is protected by one of the following from hydrochloric acid.
Choose the correct one
 - (a) Pepsin
 - (b) Mucus
 - (c) Salivary amylase
 - (d) Bile
7. Which part of alimentary canal receives bile from the liver?
 - (a) Stomach
 - (b) Small intestine
 - (c) Large intestine
 - (d) Oesophagus

- (b) Nasal passage → trachea → pharynx → larynx → alveoli
- (c) larynx → nostrils → pharynx → lungs
- (d) Nostrils → pharynx → larynx → trachea → alveoli

16. During respiration exchange of gases take place in

- (a) trachea and larynx
- (b) alveoli of lungs
- (c) alveoli and throat
- (d) throat and larynx

17. Which of the following statement (s) is (are) true about heart?

- (i) Left atrium receives oxygenated blood from different parts of body while right atrium receives deoxygenated blood from lungs
 - (ii) Left ventricle pumps oxygenated blood to different body parts while right ventricle pumps deoxygenated blood to lungs
 - (iii) Left atrium transfers oxygenated blood to right ventricle which sends it to different body parts
 - (iv) Right atrium receives deoxygenated blood from different parts of the body while left ventricle pumps oxygenated blood to different parts of the body
- (a) (i) (b) (ii)
 - (c) (ii) and (iv) (d) (i) and (iii)

18. What prevents backflow of blood inside the heart during contraction?

- (a) Valves in heart
- (b) Thick muscular walls of ventricles
- (c) Thin walls of atria
- (d) All of the above

19. Single circulation i.e., blood flows through the heart only once during one cycle of passage through the body, is exhibited by

- (a) Labeo, Chameleon, Salamander
- (b) Hippocampus, Exocoetus, Anabas
- (c) Hyla, Rana, Draco
- (d) Whale, Dolphin, Turtle

20. In which of the following vertebrate group/groups, heart does not pump oxygenated blood to different parts of the body?

- (a) Pisces and amphibians
- (b) Amphibians and reptiles
- (c) Amphibians only
- (d) Pisces only

21. Choose the correct statement that describes arteries.

- (a) They have thick elastic walls, blood flows under high pressure; collect blood from different organs and bring it back to the heart
- (b) They have thin walls with valves inside, blood flows under low pressure and carry blood away from the heart to various organs of the body
- (c) They have thick elastic walls, blood flows under low pressure; carry blood from the heart to various organs of the body
- (d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body.

22. The filtration units of kidneys are called

- (a) ureter
- (b) urethra
- (c) neurons
- (d) nephrons

23. Oxygen liberated during photosynthesis comes from

- (a) water
- (b) chlorophyll
- (c) carbon dioxide
- (d) glucose

24. The blood leaving the tissues becomes richer in

- (a) carbon dioxide
- (b) water
- (c) haemoglobin
- (d) oxygen

25. Which of the following is an incorrect statement?

- (a) Organisms grow with time
- (b) Organisms must repair and maintain their structure
- (c) Movement of molecules does not take place among cells
- (d) Energy is essential for life processes

26. The internal (cellular) energy reserve in autotrophs is

- (a) glycogen
- (b) protein
- (c) starch
- (d) fatty acid

27. Which of the following equations is the summary of photosynthesis?

- (a) $6\text{CO}_2 + 12\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$
- (b) $6\text{CO}_2 + \text{H}_2\text{O} + \text{Sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 + 6\text{H}_2\text{O}$
- (c) $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Chlorophyll} + \text{Sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$
- (d) $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Chlorophyll} + \text{Sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2 + 6\text{H}_2\text{O}$

28. Choose the event that does not occur in photosynthesis

- (a) Absorption of light energy by chlorophyll
- (b) Reduction of carbon dioxide to carbohydrates
- (c) Oxidation of carbon to carbon dioxide
- (d) Conversion of light energy to chemical energy

29. The opening and closing of the stomatal pore depends upon

- (a) oxygen
- (b) temperature
- (c) water in guard cells
- (d) concentration of CO₂ in stomata

30. Choose the forms in which most plants absorb nitrogen

- (i) Proteins
 - (ii) Nitrates and Nitrites
 - (iii) Urea
 - (iv) Atmospheric nitrogen
- (a) (i) and (ii) (b) (ii) and (iii)

(c) (iii) and (iv) (d) (i) and (iv)

31. Which is the first enzyme to mix with food in the digestive tract?

- (a) Pepsin
- (b) Cellulase
- (c) Amylase
- (d) Trypsin

32. Which of the following statement(s) is (are) correct?

- (i) Pyruvate can be converted into ethanol and carbon dioxide by yeast
 - (ii) Fermentation takes place in aerobic bacteria
 - (iii) Fermentation takes place in mitochondria
 - (iv) Fermentation is a form of anaerobic respiration
- (a) (i) and (iii) (b) (ii) and (iv)
 - (c) (i) and (iv) (d) (ii) and (iii)

33. Lack of oxygen in muscles often leads to cramps among cricketers. This results due to

- (a) conversion of pyruvate to ethanol
- (b) conversion of pyruvate to glucose
- (c) non conversion of glucose to pyruvate
- (d) conversion of pyruvate to lactic acid

34. Choose the correct path of urine in our body

- (a) kidney → ureter → urethra → urinary bladder
- (b) kidney → urinary bladder → urethra → ureter
- (c) kidney → ureters → urinary bladder → urethra
- (d) urinary bladder → kidney → ureter → urethra

35. During deficiency of oxygen in tissues of human beings, pyruvic acid is converted into lactic acid in the

- (a) cytoplasm
- (b) chloroplast
- (c) mitochondria
- (d) golgi body

36. Name the process in plants that links light energy with chemical energy

37. Name the Organisms that can prepare their own food

38. Name the cell organelle where photosynthesis occurs

39. Name the Cells that surround a stomatal pore

40. Name the Organisms that cannot prepare their own food

41. Name an enzyme secreted from gastric glands in stomach that acts on proteins.

42. "All plants give out oxygen during day and carbon dioxide during night". Do you agree with this statement? Give reason.

43. How do the guard cells regulate opening and closing of stomatal pores?

- 44.** Two green plants are kept separately in oxygen free containers, one in the dark and the other in continuous light. Which one will live longer? Give reasons.
- 45.** If a plant is releasing carbon dioxide and taking in oxygen during the day, does it mean that there is no photosynthesis occurring? Justify your answer.
- 46.** Why do fishes die when taken out of water?
- 47.** Differentiate between an autotroph and a heterotroph.
- 48.** Is 'nutrition' a necessity for an organism? Discuss.
- 49.** What would happen if green plants disappear from earth?
- 50.** Leaves of a healthy potted plant were coated with vaseline. Will this plant remain healthy for long? Give reasons for your answer.
- 51.** How does aerobic respiration differ from anaerobic respiration?
- 52.** Differentiate between an artery and a vein.
- 53.** What are the adaptations of leaf for photosynthesis?
- 54.** Why is small intestine in herbivores longer than in carnivores?
- 55.** What will happen if mucus is not secreted by the gastric glands?
- 56.** What is the significance of emulsification of fats?
- 57.** What causes movement of food inside the alimentary canal?
- 58.** Why does absorption of digested food occur mainly in the small intestine?
- 59.** Why is the rate of breathing in aquatic organisms much faster than in terrestrial organisms?
- 60.** Why is blood circulation in human heart called double circulation?
- 61.** What is the advantage of having four chambered heart?
- 62.** Mention the major events during photosynthesis
- 63.** In each of the following situations what happens to the rate of photosynthesis?
(a) Cloudy days
(b) No rainfall in the area
(c) Good manuring in the area
(d) Stomata get blocked due to dust
- 64.** Name the energy currency in the living organisms. When and where is it produced?
- 65.** What is common for cuscuta, ticks and leeches?
- 66.** Explain the role of mouth in digestion of food.

- 67.** What are the functions of gastric glands present in the wall of the stomach?
- 68.** Name the correct substrates for the following enzymes
(a) Trypsin (b) Amylase (c) Pepsin (d) Lipase
- 69.** Why do veins have thin walls as compared to arteries?
- 70.** What will happen if platelets were absent in the blood?
- 71.** Plants have low energy needs as compared to animals. Explain.
- 72.** Why and how does water enter continuously into the root xylem?
- 73.** Why is transpiration important for plants?
- 74.** How do leaves of plants help in excretion?
- 75.** Explain the process of nutrition in *Amoeba*.
- 76.** Describe the alimentary canal of man.
- 77.** Explain the process of breathing in man.
- 78.** Explain the importance of soil for plant growth.
- 79.** Draw the diagram of alimentary canal of man and label the following parts.
Mouth, Oesophagus, Stomach, Intestine
- 80.** How do carbohydrates, proteins and fats get digested in human beings?
- 81.** Explain the mechanism of photosynthesis.
- 82.** Explain the three pathways of breakdown in living organisms.
- 83.** Describe the flow of blood through the heart of human beings.
- 84.** Describe the process of urine formation in kidneys.
- 85.** Why is the process of diffusion insufficient to meet the oxygen requirement of human beings?
- 86.** Draw a diagram of human alimentary canal showing duodenum, small intestine, liver and pancreas.
- 87.** Draw a diagram of the human urinary system and label in it.
- 88.** What do you mean by double circulation of blood?
- 89.** “If there were no algae there would be no fish in the sea”. Comment.
- 90.** Write the functions of the following in the digestive process :
(i) Bile (ii) Bicarbonate secreted by the duodenal wall. (iii) Pancreatic amylase.
-

CHAPTER – 7

CONTROL AND COORDINATION

INTRODUCTION

As the complexity of the individuals, plants or animals increases the different cells and organs become separated from each other by greater distance. Thus it becomes necessary to have a system by which the different parts of the organisms can function as a single unit. This is possible only if the different parts can coordinate with each other and carry out a particular function.

To carry out a simple function such as picking up an object from the ground there has to be coordination of the eyes, hands, legs and the vertebral column. The eyes have to focus on the object, the hands have to pick it up and grasp it, the legs have to bend and so does the back bone (vertebral column). All these actions have to be coordinated in such a manner that they follow a particular sequence and the action is completed. A similar mechanism is also needed for internal functions of the body.

The individuals also have to adjust to the changing conditions around them and vary their responses. At the same time, the internal conditions of the body should be maintained constant. This is called homeostasis. Homeostasis is derived from 'homeo' meaning same and 'stasis' meaning standing still. The internal conditions of the body are maintained at a constant by controlling the physiology of the organism. Just as in animals, plants also have to control and coordinate their various functions.

NERVOUS SYSTEM

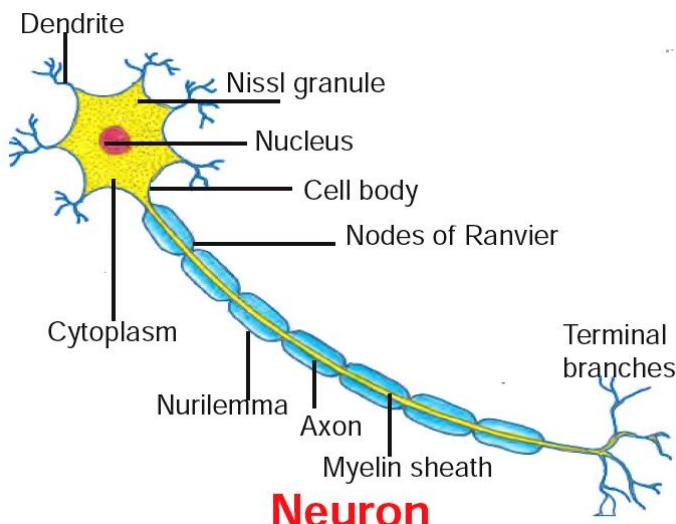
The nervous system of an animal is composed of

- i) Specialized cells called neurons or nerve cells which can detect, receive and transmit different kinds of stimuli.
- ii) The nerve fibres which are certain bundles of extended processes of nerve cells.

NERVE CELLS

Nerve cells or neurons are the structural and functional units of the nervous system. Billions of nerve cells make up our brain.

A nerve cell is a microscopic structure consisting of three major parts namely cell body, dendrites and axon.



CELL BODY

It is the cell structure irregular in shape or polyhedral structure, it is also called as cyton. Cell body contains cytoplasm with typical cell organelles and certain granular bodies are called Nissl granules .

DENDRITES

Dendrites or Dendrons are shorter fibres which branch repeatedly and project out of the cell body. Dendrites transmit electrical impulses towards the cyton.

AXON

One of the fibres arising from the cell body is very long with a branched distal end and it is called as Axon.

The distal branches terminate as bulb like structures called synaptic knob filled with chemicals called neuro transmitters. Axon contains axoplasm inside and is covered by a membrane called neurilemma. Neurilemma encloses the axon except at the branched distal ends. In some neurons called myelinated neurons an additional white fatty fibre called myelin sheath covers the neurilemma. Myelin sheath is not continuous over the neurilemma. The gaps left by the myelin sheath on the axon are called Nodes of Ranvier. Over the myelin sheath are found certain cells called Schwann cells.

TYPES OF NERVE CELLS

a) Myelinated or Medullated or White neurons:

When the axon is enclosed by the white fatty myelin cover it is called Myelinated or Medullated or White neurons. This forms the cerebral cortex of our brain.

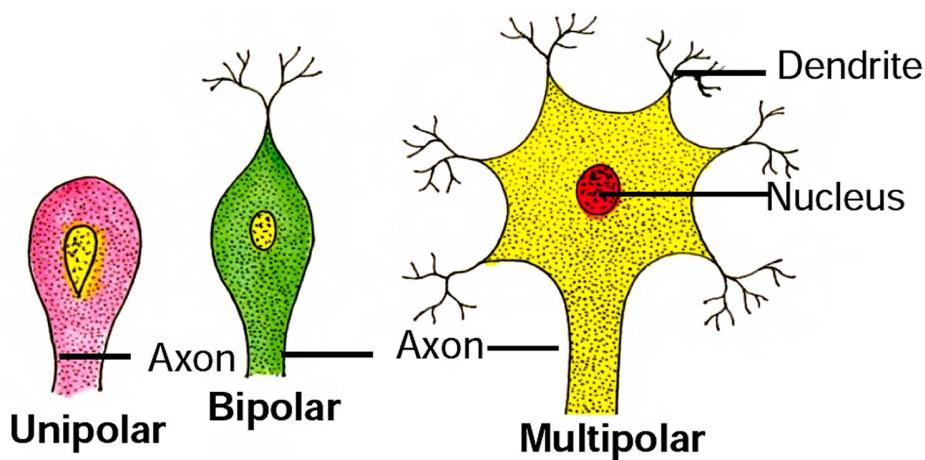
b) Non- Myelinated or Non-Medullated or Grey neurons:

This neuron is not enclosed by myelin sheath; so it appears greyish in colour.

The axon is covered by only neurilemma and Schwann cells. This type of neuron is found in the white matter of cerebrum.

c) Unipolar neurons:

The embryonic nervous tissue contains unipolar neurons. An unipolar neuron has a nerve cell body with a single process or fibre, which will act both as axon and Dendron.



structure of neuron and types

d) Bipolar neurons:

The sensory hair cells of the sense organs like rods and cones of retina are made up of bipolar neurons. Each bipolar neuron has a cell body and two process at the ends, one acting as axon and the other acting as Dendron.

e) Multipolar neuron:

The cerebral cortex contains the multipolar neurons; each multipolar neuron has a cell body with many dendrites and an axon.

Synapse: The dendrites and the synaptic knobs of the axons of neighbouring neurons are in physical contact with one another without fusing. This point of contact between the neighbouring nerve cells is called synapse.

NERVE IMPULSE

The conduction of stimuli by the nerve cells is called nerve impulse. The dendrites will receive the stimuli from the receptor (sense organ) and conduct the same as electrical impulse to the axon through the cyton. At the synapse, the synaptic knobs release out chemical substances called neuro transmitters which convert the electrical impulse into chemical impulse and pass it to the neighbouring neuron.

TYPES OF NEURON

- Sensory neuron: These neurons receive signals from a sense organ.
- Motor neuron: These neurons send signals to a muscle or a gland.
- Association neuron: These neurons relay the signals between sensory neuron and motor neuron.

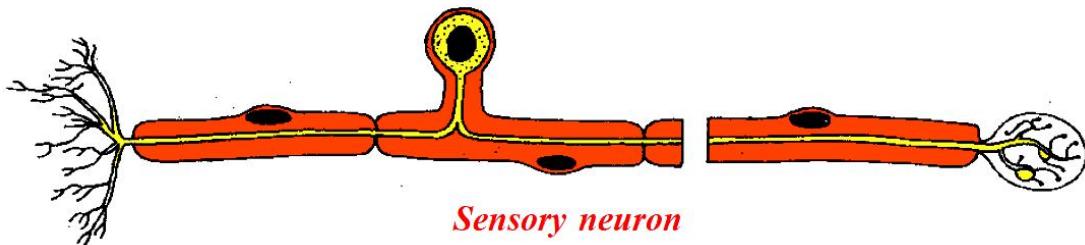
Pathways: From stimulus to response

In the holding stick activity you observed that there is coordination between eye and finger. Different pathways are taken by nerves to bring about this coordinated activity.

On the basis of pathways followed, nerves are classified mainly into three different types.

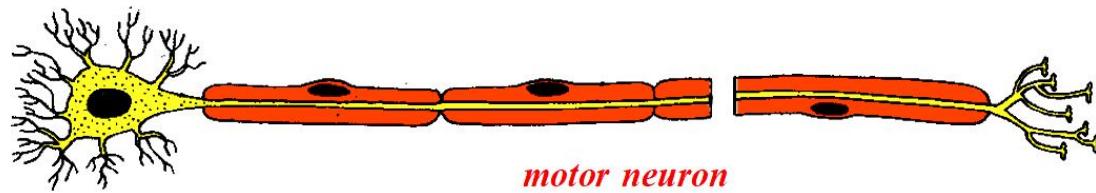
AFFERENT NEURONS:

Afferent (or ferrying towards) which carry messages towards the central nervous system (spinal cord or brain) from nerve endings on the muscles of different sense organs that sense the change in surroundings are called stimulus detectors. These are also called 'sensory' nerves.



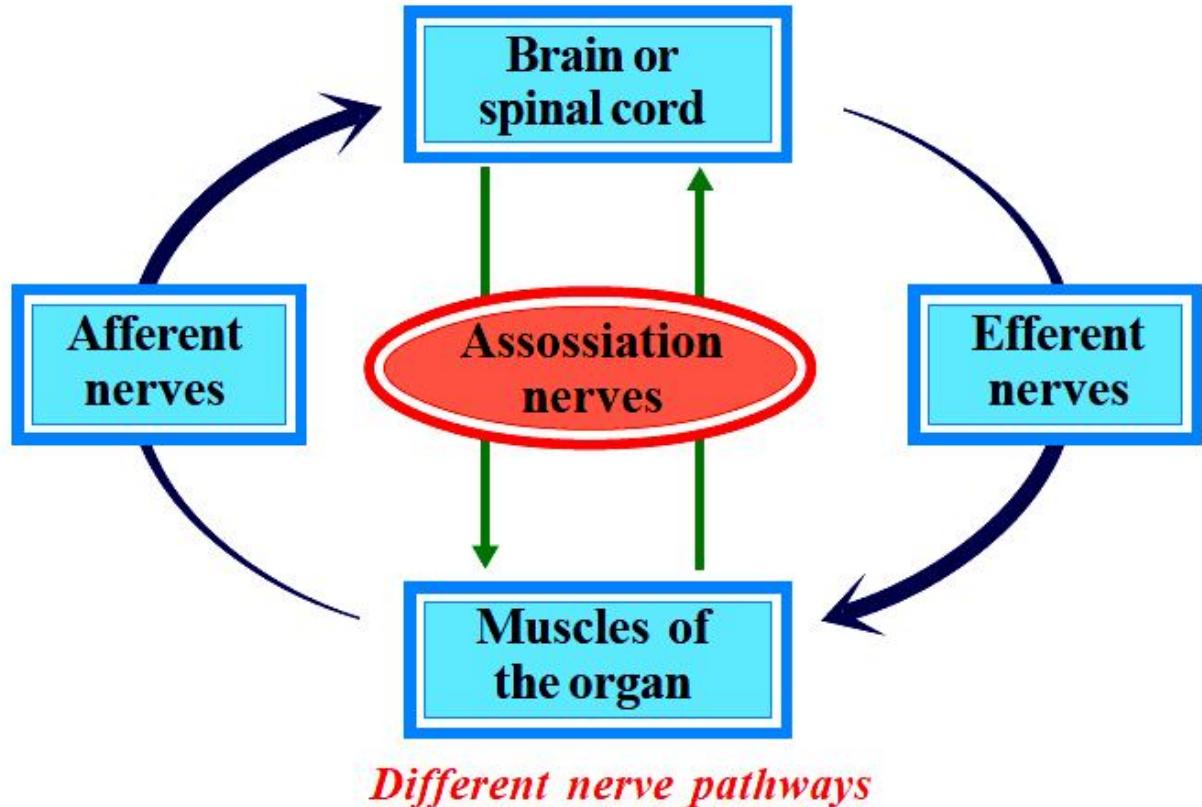
EFFERENT NEURON:

Efferent (or ferrying away) which carry messages from the central nervous system to parts that shall carry out the response or the effectors (nerve endings). They are also called 'motor' nerves.

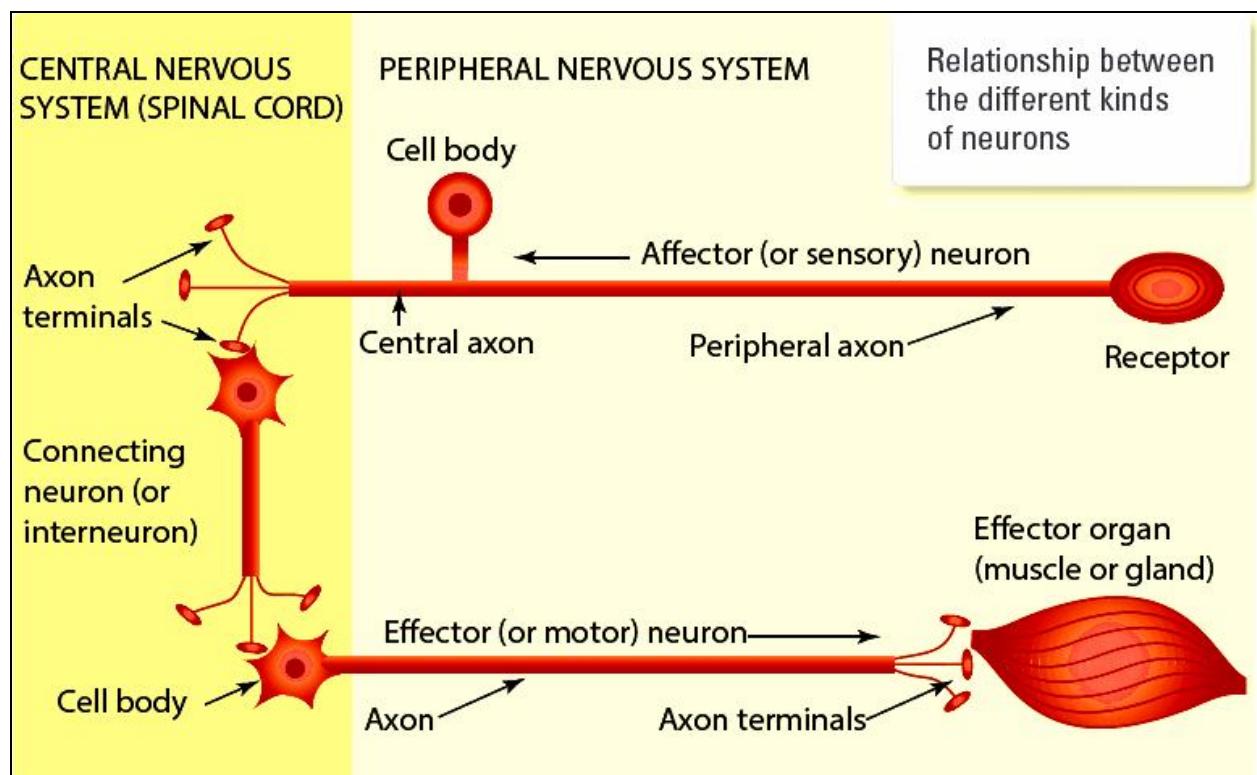


ASSOCIATION NERVES:

Association nerves, which link together the afferent and efferent nerves.



Different nerve pathways



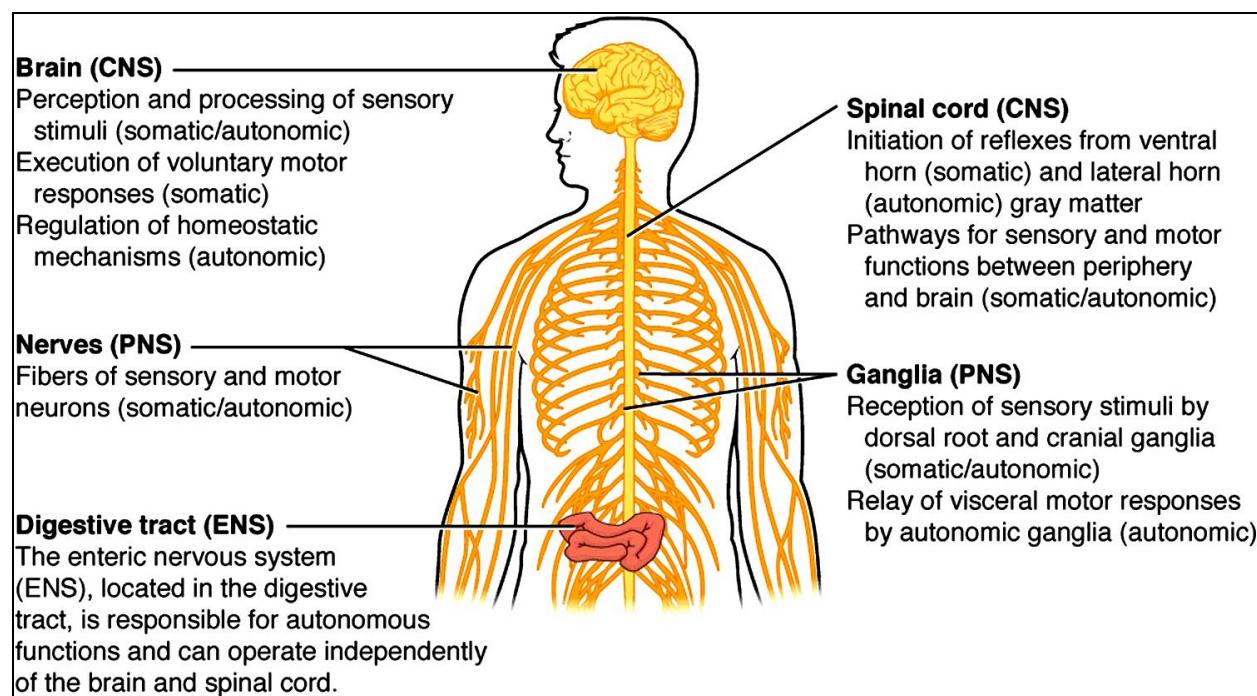
NERVOUS SYSTEM IN HUMANS

The nervous system can be divided into two major regions: the central and peripheral nervous systems. The central nervous system (CNS) is the brain and spinal cord, and the peripheral nervous system (PNS) is everything else. The brain is contained within the cranial cavity of the skull, and the spinal cord is contained within the vertebral cavity of the vertebral column. It is a bit of an oversimplification to say that the CNS is what is inside these two cavities and the peripheral nervous system is outside of them, but that is one way to start to think about it. In actuality, there are some elements of the peripheral nervous system that are within the cranial

or vertebral cavities. The peripheral nervous system is so named because it is on the periphery—meaning beyond the brain and spinal cord. Depending on different aspects of the nervous system, the dividing line between central and peripheral is not necessarily universal.

The nervous system can be divided into two parts mostly on the basis of a functional difference in responses. The somatic nervous system (SNS) is responsible for conscious perception and voluntary motor responses. Voluntary motor response means the contraction of skeletal muscle, but those contractions are not always voluntary in the sense that you have to want to perform them. Some somatic motor responses are reflexes, and often happen without a conscious decision to perform them. If your friend jumps out from behind a corner and yells “Boo!” you will be startled and you might scream or leap back. You didn’t decide to do that, and you may not have wanted to give your friend a reason to laugh at your expense, but it is a reflex involving skeletal muscle contractions. Other motor responses become automatic (in other words, unconscious) as a person learns motor skills (referred to as “habit learning” or “procedural memory”).

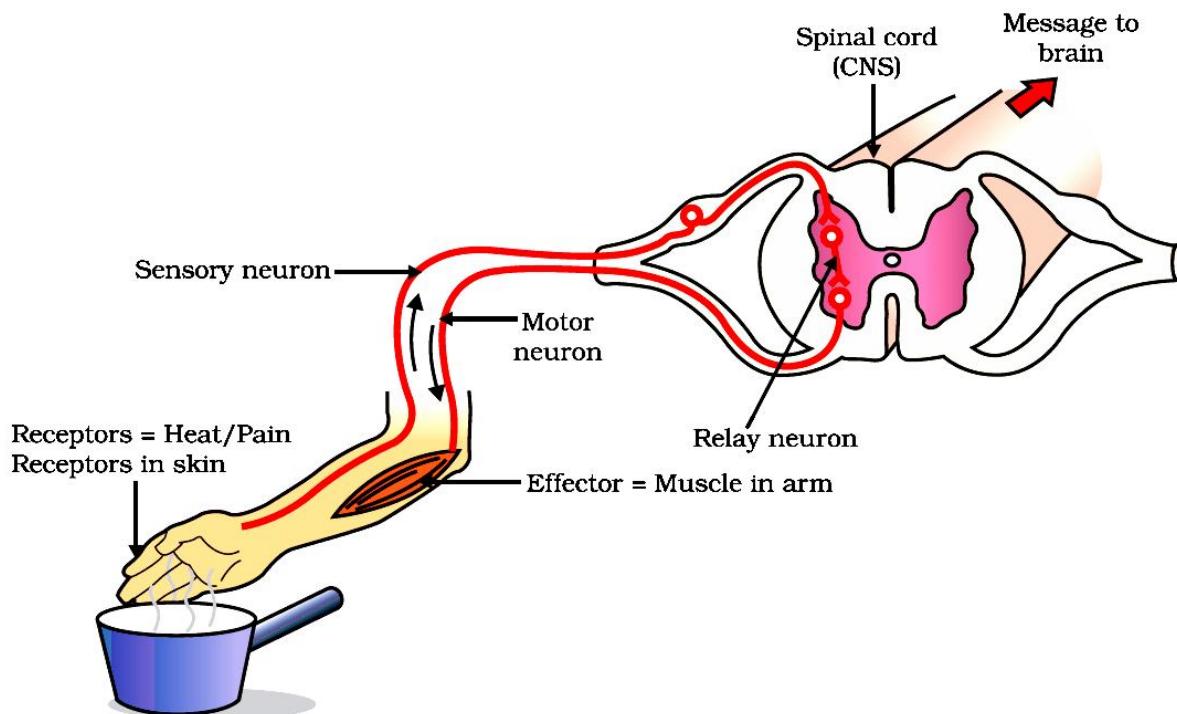
The autonomic nervous system (ANS) is responsible for involuntary control of the body, usually for the sake of homeostasis (regulation of the internal environment). Sensory input for autonomic functions can be from sensory structures tuned to external or internal environmental stimuli. The motor output extends to smooth and cardiac muscle as well as glandular tissue. The role of the autonomic system is to regulate the organ systems of the body, which usually means to control homeostasis. Sweat glands, for example, are controlled by the autonomic system. When you are hot, sweating helps cool your body down. That is a homeostatic mechanism. But when you are nervous, you might start sweating also. That is not homeostatic, it is the physiological response to an emotional state.



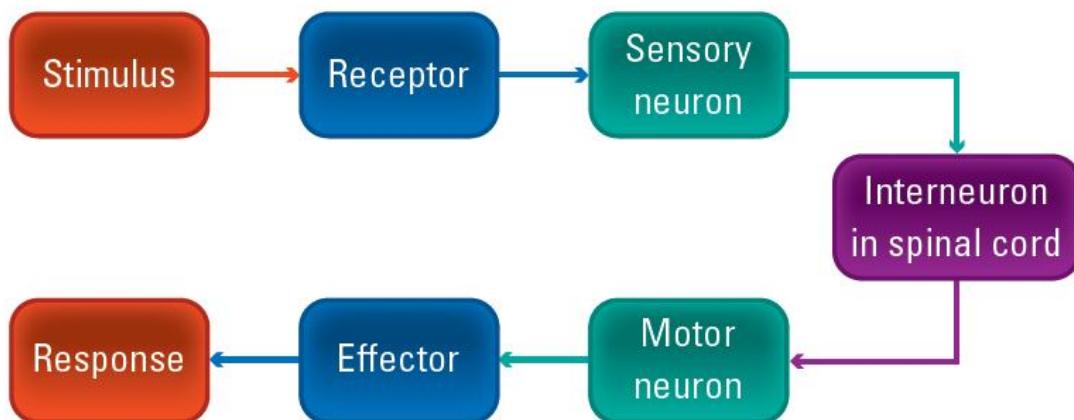
There is another division of the nervous system that describes functional responses. The enteric nervous system (ENS) is responsible for controlling the smooth muscle and glandular tissue in your digestive system. It is a large part of the PNS, and is not dependent on the CNS. It is sometimes valid, however, to consider the enteric system to be a part of the autonomic system because the neural structures that make up the enteric system are a component of the autonomic output that regulates digestion. There are some differences between the two, but for our purposes here there will be a good bit of overlap. See Figure for examples of where these divisions of the nervous system can be found.

REFLEX ACTION

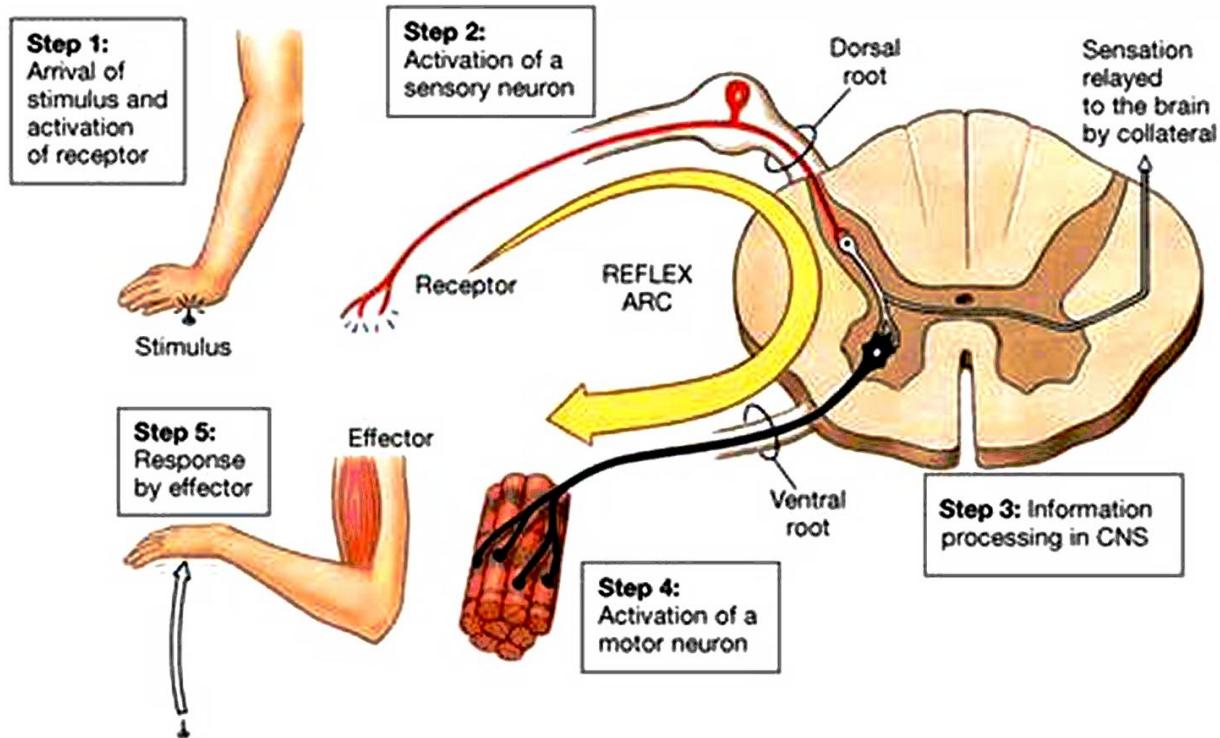
Reflex action is a special case of involuntary movement in voluntary organs. When a voluntary organ is in the vicinity of a sudden danger, it is immediately pulled away from the danger to save itself. For example; when your hand touches a very hot electric iron, you move away your hand in a jerk. All of this happens in flash and your hand is saved from the imminent injury. This is an example of reflex action.



Reflex Arc: The path through which nerves signals; involved in a reflex action; travel is called the reflex arc. The following flow chart shows the flow of signal in a reflex arc.



The receptor is the organ which comes in the danger zone. The sensory neurons pick signals from the receptor and send them to the relay neuron. The relay neuron is present in the spinal cord. The spinal cord sends signals to the effector via the motor neuron. The effector comes in action moves the receptor away from the danger.



The reflex arc passes at the level of the spinal cord and the signals involved in reflex action do not travel up to the brain. This is important because sending signals to the brain would involve more time. Although every action is ultimately controlled by the brain, the reflex action is mainly controlled at the level of spinal cord.

Muscular Movements and Nervous Control: Muscle tissues have special filaments; called actin and myosin. When a muscle receives a nerve signal; a series of events is triggered in the muscle. Calcium ions enter the muscle cells. It results in actin and myosin filaments sliding towards each other and that is how a muscle contracts. Contraction in a muscle brings movement in the related organ.

HUMAN BRAIN

Human brain is a highly complex organ; which is mainly composed of the nervous tissue. The tissues are highly folded to accommodate a larger surface area in less space. The brain is covered by a three layered system of membranes; called meninges. Cerebrospinal fluid is filled between the meninges. The CSF provides cushion to the brain against mechanical shocks. Furthermore, the brain is housed inside the skull for optimum protection. The human brain can be divided into three regions, viz. forebrain, midbrain and hindbrain.

PARTS OF HUMAN BRAIN

- Forebrain: It is composed of the cerebrum.
- Midbrain: It is composed of the hypothalamus.
- Hindbrain: It is composed of the cerebellum, pons and medulla oblongata.

Some main structures of the human brain are explained below.

Cerebrum: The cerebrum is the largest part in the human brain. It is divided into two hemispheres; called cerebral hemispheres.

FUNCTIONS OF CEREBRUM:

- The cerebrum controls the voluntary motor actions.
- It is the site of sensory perceptions; like tactile and auditory perceptions.
- It is the seat of learning and memory.

Hypothalamus: The hypothalamus lies at the base of the cerebrum. It controls sleep and wake cycle (circadian rhythm) of the body. It also controls the urges for eating and drinking.

Cerebellum: Cerebellum lies below the cerebrum and at the back of the whole structure. It coordinates the motor functions. When you are riding your bicycle; the perfect coordination between your pedaling and steering control is achieved by the cerebellum.

Medulla: Medulla forms the brain stem; along with the pons. It lies at the base of the brain and continues into the spinal cord. Medulla controls various involuntary functions; like heart beat, respiration, etc.

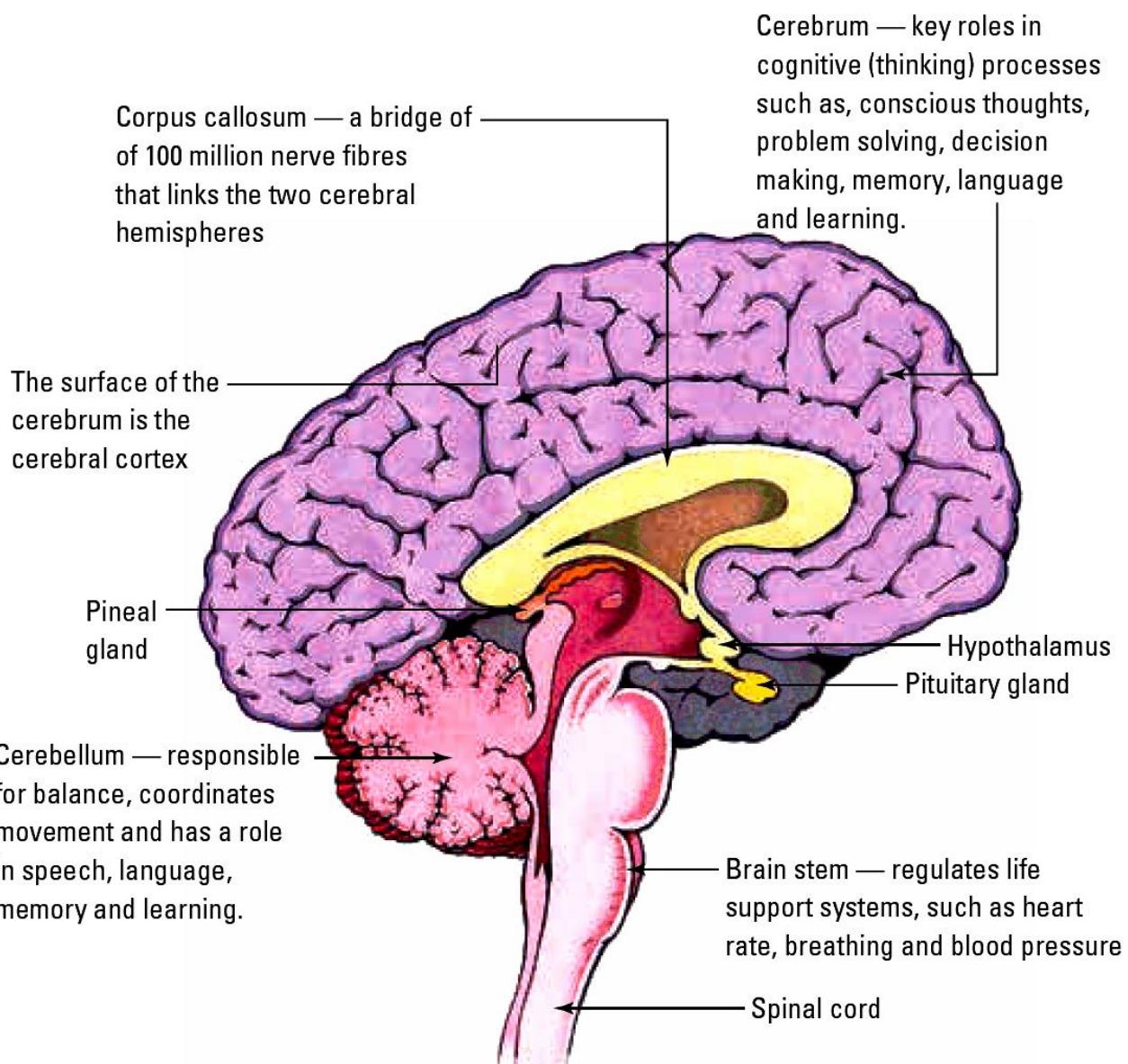


Table : Functions of the various parts of the brain

Part of the brain	Functions
Cerebrum	<ul style="list-style-type: none"> i) Seat of mental abilities, controls thinking, memory, reasoning, perception, emotions and speech. ii) Interprets sensations and responds to cold, heat, pain and pressure.
Diencephalon	<ul style="list-style-type: none"> i) Relay centre for sensory impulses, such as pain, temperature and light. ii) Reflex centre for muscular activities. iii) Centre for certain emotions such as anger. iv) Centre for water balance, blood pressure, body temperature, sleep and hunger. v) The hypothalamus controls the pituitary gland, which functions as the master gland.
Midbrain	It relays motor impulses from the cerebral cortex to the spinal cord and relays sensory impulses from the spinal cord to the thalamus, reflexes for sight and hearing.
Cerebellum	<ul style="list-style-type: none"> i) Maintains posture, equilibrium and muscle tone. ii) Coordinates voluntary movements initiated by cerebrum.
Medulla oblongata	<ul style="list-style-type: none"> i) Contains centre for cardiac, respiratory and vasomotor activities. (Vasomotor refers to actions upon a blood vessel which alter its diameter) ii) Coordinates reflexes like swallowing, coughing, sneezing and vomiting.

INTEXT QUESTIONS PAGE NO. 119

Question 1: What is the difference between a reflex action and walking?

Answer :

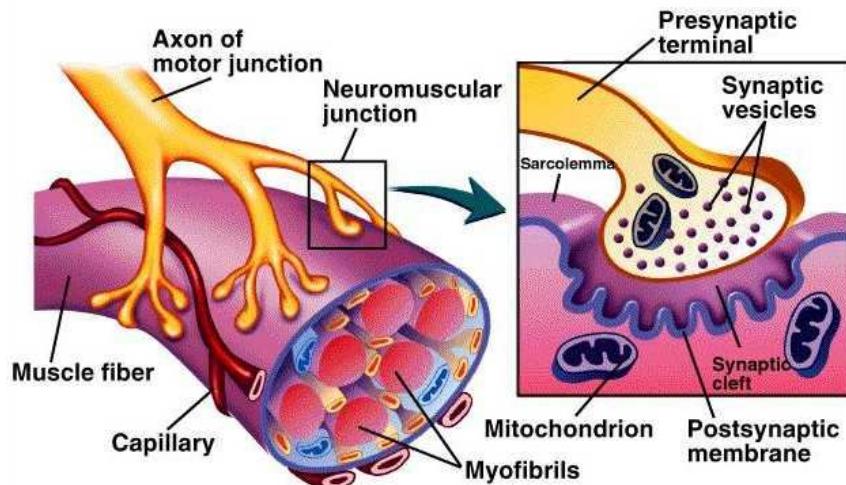
A reflex action is a rapid, automatic response to a stimulus. It does not involve any thinking. For example, we close our eyes immediately when the bright light is focused. Walking, on the other hand, is a voluntary action. It is under our conscious control.

Question 2: What happens at the synapse between two neurons?

Answer :

A very small gap that occurs between the last portion of axon of one neuron and the dendron of the other neuron is known as a synapse. It acts as a one way valve to transmit impulses in one direction only. This uni-direction transfer of impulses occurs as the chemicals are produced in only one side of the neuron i.e., the axon's side. From axon, the impulses travel across the synapse to the dendron of the other neuron.

Neuromuscular Junction



Question 3: Which part of the brain maintains posture and equilibrium of the body?

Answer : Cerebellum, a part of hindbrain is responsible for maintaining posture and equilibrium of the body.

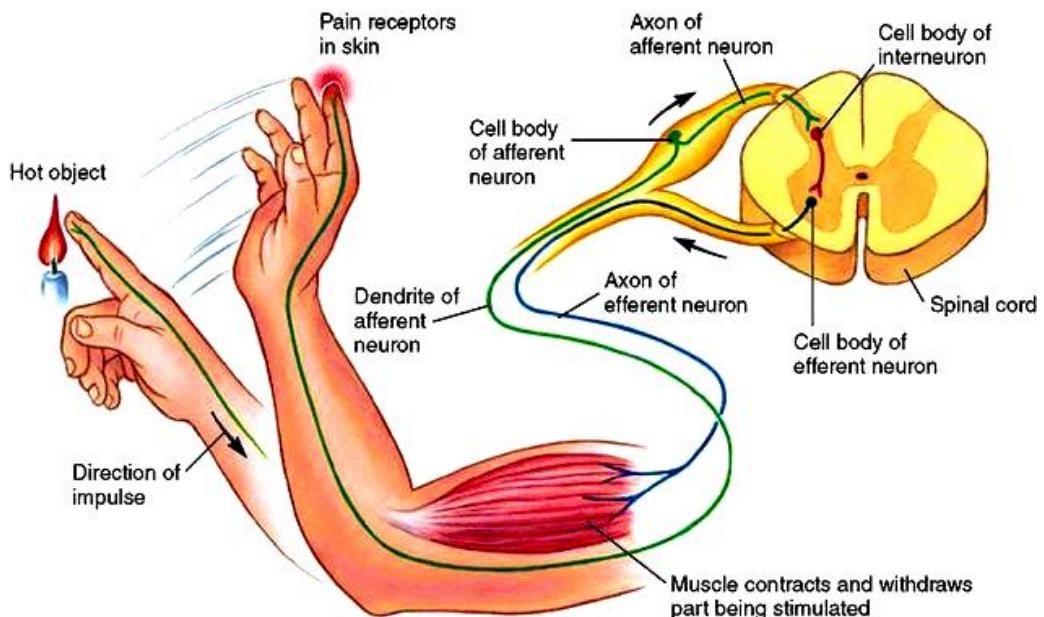
Question 4: How do we detect the smell of an agarbatti (incense stick)?

Answer : The thinking part of our brain is the forebrain. It has separate areas that are specialized for hearing, smelling, sight, taste, touch, etc. The forebrain also has regions that collect information or impulses from the various receptors. When the smell of an incense stick reaches us, our forebrain detects it. Then, the forebrain interprets it by putting it together with the information received from other receptors and also with the information already stored in the brain.

Question 5: What is the role of the brain in reflex action?

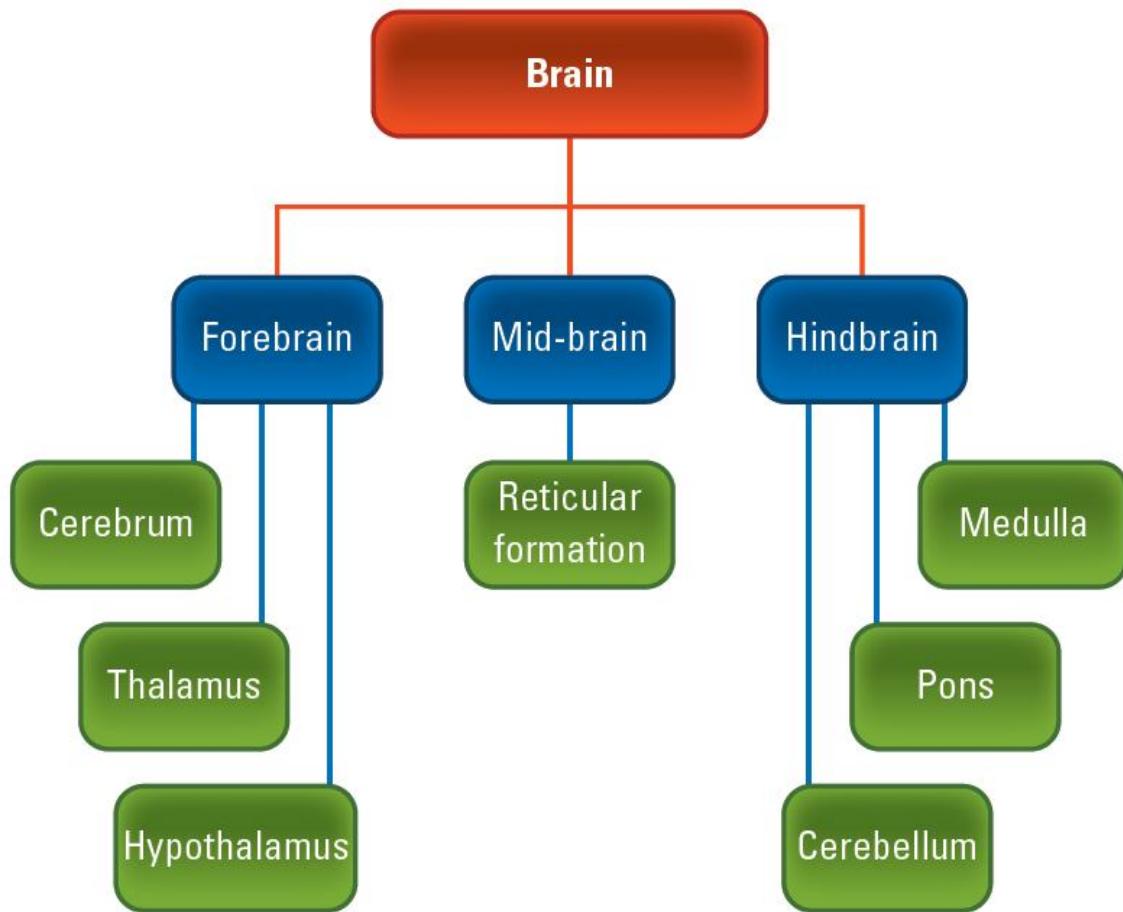
Answer : Reflex actions are sudden responses, which do not involve any thinking. For example, when we touch a hot object, we withdraw our hand immediately without thinking as thinking may take time which would be enough to get us burnt.

The sensory nerves that detect the heat are connected to the nerves that move the muscles of the hand. Such a connection of detecting the signal from the nerves (input) and responding to it quickly (output) is called a reflex arc. The reflex arcs –connections present between the input and output nerves – meet in a bundle in the spinal cord.



REFLEX ARC: Reflex arcs are formed in the spinal cord and the information (input) reaches the brain. The brain is only aware of the signal and the response that has taken place. However, the brain has no role to play in the creation of the response.

FLOWCHART OF HUMAN BRAIN



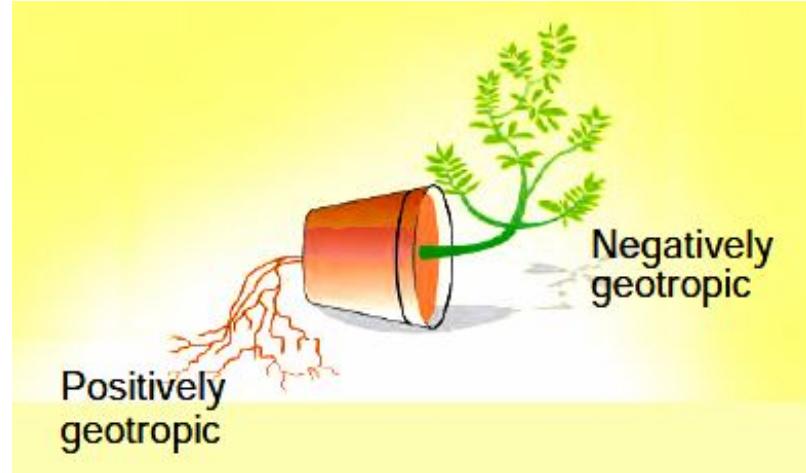
COORDINATION IN PLANTS:

Unlike animals, plants do not have a nervous system. Plants use chemical means for control and coordination. Many plant hormones are responsible for various kinds of movements in plants. Movements in plants can be divided into two main types, viz. tropic movement and nastic movement.

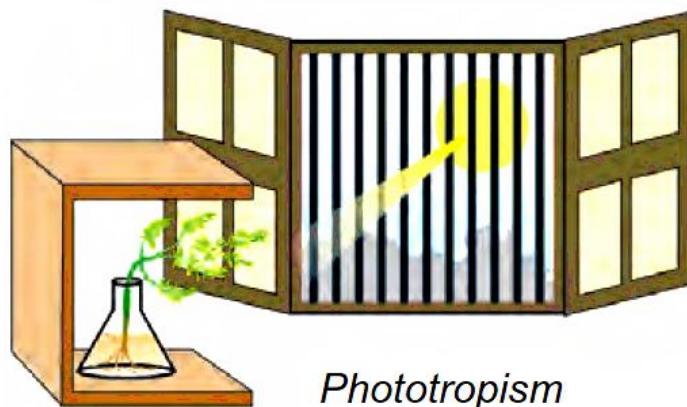
TROPIC MOVEMENT:

The movements which are in a particular direction in relation to the stimulus are called tropic movements. Tropic movements happen as a result of growth of a plant part in a particular direction. There are four types of tropic movements, viz. geotropic, phototropic, hydrotropic and thigmotropic.

- **Geotropic Movement:** The growth in a plant part in response to the gravity is called geotropic movement. Roots usually show positive geotropic movement, i.e. they grow in the direction of the gravity. Stems usually show negative geotropic movement.



- **Phototropic Movement:** The growth in a plant part in response to light is called phototropic movement. Stems usually show positive phototropic movement, while roots usually show negative phototropic movement. If a plant is kept in a container in which no sunlight reaches and a hole in the container allows some sunlight; the stem finally grows in the direction of the sunlight. This happens because of a higher rate of cell division in the part of stem which is away from the sunlight. As a result, the stem bends towards the light. The heightened rate of cell division is attained by increased secretion of the plant hormone auxin in the part which is away from sunlight.



- **Hydrotropic Movement:** When roots grow in the soil, they usually grow towards the nearest source of water. This shows a positive hydrotrophic movement.
- **Thigmotropic Movement:** The growth in a plant part in response to touch is called thigmotropic movement. Such movements are seen in tendrils of climbers. The tendril grows in a way so as it can coil around a support. The differential rate of cell division in different parts of the tendril happens due to action of auxin.

NASTIC MOVEMENT

The movements which do not depend on the direction from the stimulus acts are called nastic movement. For example; when someone touches the leaves of mimosas, the leaves droop. The drooping is independent of the direction from which the leaves are touched. Such movements usually happen because of changing water balance in the cells. When leaves of mimosas are touched, the cells in the leaves lose water and become flaccid; resulting in drooping of leaves.

Some Plant Hormones: Auxin, gibberellins and cytokinin promote growth in plant parts. Abscissic acid inhibits growth in a particular plant part.

INTEXT QUESTIONS PAGE NO. 122

Question 1: What are plant hormones?

Answer : Plant hormones or phytohormones are naturally-occurring organic substances. These are synthesized in one part of the plant body (in minute quantities) and are translocated to other parts when required. The five major types of phytohormones are auxins, gibberellins, cytokinins, abscisic acid, and ethylene.

Question 2: How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?

Answer : The movement of leaves of the sensitive plant, *Mimosa pudica* or “touch me not”, occurs in response to touch or contact stimuli. This movement is independent of growth. The movement of shoot towards light is known as phototropism. This type of movement is directional and is growth dependent.

Question 3: Give an example of a plant hormone that promotes growth.

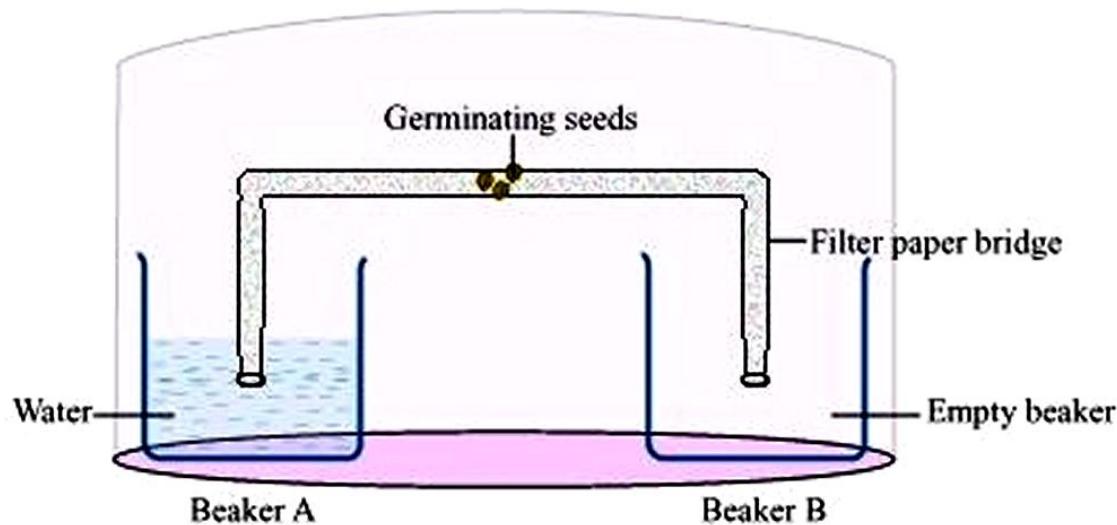
Answer : Auxin is an example of growth-promoting plant hormone.

Question 4: How do auxins promote the growth of a tendril around a support?

Answer : Auxin is synthesized at the shoot tip. It helps the cell grow longer. When a tendril comes in contact with a support, auxin stimulates faster growth of the cells on the opposite side, so that the tendril forms a coil around the support. This makes the tendrils appear as a watch spring.

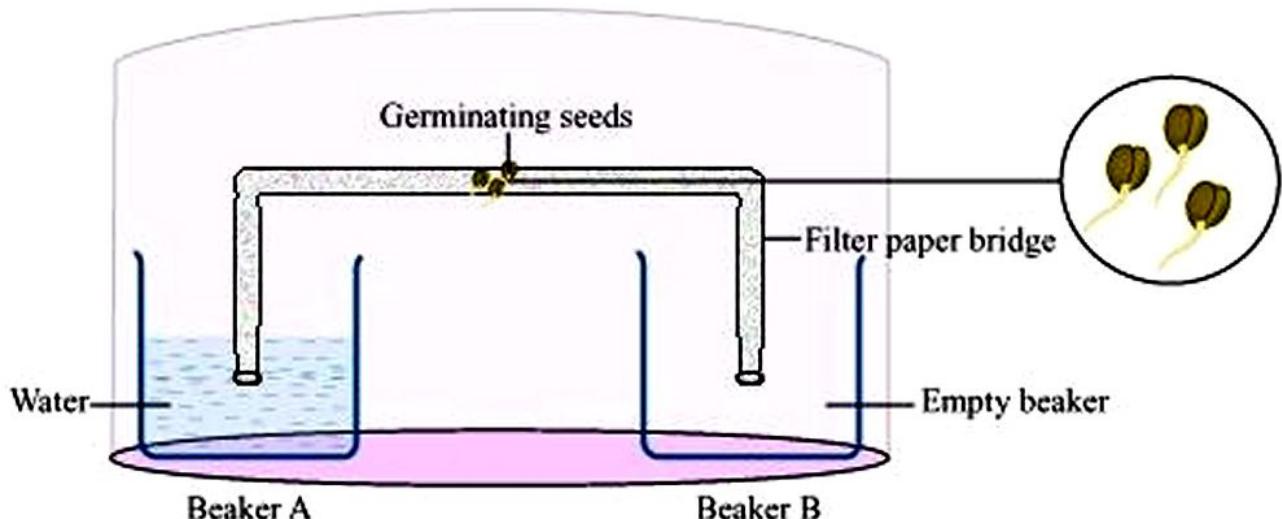
Question 5: Design an experiment to demonstrate hydrotropism.

Answer : Take two small beakers and label them as A and B. Fill beaker A with water. Now make a cylindrical-shaped roll from a filter paper and keep it as a bridge between beaker A and beaker B, as shown in the figure. Attach few germinating seeds in the middle of the filter paper bridge. Now, cover the entire set-up with a transparent plastic container so that the moisture is retained.



Observation:

The roots of the germinating seeds will grow towards beaker A.



This experiment demonstrates the phenomenon of hydrotropism.

HORMONES IN ANIMALS

The hormones in animals are produced by the endocrine glands, and they too play an important role in control and coordination.

Hormones are chemical substances that control and coordinate activities of living organisms and also their growth. The term hormone was introduced by Bayliss and Starling. Animal hormones do not bring about directional growth depending on environmental cues, but promote controlled growth in various areas to maintain the body design. The various endocrine glands in humans are hypothalamus, pineal gland, pituitary gland, thyroid gland, parathyroid glands, thymus, pancreas, adrenal glands, ovary (in female) and testis (in males).

FEATURES AND FUNCTIONS OF HORMONES:

1. They are secreted by the endocrine glands and are called 'chemical messengers'.
2. They are poured directly into blood stream as endocrine glands have no ducts of their own (ductless glands).
3. They usually have their effect at sites different from the sites where they are made.
They act on specific areas called targetorgans.
4. Hormones coordinate body activities and growth
5. They are released in minute quantities

ENDOCRINE SYSTEM

The endocrine system is composed of several endocrine glands. A ductless gland is called endocrine gland. Endocrine gland secretes its product directly into the bloodstream. Hormones are produced in the endocrine glands. Hormone is mainly composed of protein. Hormones assist the nervous system in control and coordination. Nerves do not reach to every nook and corner of the body and hence hormones are needed to affect control and coordination in those parts. Moreover, unlike nervous control; hormonal control is somewhat slower.

Different types of endocrine glands present in our body are the pituitary gland, the pineal gland, the hypothalamus, the thyroid, the parathyroid, the thymus, the adrenal gland, the pancreas, the testes and the ovary.

The pituitary gland:

- It is a pea-shaped gland located at the base of the brain.
- It is considered to be master gland as it secretes many hormones to regulate the organs as well as the other glands.
- Different hormones secreted by this gland include Growth hormone, TSH, FSH,

LH, ACTH, MSH, Vasopressin and Oxytocin.

The hypothalamus:

- It is a neuro-endocrine part of the brain.
- It links the nervous system and the endocrine system through the pituitary gland.
- Different hormones secreted by this gland include TRH, GnRH, GHRH, CRH, Somatostatin, Dopamine.

The thyroid gland:

- It is located in the neck, ventral to the larynx.
- It is the one of the largest endocrine glands.
- The principal hormones produced by this gland are triiodothyronine and thyroxine.
- Thyroxine is a hormone that regulates the metabolism of carbohydrates, proteins and fats in the body.

Hyposecretion of thyroxine leads to cretinism in children, and myxoedema in adults. Hypersecretion of thyroxine leads to exophthalmic goitre in adults. Goitre is caused due to deficiency of iodine in food. Iodine is essential for the synthesis of thyroxine.

Parathyroid glands:

- These are two pairs of small, oval-shaped glands embedded on the dorsal surface of the thyroid gland present in the neck.
- They secrete parathormone. Parathormone helps in regulation of calcium and phosphate ions in the bones and blood.
- Hyposecretion leads to parathyroid tetany and hypersecretion causes osteoporosis.

The adrenal glands:

- These are located above the kidneys and hence are called as suprarenal glands.
- Two regions of the adrenal gland are adrenal cortex and adrenal medulla.
- Adrenal cortex secretes the hormones like cortisol, aldosterone and androgens.
- Adrenal medulla secretes the hormones like adrenaline and noradrenaline.

Adrenaline is also called the “hormone of fight or flight,” or the emergency hormone. It prepares the body to face an emergency condition of physical stress, like danger, anger and excitement.

The pancreas:

- It is located just below the stomach within the curve of the duodenum. It is both exocrine and endocrine in function.
- It secretes hormones such as insulin, glucagon, somatostatin and pancreatic polypeptide.
- Insulin regulates the sugar level in our blood. Insulin secreted in small amounts increases the sugar level in our blood which in turn causes a disease called diabetes mellitus.

Gonads:

Two types of gonads present in human beings are female gonads and male gonads.

Female gonads

- A pair of ovaries forms the gonads in female.
- Ovaries are the female sex organs that lie one on either side of the abdominal cavity. Ovaries produce two hormones, namely, oestrogen and progesterone.
- Oestrogen controls the changes that occur during puberty, like feminine voice, soft skin and development in mammary glands.
- Progesterone controls the uterine changes in the menstrual cycle, and helps in the maintenance of pregnancy.

Male gonads

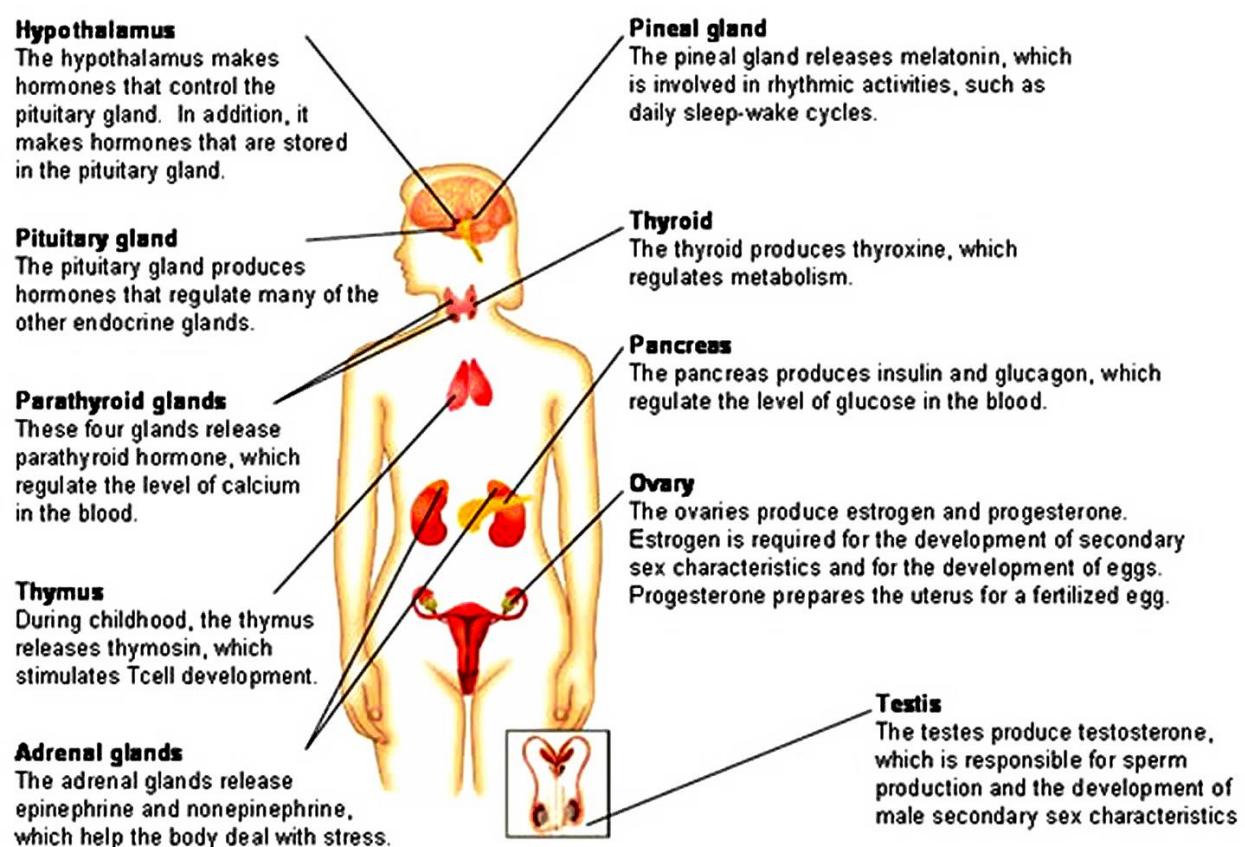
- A pair of testes forms the gonads in males.
- A pair of testes is the male sex organ located in the scrotum, which is outside the abdomen.
- Testes produce the hormone testosterone.
- Testosterone controls the changes, which occur during puberty, like deeper voice, development of penis, facial and body hair.

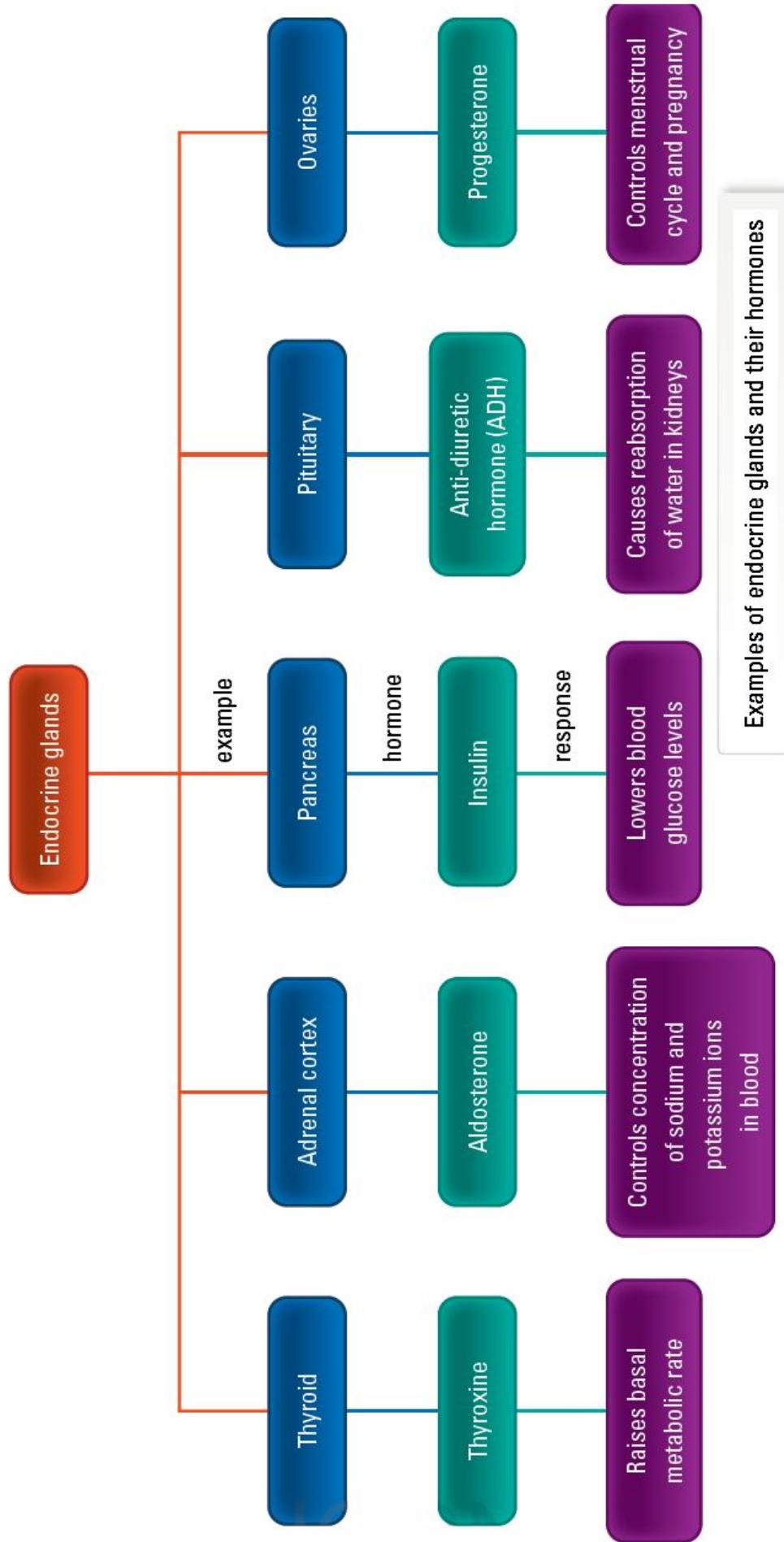
The pineal gland:

- It is located near the centre of the brain, dorsal to the diencephalon.
- It produces the hormone melatonin.
 - Melatonin affects reproductive development, modulation of wake and sleep patterns, and seasonal functions.

The thymus gland:

- It is located in front of the heart, in the upper part of the sternum.
- It produces the hormone thymosine.
- It helps in the maturation of T-lymphocytes.





INTEXT QUESTIONS PAGE NO. 125

Question 1: How does chemical coordination take place in animals?

Answer : Chemical coordination takes place in animals with the help of hormones. Hormone is the chemical messenger that regulates the physiological processes in living organisms. It is secreted by glands. The regulation of physiological processes, and control and coordination by hormones comes under the endocrine system. The nervous system along with the endocrine system in our body controls and coordinates the physiological processes.

Question 2: Why is the use of iodised salt advisable?

Answer : Iodine stimulates the thyroid gland to produce thyroxin hormone. It regulates carbohydrate, fat, and protein metabolism in our body. Deficiency of this hormone results in the enlargement of the thyroid gland. This can lead to goitre, a disease characterized by swollen neck. Therefore, iodised salt is advised for normal functioning of the thyroid gland.

Question 3: How does our body respond when adrenaline is secreted into the blood?

Answer : Adrenalin is a hormone secreted by the adrenal glands in case of any danger or emergency or any kinds of stress. It is secreted directly into the blood and is transported to different parts of the body.

When secreted in large amounts, it speeds up the heartbeat and hence supplies more oxygen to the muscles. The breathing rate also increases due to contractions of diaphragm and rib muscles. It also increases the blood pressure. All these responses enable the body to deal with any stress or emergency.

Question 4: Why are some patients of diabetes treated by giving injections of insulin?

Answer : Diabetes is a disease in which the level of sugar in the blood is too high. Insulin, a hormone secreted by the pancreas, helps in regulating the blood sugar levels. This is the reason why diabetic patients are treated by giving injections of insulin.

EXERCISE QUESTIONS PAGE NO. 125, 126

Question 1: Which of the following is a plant hormone?

- (a) Insulin
- (b) Thyroxin
- (c) Oestrogen
- (d) Cytokinin

Answer : (d) Cytokinin is a plant hormone.

Question 2: The gap between two neurons is called a

- (a) dendrite.
- (b) synapse.
- (c) axon.
- (d) impulse.

Answer : (b) The gap between two neurons is called a synapse.

Question 3: The brain is responsible for

- (a) thinking.
- (b) regulating the heart beat.
- (c) balancing the body.
- (d) all of the above.

Answer : (d) The brain is responsible for thinking, regulating the heart beat and balancing the body.

Question 4: What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

Answer : Receptors are sensory structures (organs/tissues or cells) present all over the body. The receptors are either grouped in case of eye or ear, or scattered in case of skin.

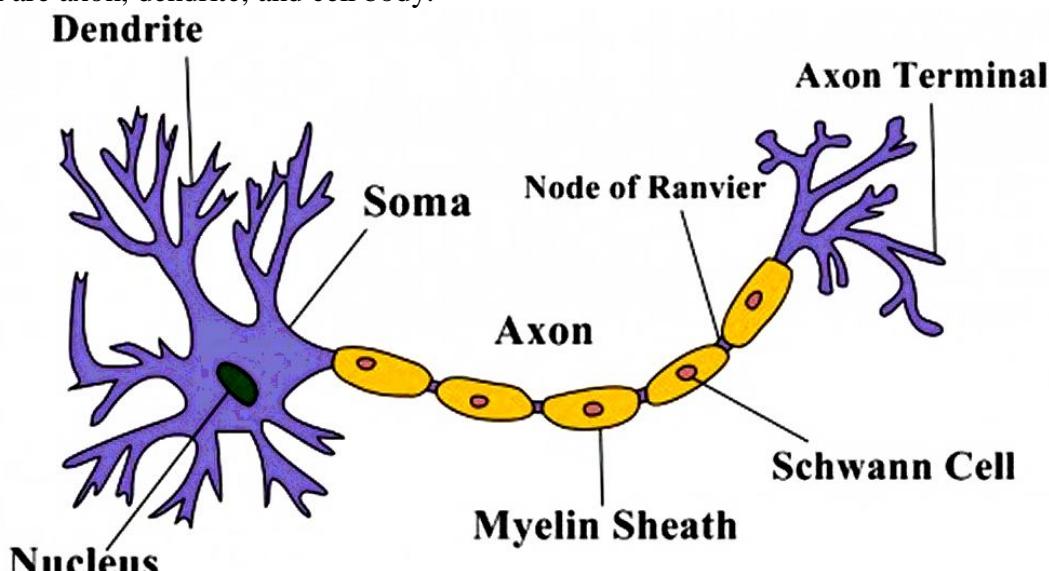
Functions of receptors:

- (i) They sense the external stimuli such as heat or pain.
- (ii) They also trigger an impulse in the sensory neuron which sends message to the spinal cord.

When the receptors are damaged, the external stimuli transferring signals to the brain are not felt. For example, in the case of damaged receptors, if we accidentally touch any hot object, then our hands might get burnt as damaged receptors cannot perceive the external stimuli of heat and pain.

Question 5: Draw the structure of a neuron and explain its function.

Answer : Neurons are the functional units of the nervous system. The three main parts of a neuron are axon, dendrite, and cell body.



Functions of the three parts of a neuron:

Axon: It conducts messages away from the cell body.

Dendrite: It receives information from axon of another cell and conducts the messages towards the cell body.

Cell body: It contains nucleus, mitochondria, and other organelles. It is mainly concerned with the maintenance and growth.

Question 6: How does phototropism occur in plants?

Answer : The growth movement in plants in response to light stimulus is known as phototropism. The shoots show positive phototropism and the roots show negative phototropism. This means that the shoots bend towards the source of light whereas the roots bend away from the light source.

Some examples of phototropism are as follows:

- (a) The flower head of sunflower is positively phototropic and hence it moves from east to west along with the sun.
- (b) The ovary stalk of groundnut is positively phototropic before fertilization and becomes negatively phototropic after fertilization, so that the fruit is formed underground.

Question 7: Which signals will get disrupted in case of a spinal cord injury?

Answer : The reflex arc connections between the input and output nerves meet in a bundle in the spinal cord. In fact, nerves from all over the body meet in a bundle in the spinal cord on their way to the brain. In case of any injury to the spinal cord, the signals coming from the nerves as well as the signals coming to the receptors will be disrupted.

Question 8: How does chemical coordination occur in plants?

Answer : In animals, control and coordination occur with the help of nervous system. However, plants do not have a nervous system.

Plants respond to stimuli by showing movements. The growth, development, and responses to the environment in plants is controlled and coordinated by a special class of chemical substances known as hormones. These hormones are produced in one part of the plant body and are translocated to other needy parts. For example, a hormone produced in roots is translocated to other parts when required. The five major types of phytohormone are auxins, gibberellins, cytokinins, abscisic acid, and ethylene. These phytohormones are either growth promoters (such as auxins, gibberellins, cytokinins, and ethylene) or growth inhibitors such as abscisic acid.

Question 9: What is the need for a system of control and coordination in an organism?

Answer : The maintenance of the body functions in response to changes in the body by working together of various integrated body systems is known as coordination. All the movements that occur in response to stimuli are carefully coordinated and controlled. In animals, the control and coordination movements are provided by nervous and muscular systems. The nervous system sends messages to and away from the brain. The spinal cord plays an important role in the relay of messages. In the absence of this system of control and coordination, our body will not be able to function properly. For example, when we accidentally touch a hot utensil, we immediately withdraw our hand. In the absence of nerve transmission, we will not withdraw our hand and may get burnt.

Question 10: How are involuntary actions and reflex actions different from each other?

Answer : Involuntary actions cannot be consciously controlled. For example, we cannot consciously control the movement of food in the alimentary canal. These actions are however directly under the control of the brain. On the other hand, the reflex actions such as closing of eyes immediately when bright light is focused show sudden response and do not involve any thinking. This means that unlike involuntary actions, the reflex actions are not under the control of brain.

Question 11: Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.

Answer :

Nervous system mechanism	Hormonal system mechanism
1. The information is conveyed in the form of electric impulse.	1. The information is conveyed in the form of chemical messengers.
2. The axons and dendrites transmit the information through a coordinated effort.	2. The information is transmitted or transported through blood.
3. The flow of information is rapid and the response is quick.	3. The information travels slowly and the response is slow.
4. Its effects are short lived.	4. It has prolonged effects.

Question 12: What is the difference between the manner in which movement takes place in a sensitive plant and the movement in our legs?

Answer :

Movement in sensitive plants	Movement in our legs
1. The movement that takes place in a sensitive plant such as Mimosa pudica occurs in response to touch (stimulus).	1. Movement in our legs is an example of voluntary actions.
2. For this movement, the information is transmitted from cell to cell by electro-chemical signals as plants do not have any specialised tissue for conduction of impulses.	2. The signal or messages for these actions are passed to the brain and hence are consciously controlled.
3. For this movement to occur, the plant cells change shape by changing the amount of water in them.	3. In animal muscle cells, some proteins are found which allow the movement to occur.

ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 7
CONTROL AND COORDINATION

- 1.** What is a neuron?
- 2.** Name any two types of tropism.
- 3.** What is a phytohormone? Name any two phytohormones.
- 4.** Mention the receptors for light and sound in animals.
- 5.** How does control and coordination takes place in plants?
- 6.** Mention the names of various phytohormones.
- 7.** Discuss phototropism.
- 8.** Differentiate between tropic and nastic movements.
- 9.** Draw the diagram of a neuron.
- 10.** Draw a neat diagram of the nervous system in an insect.
- 11.** Describe the central nervous system in human beings.
- 12.** Write the functions of any one part of the hind – brain.
- 13.** What is the autonomic nervous system?
- 14.** Define reflex action with suitable examples.
- 15.** Name the hormones secreted by thyroid, parathyroid and pancreas. Reaction of stimuli is a characteristic property of living organisms. Explain
- 16.** It usually takes lot of time to observe the effect of a stimulus on plants. Explain
- 17.** Why is control and coordination system necessary in organisms?
- 18.** What is homeostasis?
- 19.** Give examples of some of the movements shown by plants.
- 20.** What are growth regulators?
- 21.** What are the stages of growth in plants?
- 22.** Name the different phytohormones.
- 23.** What are auxins?
- 24.** Give four major functions of auxins.

- 25.** What are gibberellins and where are they synthesised?
- 26.** What is the most important commercial application of gibberellins?
- 27.** What are exocrine and endocrine glands?
- 28.** What are hormones?
- 29.** What are the characteristics of hormones?
- 30.** Name the various endocrine glands.
- 31.** What is TSH? Where is it produced?
- 32.** Which gland has both exocrine and endocrine parts?
- 33.** Name the different regions of the brain and their parts.
- 34.** What is cerebrum? What are its functions?
- 35.** What is the importance of hypothalamus?
- 36.** What are the functions of mid brain?
- 37.** What is cerebellum? Where is it present? What are its functions?
- 38.** What is the importance of medulla oblongata?
- 39.** What are the functions of spinal cord?
- 40.** What is a reflex?
- 41.** What are the two main types of reflexes? Give one example for each.
- 42.** What is a synapse?
- 43.** What are nerve fibres?
- 44.** What are nodes of Ranvier?
- 45.** What are the three types of nerves?
- 46.** What are receptors?
- 47.** What are effectors?
- 48.** What is meningitis?
- 49.** What are the three divisions of the human nervous system?
- 50.** What is the central nervous system composed of?
- 51.** How are organs of the central nervous system protected?

- 52.** Difference between dormancy and breaking of dormancy
- 53.** Write Four major types of plant hormones and their functions
- 54.** How does tropism helps in movement?
- 55.** Why does the stem of a plant bend to one direction?
- 56.** Explain the bending of plant root away from light by the action of auxin hormones
- 57.** Give an example of chemotropism? With the help of diagram
- 58.** Roots can grow against the law of gravity. When does this happen?
- 59.** Definition and Function of thigmotropism
- 60.** Why do followers open their petals in morning and close them in evening
- 61.** Name the Scientific terms for Bending of shoot towards sunlight
- 62.** Name the Scientific terms for Growing of root towards the earth
- 63.** Name the Scientific terms for Growth of a pollen tube towards ovule
- 64.** Name the Scientific terms for Bending of root towards water
- 65.** Name the Scientific terms for Winding of tendril around a support
- 66.** What is Receptor and write its role
- 67.** Explain the Function of Human nervous system
- 68.** Explain the function of electrical impulses
- 69.** Draw the diagram of neuron and explain its function
- 70.** How are messages transferred from one neuron to another?
- 71.** Name the Gap between two neurons
- 72.** Explain the types of peripheral nervous systemIn a reflex action, we are unaware that anything is going to happen to us. Explain
- 73.** Explain the Diagram of reflex arc with its details
- 74.** How effectors cause action
- 75.** What is Self governing nervous system and write its function
- 76.** What is the Functions of central nervous system?
- 77.** Brain is the highest coordinating centre in the body. Explain

- 78.** Explain the Function of different part of brain.
- 79.** How is all the voluntary action of body coordinated by cerebrum?
- 80.** What is Animal hormones and write its functions
- 81.** Hormones are kind of chemical messengers. Explain
- 82.** Name all glands in our body having both exocrine and endocrine functions?
- 83.** What is hormonal system? Position of endocrine glands in human body.
- 84.** Explain the Functions of all glands in our body
- 85.** What are the two main centers for the coordination of two systems?
- 86.** What all can happens if the pituitary glands do not function properly
- 87.** How hormones help in coordinated growth?
- 88.** Write the Sense organs of our body
- 89.** Is walking different from reflex action
- 90.** What do you understand by CNS? Explain
- 91.** Draw Flow chart to show the classification of nervous system into various parts
- 92.** What is synapse? What happens at the synapse between two neurons? How are the messages carried?
- 93.** Who detects smell and taste in our body?
- 94.** Why does the food taste different when you nose is blocked?
- 95.** Explain Insulin and diabetes.
- 96.** Draw and mark Location of all glands in the human body
- 97.** Write the Function of thyroxin hormone
- 98.** Name one hormone found in male
- 99.** Write the Function of hypothalamus, pituitary gland and cerebrum
- 100.** Explain the Main thinking part of brain
- 101.** Explain the Parts covered under hind brain
- 102.** Name the part which control blood pressure, salivation and vomiting control
- 103.** What do you understand by the term reflex arc
- 104.** Write the Function of gustatory receptor
- 105.** Write an assay on reflex action
-

ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 7
CONTROL AND COORDINATION

1. Drastic changes of body features associated with puberty are mainly because of secretion of
 - a. Estrogen from testes and testosterone from ovary
 - b. Estrogen from adrenal gland and testosterone from pituitary gland
 - c. Testosterone from testes and estrogen from ovary
 - d. Testosterone from thyroid gland and estrogen from pituitary gland
2. Learning is related to
 - a. Hypothalamus
 - b. Thalamus
 - c. Cerebrum
 - d. Cerebellum
3. Which of the following statements about transmission of nerve impulse is incorrect?
 - a. Nerve impulse travels from dendritic end towards axonal end
 - b. At the dendritic end electrical impulses bring about the release of some chemicals which generate an electrical impulse at the axonal end of another neuron
 - c. The chemicals released from the axonal end of one neuron cross the synapse and generate a similar electrical impulse in a dendrite of another neuron
 - d. A neuron transmits electrical impulses not only to another neuron but also to muscle and gland cells
4. Which of the following organs is not controlled by autonomous nervous system ?
 - a. Heart
 - b. Uterus
 - c. Glands
 - d. Eyes
5. The substance that triggers the fall of mature leaves and fruits from plants is due to
 - a. Auxin
 - b. Gibberellins
 - c. Abscissic acid
 - d. Cytokinin
6. The typical neuronal resting membrane potential measures between
 - a. 40 mv to – 80 mv
 - b. 30 mv to – 80 mv
 - c. 40 mv to – 90 mv
 - d. 40 mv to – 70 mv
7. The growth of tendrils in pea plants is due to
 - a. Effect of light
 - b. Effect of gravity
 - c. Rapid cell divisions in tendril cells that are away from the support
 - d. Rapid cell divisions in tendril cells in contact with the support
8. In reflex action, the reflex arc is formed by
 - a. Muscles - receptor – brain
 - b. Muscles - effector – brain

- c. Receptor - spinal cord – muscles
- d. Spinal cord - receptor – muscles

- 9.** Which of the following statements are true about brain?
- i. The main thinking part of brain is hind brain
 - ii. Centers of hearing, smell, memory, sight etc. are located in fore brain
 - iii. Involuntary actions like salivation, vomiting, blood pressure are controlled by the medulla in the hind brain
 - iv. Cerebellum does not control posture and balance of the body
- a. (i) and (ii)
 - b. (i), (ii) and (iii)
 - c. (ii) and (iii)
 - d. (iii) and (iv)
- 10.** Which of the following statements is correct about receptors?
- a. Gustatory receptors detect taste while olfactory receptors detect smell
 - b. Both gustatory and olfactory receptors detect smell
 - c. Auditory receptors detect smell and olfactory receptors detect taste
 - d. Olfactory receptors detect taste and gustatory receptors smell
- 11.** Which two organs are connected by pons with the help of transverse band of nerves?
- a. Nerves of brain and spinal cord
 - b. Both the cerebral hemispheres
 - c. Cerebellum and central nervous system
 - d. Sympathetic and parasympathetic
- 12.** Electrical impulse travels in neuron from:
- a. Dendrite→axon→axon end→cell body
 - b. Cell body→Dendrite→axon→axon end
 - c. Dendrite→cell body→axon→axon end
 - d. Axon end→axon→cell body→Dendrite
- 13.** The plant hormone which is essential for cell division is
- (a) Ethylene
 - (b) Auxin
 - (c) Gibberellin
 - (d) Cytokinin
- 14.** The activities of the internal organs are controlled by the
- (a) Central Nervous System
 - (b) Peripheral Nervous System
 - (c) Autonomic Nervous System
 - (d) None of these
- 15.** The seat of intelligence and voluntary action in the brain is
- (a) Diencephalon
 - (b) Cerebrum
 - (c) Cerebellum
 - (d) Medulla Oblongata
- 16.** The gap between two neurons is known as ____.
- (a) synapse
 - (b) synopsis

- (c) impulse
- (d) synaptic node

17. Which of the following is a plant hormone?

- (a) Thyroxin
- (b) Cytokinin
- (c) Insulin
- (d) Oestrogen

18. Tropic movements are

- (a) in response to light
- (b) in response to gravity
- (c) uni-directional
- (d) non-directional

19. Artificial ripening of fruit is carried out by

- (a) Auxins
- (b) Ethylene
- (c) Abscisic acid (ABA)
- (d) Gibberellins

20. Part of brain that controls respiration, heartbeat and peristalsis is ____.

- (a) Cerebrum
- (b) Cerebellum
- (c) Pons
- (d) Medulla

21. The brain is responsible for

- (a) thinking.
- (b) regulating the heart beat.
- (c) balancing the body.
- (d) all of the above.

22. Which of the following hormone is released by thyroid?

- (a) Insulin
- (b) Thyroxin
- (c) Trypsin
- (d) Pepsin

23. Which body organ is surrounded by meninges?

- (a) Heart and Lungs
- (b) Brain & Heart
- (c) Brain and Spinal Cord
- (d) Spinal Cord and Lungs

24. Part of brain that controls muscular co-ordination is ____.

- (a) Cerebrum
- (b) Cerebellum
- (c) Pons
- (d) Medulla

25. Growth of the stem is controlled by

- (a) gibberellin

- (b) auxin
- (c) abscisic acid
- (d) cytokinin

26. Wilting of leaves is caused by which hormone?

- (a) gibberellin
- (b) auxin
- (c) abscisic acid
- (d) cytokinin

27. Which of the following hormones contains iodine?

- (a) adrenaline
- (b) testosterone
- (c) thyroxine
- (d) insulin

28. Which part of brain controls the posture and balance of the body?

- (a) Cerebrum
- (b) Cerebellum
- (c) Pons
- (d) Medulla

29. Fill in the blanks.

- (a) _____ is the structural and functional unit of the nervous system.
- (b) An automatic response to a stimulus which is not controlled by the brain is called _____.
- (c) Chemical messengers which control and coordinate in plants and animals are called _____.
- (d) The movement of a plant part in the direction of light is called _____.
- (e) _____ is the movement of plant part in response to the availability of water.
- (f) _____ is the movement of plant part in response to the pull of earth's gravity
- (g) The movement of plant part in response to certain chemicals is called _____.
- (h) _____ is the reflex centre of the brain.
- (i) _____ is a structure associated with both nervous system and endocrine system.

30. List the functions of testosterone and estrogen.

31. Write name of three hormones secreted by the pituitary gland.

32. Nervous and hormonal system together perform the function of control and coordination in human beings. Justify the statement.

33. What is hydrotropism?

34. What is coordination?

- 35.** Why is the response of a plant to a stimulus not observed immediately?
- 36.** What are hormones?
- 37.** What are phytohormones?
- 38.** What are meanings? What are their functions? Name the fluid, which is filled in between meanings.
- 39.** How does control and coordination occur in single-celled animals?
- 40.** Name any two phytohormones, which are growth promoters.
- 41.** Name any growth inhibiting phytohormone.
- 42.** What makes a stem bend towards sunlight?
- 43.** What is the difference between a reflex action and walking?
- 44.** Why is a system of control and coordination essential in living organisms?
- 45.** What happens at the synapse between two neurons?
- 46.** Which part of the brain maintains posture and equilibrium of the body?
- 47.** How do we detect the smell of an agarbatti (incense stick)?
- 48.** List the functions performed by Cerebrum.
- 49.** Which is the largest and most prominent part of the brain?
- 50.** What are the functions of cerebellum?
- 51.** How brain is protected inside a human body?
- 52.** What is the role of the brain in reflex action?
- 53.** What do you mean by reflex action? Give examples of reflex actions?
- 54.** What are the different types of reflexes?
- 55.** What is reflex arc?
- 56.** What are plant hormones?
- 57.** Who coined the term phytohormones?
- 58.** How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?
- 59.** Write differences between nastic and tropic movements

- 60.** What will happen when plant is exposed to unidirectional light?
- 61.** What is chemotropism?
- 62.** Give examples of geotropism.
- 63.** Why do mammals like humans need an endocrinal system?
- 64.** What are the limitations of nervous system in human body? How it is overcome?
- 65.** How does chemical coordination take place in animals?
- 66.** Who coined the term hormone?
- 67.** What will happen if intake of iodine in our diet is low?
- 68.** Why is the use of iodised salt advised?
- 69.** Name the hormone secreted by an endocrine gland during emergency? Name the gland which secretes this hormone.
- 70.** How does adrenaline affects heart during emergency?
- 71.** How does our body respond when adrenaline is secreted into the blood?
- 72.** Which hormone is injected to a diabetic patient and why?
- 73.** Why are some patients of diabetes treated by giving injections of insulin?
- 74.** How does our body maintain blood sugar level?
- 75.** Where adrenal glands are located?
- 76.** What is hyperglycemia?
- 77.** Where thyroid gland is located?
- 78.** Which endocrine gland is called master gland? Why?
- 79.** Why is pancreas a dual gland?
- 80.** Who introduced the term Hormones?
- 81.** In Plants:
- Name the two substances which are responsible for the control and coordination in plants.
 - What is the function of Gibberellins, Ethene and Auxins?
 - What are Phytohormones? Name any two.
 - What is the difference between photoperiodism and phototropism?
 - What are nastic movements? Give one example.

f). What are the different Hormones found in Plants and their functions?

82. In Animals:

- a). Draw a diagram of nervous system of an insect. Label the following parts: Brain, Ganglion, and Nerve Chord.
 - b). Which is the structural and functional unit of nervous system? Describe with the help of a diagram.
 - c). “Nervous and the hormonal system together perform the function of the control and coordination in the humans”. Justify.
- i). **Nervous system:**
- 1). What are the different types of nervous systems found in human body? Mention the functions of each.
 - 2). Write the effects of sympathetic and parasympathetic nervous system on the following: a. Heart b. Blood Vessels c. Bronchi d. Eyes e. Gastric Bladder
 - 3). Draw the schematic diagram of reflex arc. Define reflex action with suitable example.
 - 4). If the parasympathetic nervous system causes constriction of pupil what will be the effect of sympathetic nervous system.
- ii). **Brain:**
- 1). Draw the labeled structure of human brain.
 - 2). What are the four main parts of the fore brain? Give the function of each part.
 - 3). What are the three parts of the mid brain and their functions?
 - 4). Which part of the human brain is responsible for: Intelligence and Memory, Adjustment movement and Posture, Smell?
 - 5). Give the role of Frontal lobe, temporal lobe and medulla oblongata.
 - 6). Name the different lobes found in the fore brain and give their functions.
 - 7). What is EEG? What is the use of an EEG? Which radiation do they measure?
- iii). **Endocrine Glands:**
- iv). **Draw the diagram showing endocrine glands in a male body/female body and label: Pituitary, Thyroid, Adrenal, Testis/ovaries, Thalamus, and Hypothalamus.**
- v). **Name the hormone associated with a) Reduction of blood glucose in the body
b) Overall metabolism of the body.**
- vi). **Write the function of testes, ovaries and epididymis**

- 83.** Mayank's father never bothered to check the brand/contents of the salt he had purchased from the market. Mayank noticed that her sister had developed swollen neck. The doctor advised her to eat Iodised Salt.
- Name the disease from which Mayank's sister suffered.
 - Why the doctor has advised her to eat Iodised Salt?
- 84.** Injections are given to the cattle for the production of milk.
- Do you think it is a right practice.
 - What harm is this practice causing us?
- 85.** Often the road accidents victims faced really a tough time due to the shortage of blood in the hospital.
- Give suggestion to avoid shortage of blood in the blood bank.
- 86.** A person is taking the insulin injection everyday.
- Name the disease he is suffering from.
 - How does healthy life style help this patient to control this disease?
- 87.** Most of students suffer from exam stress and anxiety during exam days.
- Suggest three good habits which students should adopt to tackle this problem.
- 88.** Generally some of teenagers readily come under bad influences under peer group pressure.
- Why does teenagers readily come under this influence.
 - Suggest methods to overcome such problems.
- 89.** Differentiate between (i)tropic and nastic movements. (ii)axon and dendrites (iii)cerebrum and cerebellum.
- 90.** How does the nervous tissue cause action?
- 91.** What are PHYTOHORMONES?give examples
- 92.** Which organ secretes hormone when the blood sugar rises? Name a digestive enzyme released by this organ.
- 93.** What will happen when plant is exposed to unidirectional light?
- 94.** A particular hormone requires iodine for its synthesis. Name the endocrine gland which secretes this hormone and state its location in human body.
- 95.** How are our brain and spinal cord protected?
- 96.** Identify the glands and mention hormones produced-----
- Gland which prepares our body to function at maximum efficiency during anger or danger.
 - gland that helps in growth of bones and muscles.
 - gland that helps in growth of secondary sexual characters in males.
- 97.** Mention some secondary sexual characters seen in both girls and boys during puberty.
- 98.** Give reasons:
- Why we must take iodised salt?
 - Why the touch-me-not(*Mimosa pudica*)plant leaves droop when touched?

- 99.** Name two systems which together perform function of control and coordination in human being.
- 100.** What is reflex arc?
- 101.** What are the characteristics of animal hormones?
- 102.** Write the mechanism of adrenaline hormone?
- 103.** Why adrenaline is called emergency hormone?
- 104.** What is synapse?
- 105.** What regulates the timing and amount of release of hormones?
- 106.** What is the role of Medulla?
- 107.** What is the function of cerebellum?
- 108.** What is the function of fore brain?
-

ASSIGNMENT QUESTIONS SET – 3
CHAPTER – 7
CONTROL AND COORDINATION

1. The substance that accelerates the growth in the stem is _____.
 1. auxin
 2. cytokinin
 3. enzyme
 4. vitamin

2. The cells in our body that can be over a foot long are _____.
 1. muscle cells
 2. nerve cells
 3. bone cells
 4. blood cells

3. Learning is related to _____.
 1. hypothalamus
 2. thalamus
 3. cerebrum
 4. cerebellum

4. Male hormone is _____.
 1. Oestrogen
 2. progesterone
 3. adrenaline
 4. testosterone

5. Endocrine glands are those which pour their secretions into _____.
 1. Blood
 2. Ducts
 3. sinuses
 4. any of the above

6. In reflex action, the reflex arc is formed by _____.
 1. muscles - receptor - brain
 2. muscles - effector - brain
 3. receptor - spinal cord - muscles
 4. spinal cord - receptor - muscles

7. Auxins are _____.
 1. Vitamins

- 2. Enzymes
 - 3. Proteins
 - 4. Hormones
- 8.** The cerebellum is concerned with _____.
- 1. Conditioning
 - 2. Memory
 - 3. coordination and precision
 - 4. Intelligence
- 9.** The endocrine gland also known as 'master gland' is _____.
- 1. hypothalamus
 - 2. pituitary
 - 3. pancreas
 - 4. adrenal
- 10.** Which of the following acts as both endocrine and exocrine glands?
- 1. pituitary
 - 2. adrenal
 - 3. pancreas
 - 4. ovaries
- 11.** Cerebral hemispheres are centres of _____.
- 1. balance
 - 2. smell
 - 3. taste
 - 4. thinking
- 12.** Adrenaline increases _____.
- 1. heart rate
 - 2. blood pressure
 - 3. amount of glucose in blood
 - 4. all the above
- 13.** Junction of two neurons is called _____.
- 1. synapse
 - 2. end plate
 - 3. axon
 - 4. dendrite
- 14.** Gibberellins were discovered from _____.
- 1. bacteria

2. fungi
3. algae
4. mosses

15. Growth hormone is produced in _____.

1. hypothalamus
2. pituitary
3. pancreas
4. thyroid

16. The hormone secreted by the alpha cells of islets of Langerhans is _____.

1. glucagon
2. insulin
3. adrenaline
4. thymosin

17. An involuntary response to a stimulus is known as _____.

1. jerking
2. reflex
3. conditioning
4. answer

18. The CNS consists of _____.

1. Brain
2. spinal cord
3. Brain and spinal cord
4. Brain, spinal cord and all the nerves

19. An example of a sex hormone is _____.

1. testosterone
2. Insulin
3. Thyroxin
4. thymosin

20. Cerebrum is present in the _____.

1. fore brain
2. mid brain
3. hind brain
4. partly in a and b each

21. Cerebellum is situated in _____.

1. fore brain

2. mid brain
3. hind brain
4. partly in a and b each

22. Medulla oblongata is situated in _____.

1. fore brain
2. mid brain
3. hind brain
4. partly in b and c each

23. The grey matter consists of _____.

1. nerve cells
2. nerve cell bodies
3. nerve cell bodies and dendrites
4. nerve cell bodies, dendrites and axons

24. There are _____ pairs of cranial nerves.

1. 21
2. 31
3. 41
4. 12

25. There are _____ pairs of spinal nerves.

1. 12
2. 31
3. 21
4. 8

26. The hormone that is used to keep flowers fresh is _____.

1. auxin
2. gibberellic acid
3. cytokinin
4. Ethylene

27. The hormone that speeds up the ripening process is _____.

1. auxin
2. gibberelin
3. cytokinin
4. ethylene

28. A spinal nerve is a _____ nerve.

1. sensory

2. motor
3. mixed
4. long

29. Ganglion is made up of _____.

1. dendrites
2. axons
3. cytons
4. neurons

30. The preganglionic fibres and the postganglionic fibres are a part of _____.

1. central nervous system
2. peripheral nervous system
3. autonomous nervous system
4. endocrine system

31. Afferent nerves are also called the _____.

1. motor nerves
2. sensory nerves
3. mixed nerves
4. association nerves

32. Efferent nerves are also called as _____.

1. motor nerves
2. sensory nerves
3. mixed nerves
4. association nerves

33. Ganglia are present in _____.

1. the dorsal root of spinal cord
2. the ventral root of spinal cord
3. both a and b
4. neither a nor b

34. The hormone that causes blood sugar level to fall is _____.

1. glucagon
2. insulin
3. somatostatin
4. adrenalin

35. Hormone produced by the ovarian follicle is _____ and in addition _____ is produced by the corpus luteum.

1. oestrogen, progesterone

2. progesterone, oestrogen
3. oestrogen, thyroxin
4. progesterone, thyroxin

36. The gland that plays a role in 'fight or flight response' is _____.

1. pancreas
2. pituitary
3. adrenal cortex
4. adrenal medulla

37. The unit of the nervous system is _____.

1. cyton
2. dendron
3. axon
4. neuron

38. The processes that conduct signals towards the nerve cell body are the _____.

1. fibres
2. axons
3. dendrites
4. all the above

39. The nodes of Ranvier are _____.

1. covering of the nerve fibre
2. swelling along the nerve fibre
3. gaps in the cover of the nerve fibre
4. collection of nerves in the heart

40. At the synapses, the impulses are always passed from the _____.

1. axon to the dendrites
2. dendrites to the axon
3. either way is possible
4. cyton to the dendrites

41. The lobes - parietal, temporal, frontal and occipital belong to _____.

1. medulla oblongata
2. cerebrum
3. cerebellum
4. hypothalamus

42. Unconditioned reflex is controlled by the _____.

1. Brain

2. spinal cord
3. both a and b
4. the autonomic nervous system

43. Blinking of eyes is a _____.

1. reflex action
2. Involuntary action
3. voluntary action only
4. can be a or b

44. The outermost covering of the nerve is called the _____.

1. Perineurium
2. Epineurium
3. myelin sheath
4. Capsule

45. The box enclosing the brain is called the _____.

1. Skull
2. Head
3. Cranium
4. vertebral column

46. The kind of nerve carrying impulses from the brain to a gland or a muscle is called _____.

1. affector
2. effector
3. mixed
4. none of the above

47. Which of the following statements is correct about receptors?

- (a) Gustatory receptors detect taste while olfactory receptors detect smell
- (b) Both gustatory and olfactory receptors detect smell
- (c) Auditory receptors detect smell and olfactory receptors detect taste
- (d) Olfactory receptors detect taste and gustatory receptors smell

48. Electrical impulse travels in a neuron from

- (a) Dendrite → axon → axonal end → cell body
- (b) Cell body → dendrite → axon → axonal end
- (c) Dendrite → cell body → axon → axonal end
- (d) Axonal end → axon → cell body → dendrite

49. In a synapse, chemical signal is transmitted from

- (a) dendritic end of one neuron to axonal end of another neuron
- (b) axon to cell body of the same neuron
- (c) cell body to axonal end of the same neuron
- (d) axonal end of one neuron to dendritic end of another neuron

50. In a neuron, conversion of electrical signal to a chemical signal occurs at/in

- (a) cell body
- (b) axonal end
- (c) dendritic end
- (d) axon

51. Which is the correct sequence of the components of a reflex arc?

- (a) Receptors → Muscles → Sensory neuron → Motor neuron → Spinal cord
- (b) Receptors → Motor neuron → Spinal cord → Sensory neuron → Muscle
- (c) Receptors → Spinal cord → Sensory neuron → Motor neuron → Muscle
- (d) Receptors → Sensory neuron → Spinal cord → Motor neuron → Muscle

52. Which of the following statements are true?

- (i) Sudden action in response to something in the environment is called reflex action
 - (ii) Sensory neurons carry signals from spinal cord to muscles
 - (iii) Motor neurons carry signals from receptors to spinal cord
 - (iv) The path through which signals are transmitted from a receptor to a muscle or a gland is called reflex arc
- (a) (i) and (ii) (b) (i) and (iii)
 - (c) (i) and (iv) (d) (i), (ii) and (iii)

53. Which of the following statements are true about the brain?

- (i) The main thinking part of brain is hind brain
 - (ii) Centres of hearing, smell, memory, sight etc are located in fore brain.
 - (iii) Involuntary actions like salivation, vomiting, blood pressure are controlled by the medulla in the hind brain
 - (iv) Cerebellum does not control posture and balance of the body
- (a) (i) and (ii) (b) (i), (ii) and (iii)
 - (c) (ii) and (iii) (d) (iii) and (iv)

54. Posture and balance of the body is controlled by

- (a) cerebrum
- (b) cerebellum
- (c) medulla
- (d) pons

55. Spinal cord originates from

- (a) cerebrum
- (b) medulla
- (c) pons
- (d) cerebellum

56. The movement of shoot towards light is

- (a) geotropism
- (b) hydrotropism
- (c) chemotropism
- (d) phototropism

57. The main function of abscisic acid in plants is to

- (a) increase the length of cells
- (b) promote cell division
- (c) inhibit growth
- (d) promote growth of stem

58. Which of the following is not associated with growth of plant?

- (a) Auxin
- (b) Gibberellins
- (c) Cytokinins
- (d) Abscisic acid

59. Iodine is necessary for the synthesis of which hormone?

- (a) Adrenaline
- (b) Thyroxin
- (c) Auxin
- (d) Insulin

60. Choose the incorrect statement about insulin

- (a) It is produced from pancreas
- (b) It regulates growth and development of the body
- (c) It regulates blood sugar level
- (d) Insufficient secretion of insulin will cause diabetes

61. Select the mis-matched pair

- (a) Adrenaline : Pituitary gland
- (b) Testosterone: Testes
- (c) Estrogen : Ovary
- (d) Thyroxin : Thyroid gland

62. The shape of guard cells changes due to change in the

- (a) protein composition of cells
- (b) temperature of cells
- (c) amount of water in cells
- (d) position of nucleus in the cells

63. The growth of tendril in pea plants is due to

- (a) effect of light
- (b) effect of gravity
- (c) rapid cell divisions in tendrillar cells that are away from the support
- (d) rapid cell divisions in tendrillar cells in contact with the support

64. The growth of pollen tubes towards ovules is due to

- (a) hydrotropism
- (b) chemotropism
- (c) geotropism
- (d) phototropism

65. The movement of sunflower in accordance with the path of sun is due to

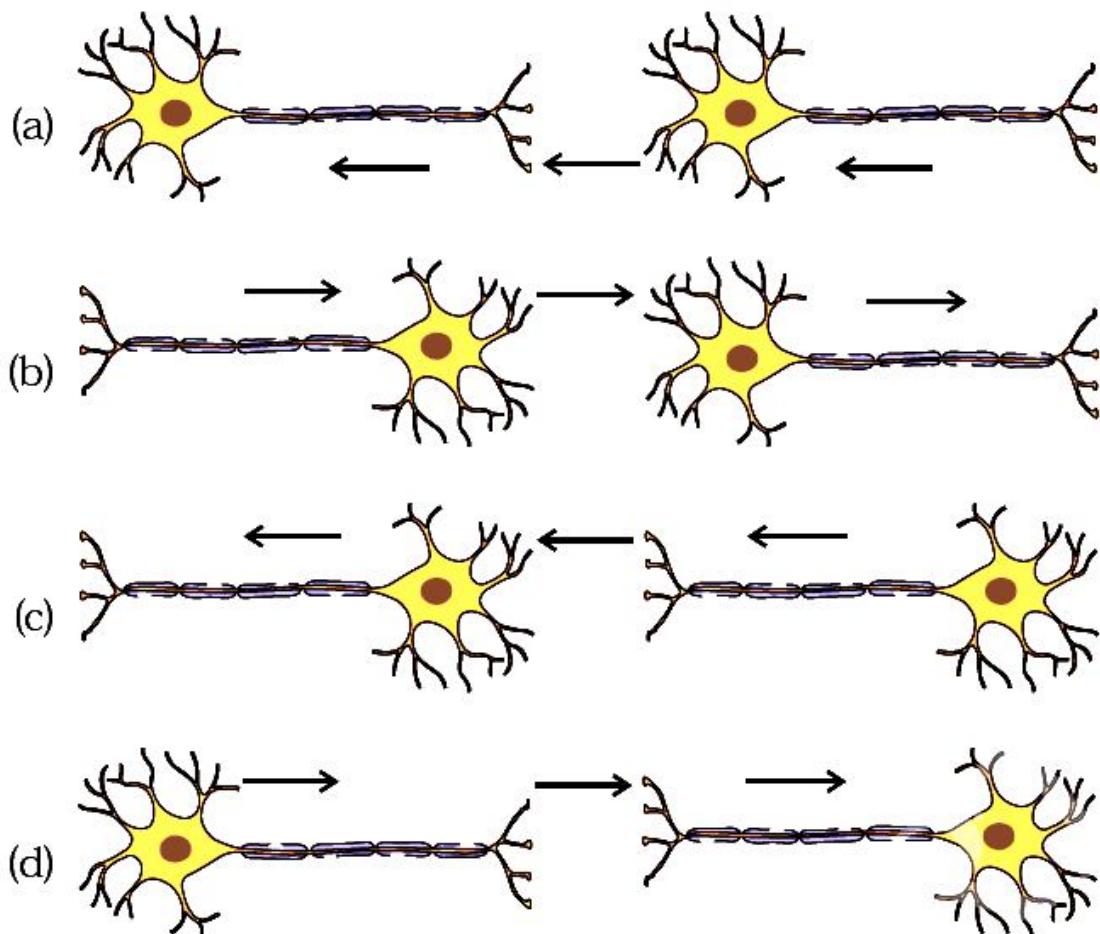
- (a) phototropism
- (b) geotropism
- (c) chemotropism
- (d) hydrotropism

66. The substance that triggers the fall of mature leaves and fruits from plants is due to

- (a) auxin
- (b) gibberellin
- (c) abscisic acid
- (d) cytokinin

- 67.** Which of the following statements about transmission of nerve impulse is incorrect?
- (a) Nerve impulse travels from dendritic end towards axonal end
 - (b) At the dendritic end electrical impulses bring about the release of some chemicals which generate an electrical impulse at the axonal end of another neuron
 - (c) The chemicals released from the axonal end of one neuron cross the synapse and generate a similar electrical impulse in a dendrite of another neuron
 - (d) A neuron transmits electrical impulses not only to another neuron but also to muscle and gland cells
- 68.** Involuntary actions in the body are controlled by
- (a) medulla in fore brain
 - (b) medulla in mid brain
 - (c) medulla in hind brain
 - (d) medulla in spinal cord
- 69.** Which of the following is not an involuntary action?
- (a) Vomiting
 - (b) Salivation
 - (c) Heart beat
 - (d) Chewing
- 70.** When a person is suffering from severe cold, he or she cannot
- (a) differentiate the taste of an apple from that of an ice cream
 - (b) differentiate the smell of a perfume from that of an *agarbatti*
 - (c) differentiate red light from green light
 - (d) differentiate a hot object from a cold object
- 71.** Which statement is not true about thyroxin?
- (a) Iron is essential for the synthesis of thyroxin
 - (b) It regulates carbohydrates, protein and fat metabolism in the body
 - (c) Thyroid gland requires iodine to synthesise thyroxin
 - (d) Thyroxin is also called thyroid hormone
- 72.** Dwarfism results due to
- (a) Excess secretion of thyroxin
 - (b) Less secretion of growth hormone
 - (c) Less secretion of adrenaline
 - (d) Excess secretion of growth hormone
- 73.** Dramatic changes of body features associated with puberty are mainly because of secretion of
- (a) oestrogen from testes and testosterone from ovary
 - (b) estrogen from adrenal gland and testosterone from pituitary gland
 - (c) testosterone from testes and estrogen from ovary
 - (d) testosterone from thyroid gland and estrogen from pituitary gland
- 74.** A doctor advised a person to take an injection of insulin because
- (a) his blood pressure was low
 - (b) his heart was beating slowly
 - (c) he was suffering from goitre
 - (d) his sugar level in blood was high

75. What is the correct direction of flow of electrical impulses?



76. The hormone which increases the fertility in males is called

- (a) oestrogen
- (b) testosterone
- (c) insulin
- (d) growth hormone

77. Which of the following endocrine glands is unpaired?

- (a) Adrenal
- (b) Testes
- (c) Pituitary
- (d) Ovary

78. Junction between two neurons is called

- (a) cell junction
- (b) neuro muscular junction
- (c) neural joint
- (d) synapse

79. In humans, the life processes are controlled and regulated by

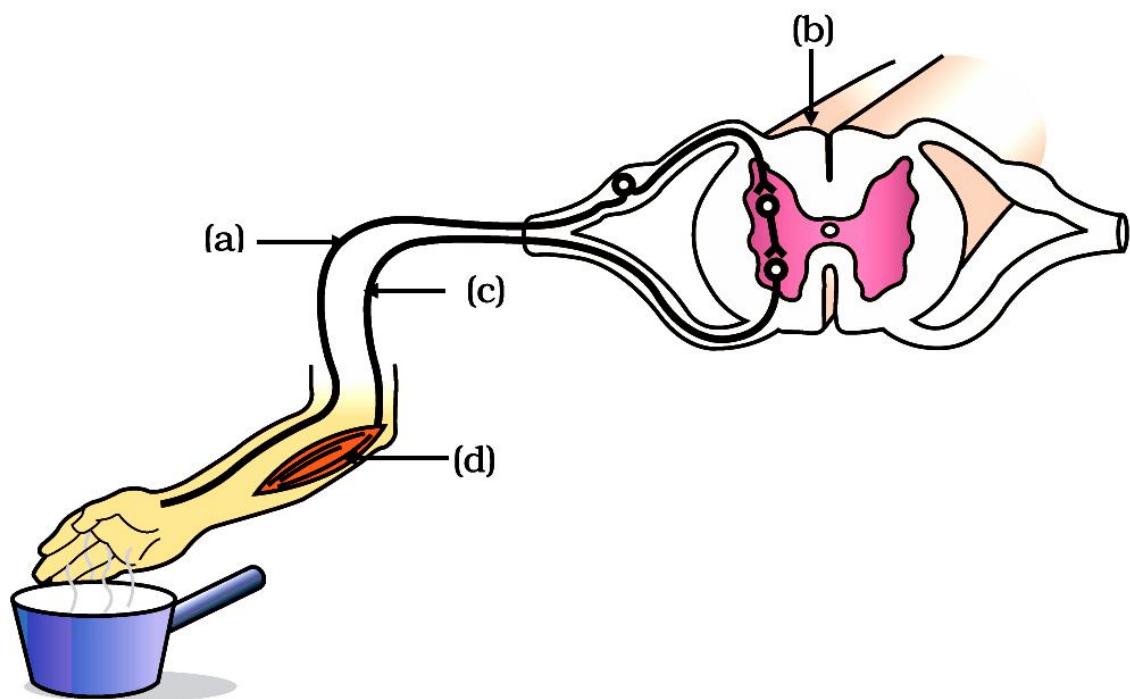
- (a) reproductive and endocrine systems
- (b) respiratory and nervous systems
- (c) endocrine and digestive systems
- (d) nervous and endocrine systems

80. Name the plant hormones responsible for the following

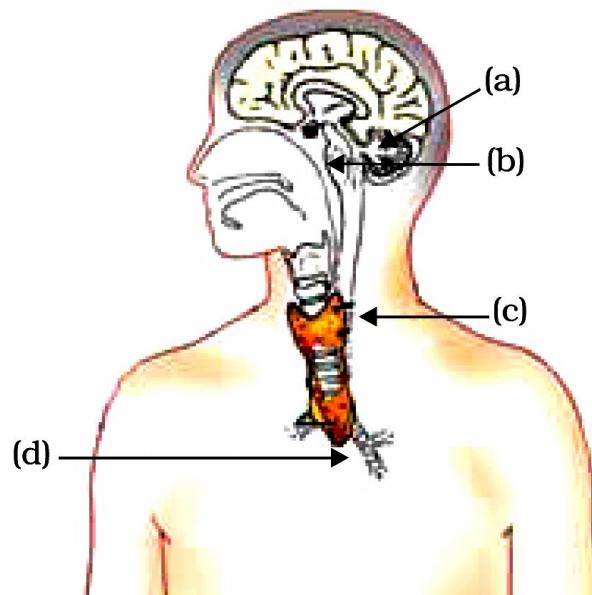
- (a) elongation of cells

- (b) growth of stem
- (c) promotion of cell division
- (d) falling of senescent leaves.

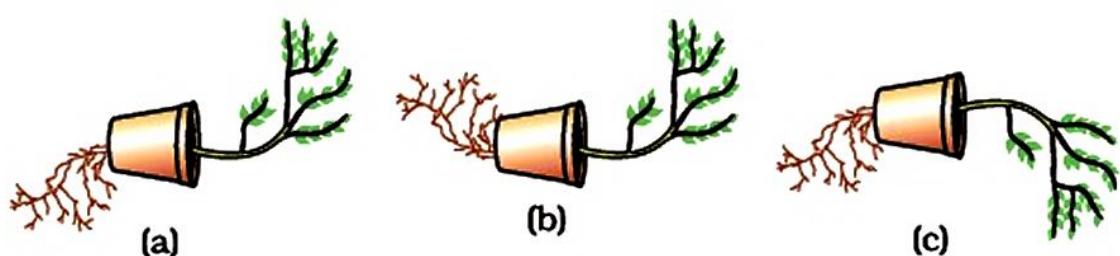
81. Label the parts (a), (b), (c) and (d) and show the direction of flow of electrical signals in below Figure



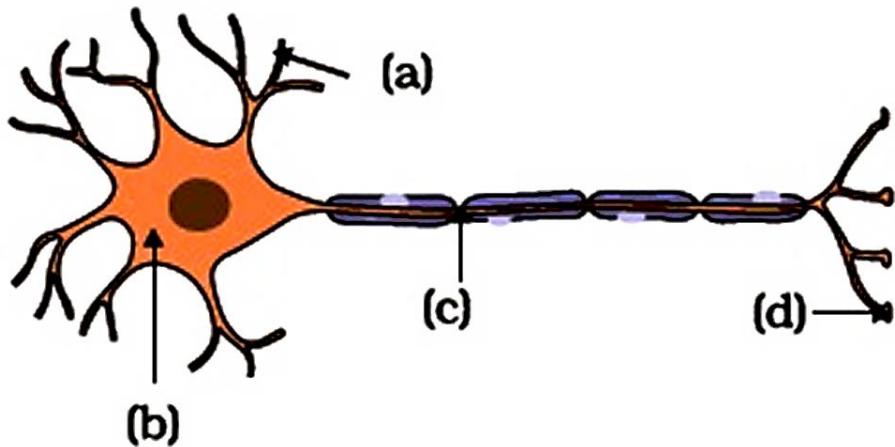
82. Label the endocrine glands in Figure 7.3.



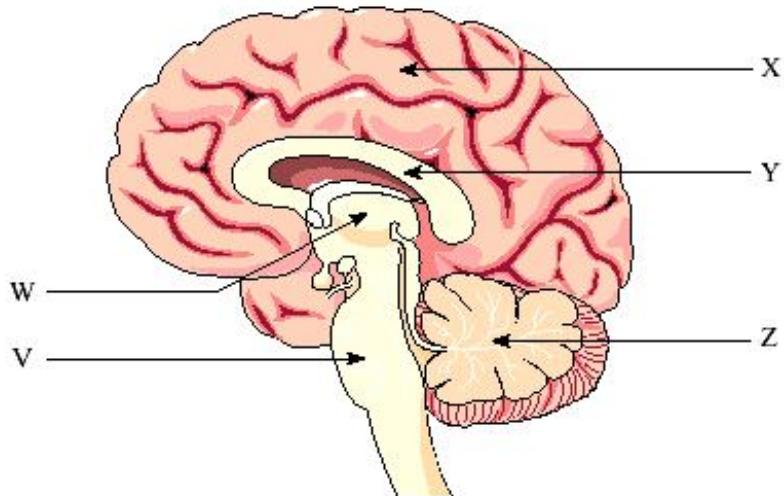
37. In Figure 7.4 (a), (b) and (c), which appears more accurate and why?



83. Label the parts of a neuron in Figure 7.5



84. Label the brain:



85. What is tropic movement? Explain with an example.

86. What will happen if intake of iodine in our diet is low?

87. What happens at the synapse between two neurons?

88. Which hormone is responsible for the changes noticed in females at puberty?

89. Dwarfism results due to deficiency of which hormone?

90. Blood sugar level rises due to deficiency of which hormone?

91. Iodine is necessary for the synthesis of which hormone?

92. Name the endocrine gland associated with brain?

93. Which gland secretes digestive enzymes as well as hormones?

94. Name the endocrine gland associated with kidneys?

95. Which endocrine gland is present in males but not in females?

- 96.** What are the major parts of the brain? Mention the functions of different parts.
- 97.** What constitutes the central and peripheral nervous systems? How are the components of central nervous system protected?
- 98.** Mention one function for each of these hormones :
- (a) Thyroxin
 - (b) Insulin
 - (c) Adrenaline
 - (d) Growth hormone
 - (e) Testosterone.
- 99.** Name various plant hormones. Also give their physiological effects on plant growth and development.
- 100.** What are reflex actions? Give two examples. Explain a reflex arc.
- 101.** “Nervous and hormonal systems together perform the function of control and coordination in human beings.” Justify the statement.
- 102.** How does chemical coordination take place in animals?
- 103.** Why is the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron but not the reverse?
-

CHAPTER – 8

HOW DO ORGANISMS REPRODUCE?

REPRODUCTION

Reproduction is an integral feature of all living beings. The process by which a living being produces its own like is called reproduction.

IMPORTANCE OF REPRODUCTION:

Reproduction is important for each species, because this is the only way for a living being to continue its lineage. Apart from being important for a particular individual, reproduction is also important for the whole ecosystem. Reproduction helps in maintaining a proper balance among various biotic constituents of the ecosystem. Moreover, reproduction also facilitates evolution because variations come through reproduction; over several generations.

TYPES OF REPRODUCTION:

There are two main types, viz. asexual and sexual reproduction.

Asexual Reproduction: When a single parent is involved and no gamete formation takes place; the method is called asexual reproduction. No meiosis happens during asexual reproduction.

Sexual Reproduction: When two parents are involved and gamete formation takes; the method is called sexual reproduction. Meiosis happens during gamete formation; which is an important step of sexual reproduction.

INTEXT QUESTIONS PAGE NO. 128

Q1. What is the importance of DNA copying in reproduction?

Ans:

The importance of DNA copying during reproduction is that:

- (i) It is responsible for the transmission of parental characteristic to its offsprings.
- (ii) It also leads to certain genetic variation.

Q2. Why is variation beneficial to the species but not necessarily for the individual?

Ans:

Variations allow organisms to exist in diverse habitats or niches. In the absence of variations, a species may be restricted to particular area. If this area gets drastically altered, due to various natural or man-made causes, the species may be wiped out. However, if some variations were present in a few individuals, these colonize other habitats and could survive. But if variations are present in a single organism there would be very little for it to survive.

ASEXUAL REPRODUCTION

MODES OF REPRODUCTION USED BY SINGLE ORGANISMS

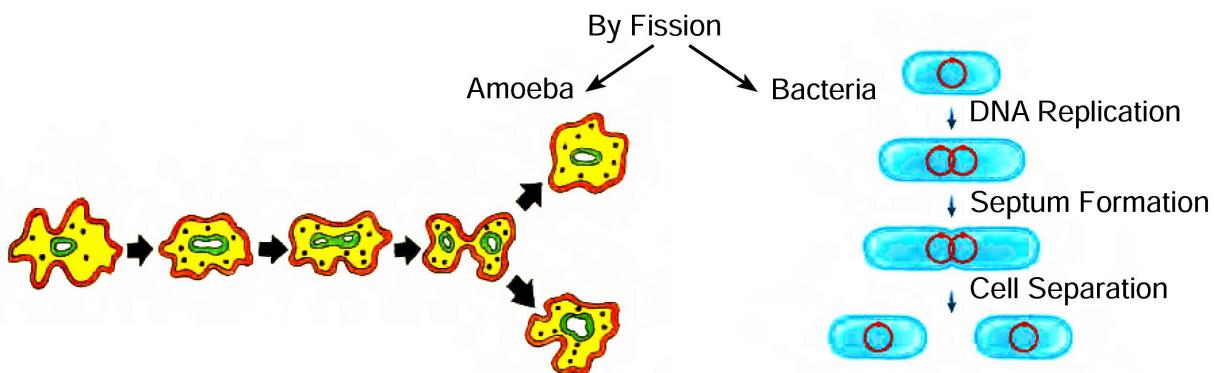
Modes of reproduction involving a single parent, without involving gametes. These are known as asexual modes of reproduction.

Organisms can reproduce asexually in many ways. Some of them are given here.

FISSION

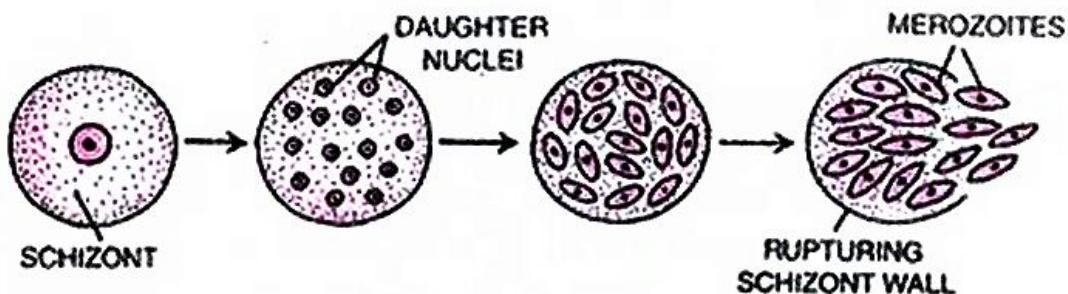
☞ BINARY FISSION

Most of the unicellular animals prefer this method for reproduction. These organisms reproduce by binary fission; especially when conditions are favourable, i.e. adequate amount of food and moisture is available. Binary fission is somewhat similar to mitosis. The mother cell divides into two daughter cells; and each daughter cell begins its life like a new individual. The parent generation ceases to exist, after binary fission. Amoeba is a very good example of the organism which reproduces by binary fission.



☞ MULTIPLE FISSION

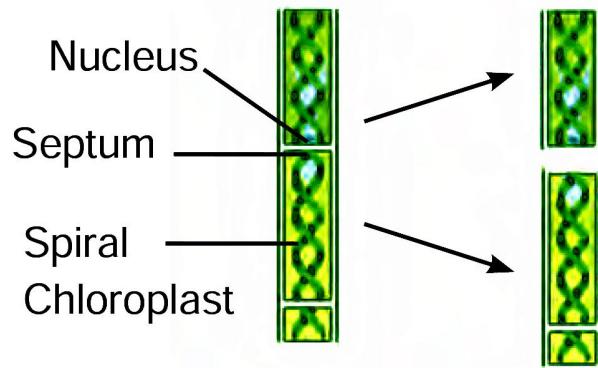
When conditions become unfavourable, i.e. food, moisture, proper temperature, etc. are not available; this is the preferred mode of reproduction by unicellular organisms. The organism develops a thick coating around itself. This is called cyst. The cyst helps the organism to tide over the bad phase. The nucleus divides into several nuclei and each daughter nucleus is surrounded by a membrane. All metabolic activities stop in the organism, after cyst formation. When favourable conditions return, the cyst dissolves or breaks down; releasing the daughter nuclei. The daughter nuclei, in turn, grow into new individuals. Plasmodium and entamoeba undergo cyst stage, when they are not in the body of their prime host, i.e. humans.



Multiple Fission in *Plasmodium*.

FRAGMENTATION

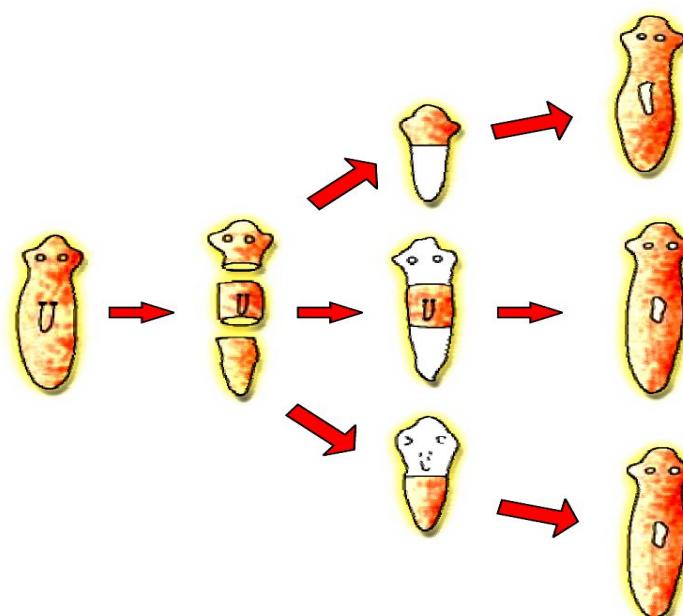
In multicellular organisms with simple body organization, simple reproductive methods have been noticed. Reproduction by fragmentation is seen in filamentous algae, e.g. spirogyra. In Spirogyra algae, the plant body breaks up into smaller fragments. Each fragment grows into a new individual.



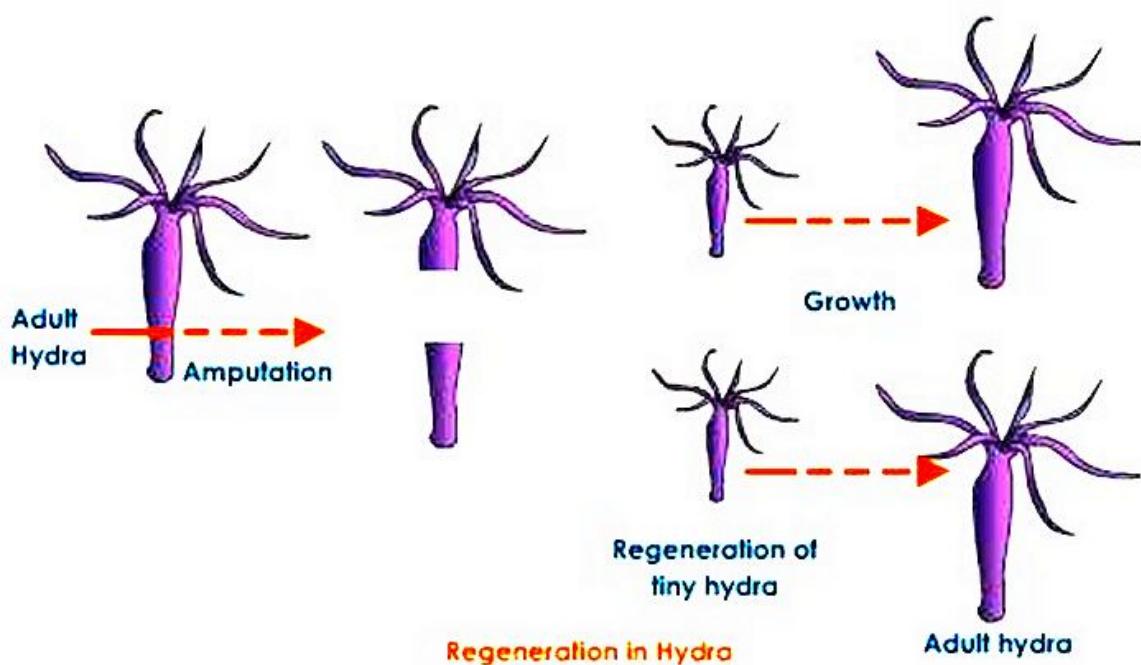
Fragmentation in spirogyra

REGENERATION

If the individual is somehow cut or broken up into many pieces, many of these pieces grow into separate individuals. For example, simple animals like Hydra and Planaria can be cut into



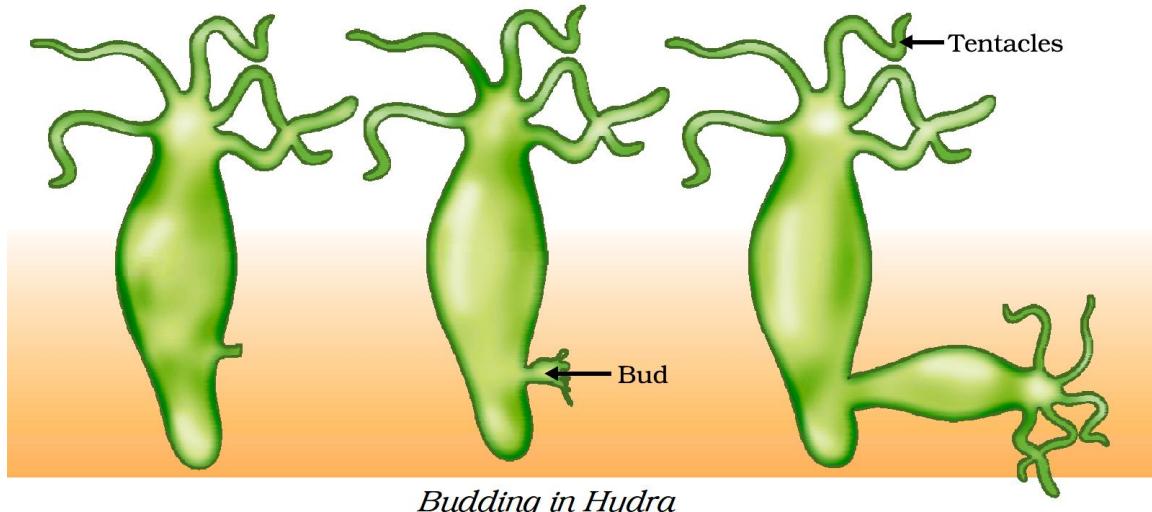
Regeneration in Planaria



any number of pieces and each piece grows into a complete organism. This is known as regeneration (see the below figures). Regeneration is carried out by specialised cells. These cells proliferate and make large numbers of cells.

BUDDING

Organisms such as Hydra use regenerative cells for reproduction in the process of budding. In Hydra, a bud develops as an outgrowth due to repeated cell division at one specific site (see below figure). These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.

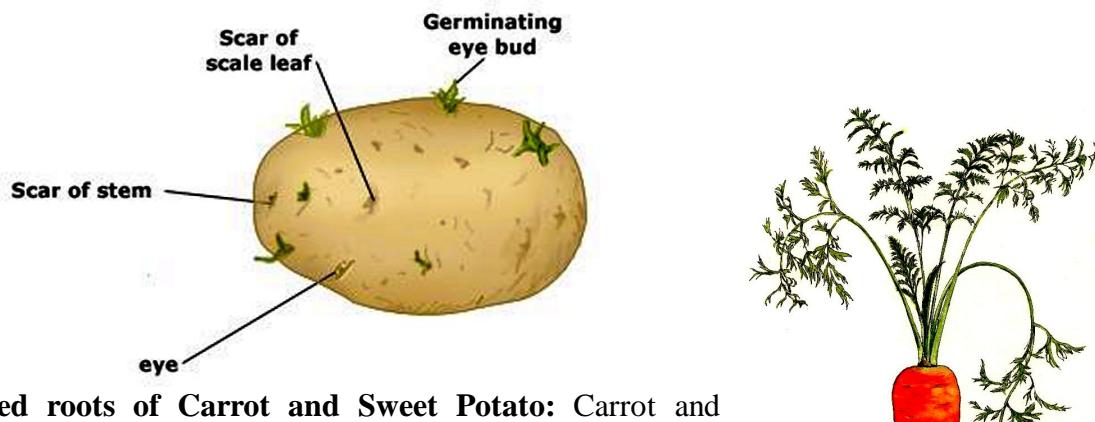


VEGETATIVE PROPAGATION

Vegetative propagation is the ability of plants to reproduce by bringing forth new plants from existing vegetative structures without sexual reproduction.

Some examples of vegetative propagation are given below.

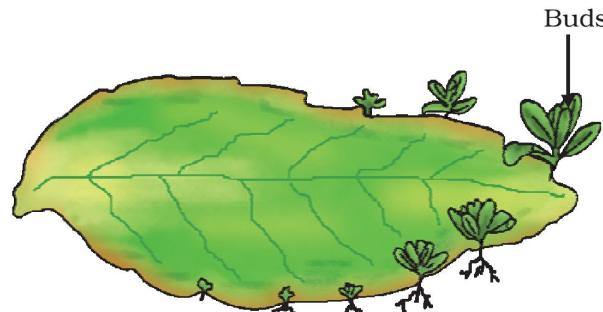
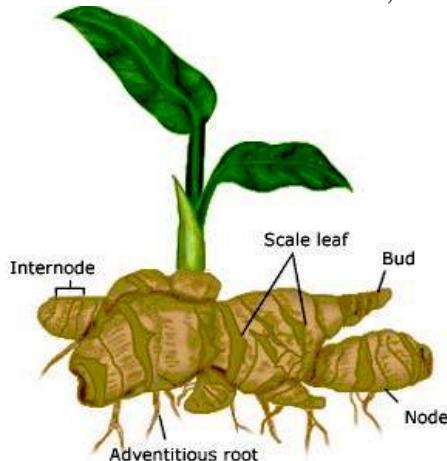
Tuber of Potato: The potato tuber is a modified stem. Many notches can be seen on the surface of potato. These are called 'eyes' of potato. Each 'eye' of a potato can give rise to a new potato plant. Farmers utilize this capability of potatoes to grow potato more quickly; which is not possible by using the seeds of potato.



Modified roots of Carrot and Sweet Potato: Carrot and sweet potato are examples of modifications of roots; for food storage. These roots can give rise to new plants; when kept under the soil.

Rhizomes of Ginger and Turmeric: Rhizomes are examples

of modified underground stems for food storage. These contain nodes, internodes and scaly leaves. When buried under the soil, the rhizomes produce new plants.

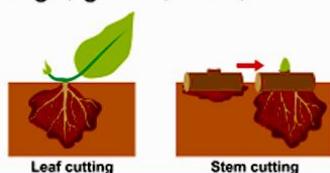


Leaf of Bryophyllum with buds

Leaf of Bryophyllum: Leaves of bryophyllum have notches on the margin. If a leaf is put under the soil, small saplings grow from the notches on the leaf margin. (see above figure)

Artificial Vegetative Propagation: Man has used artificial vegetative propagation to grow many plants. This has enabled farmers and horticulturists to grow many plants in shorter duration and has helped them to earn more profit. Artificial vegetative propagation has also helped in developing many new varieties of plants. Stem cutting, layering and grafting are the preferred means of artificial vegetative propagation.

Cutting – A part of stem is cut and the cut end grows into new plant when placed in moist soil
e.g. mango, guava, litchi, lemon, rose



Layering – The stem of a plant is bent down until it touches the soil. The stem is then cut once it develops roots and grows into a new plant.
e.g. lemon, rose, jasmine



Grafting – The stem of a plant is cut and then fitted on another strong plant and covered with grafting wax.
e.g. apples, oranges, water melon, ornamental plants

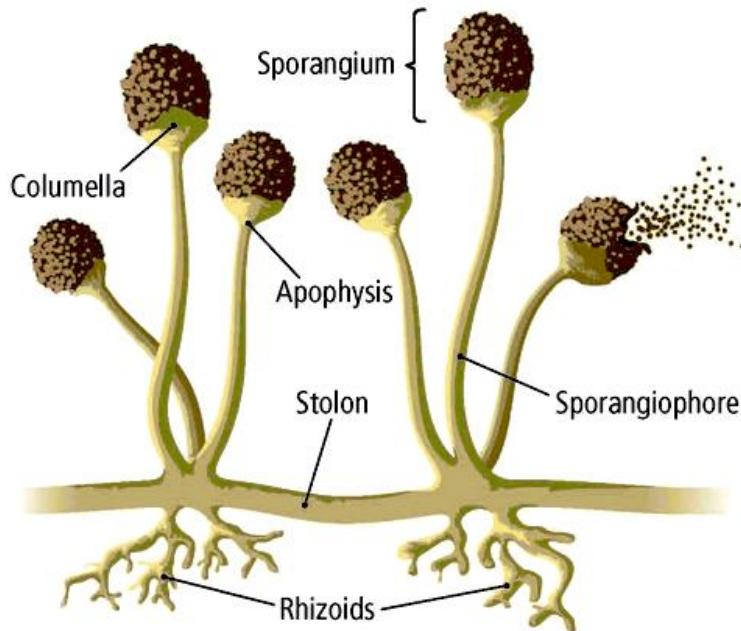


Air Layering – A slanting cut is made in the stem and kept separate with a toothpick. Moss and plastic is wrapped around it till roots grow. Then new plant is cut and planted separately.



SPORE FORMATION

Rhizopus produces hundreds of microscopic reproductive units called spores. When the spore case (also called sporangium) bursts, the spores spreads into air. These air-borne spores land on food or soil, under favourable conditions like damp and warm conditions, they germinate and produce new individuals. Most of the fungi like Rhizopus, Mucor etc., Bacteria and non-flowering plants such as ferns and mosses reproduce by the method of spore formation.



ADVANTAGES OF ASEXUAL REPRODUCTION:

- ☞ The organism does not have to depend on another organism for carrying out reproduction; because a single parent is needed.
- ☞ It takes less time than sexual reproduction and hence more number of offspring can be produced in shorter time.
- ☞ The offspring are exact clones of their parent.
- ☞ Desirable characteristics can be easily incorporated into plants with artificial vegetative propagation.

DISADVANTAGES OF ASEXUAL REPRODUCTION:

- ☞ As a single parent is involved, so there is negligible chance of variation.
- ☞ In most of the cases in simple organisms, the parent generation ceases to exist after asexual reproduction.
- ☞ Asexual reproduction cannot give rise to biodiversity which is important for a healthy ecosystem.

INTEXT QUESTIONS PAGE NO. 133

Q1. How does binary fission differ from multiple fission?

Ans:

S. No.	<i>Binary Fission</i>	<i>Multiple Fission</i>
1	In binary fission, the parent organism splits to form two new organisms.	In multiple fission, the parent organism splits to form many new organisms at the same time.
2	It takes place during favourable environmental conditions.	It takes place during unfavourable environmental conditions.
3	It takes place in organisms like <i>Amoeba, Paramecium, etc.</i>	It takes place in organisms like <i>Plasmodium</i> .

Q2. How will an organism be benefited if it reproduces through spores?

Ans: Spores are tiny, spherical, asexual reproductive bodies which under favourable conditions, like damp and warm conditions, germinate to produce new plants. They are covered by the hard protective wall, which enables the plant to survive unfavourable conditions.

Q3. Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?

Ans:

Multicellular organisms cannot reproduce by cell because they are not simple random collection of cells. In them, specialised cells are organized as tissues and tissues are organised into organs, which then have to be kept at different positions in the body. Cell-by-cell division would be impractical. Multicellular organisms, therefore, require to use more complex ways of reproduction.

Moreover, simple multicellular organisms possess special type of tissues which have the potential to grow into a new organism but complex multicellular organisms have no such specialised cells.

Q4. Why is vegetative propagation practised for growing some types of plants?

Ans:

Vegetative propagation method is used for growing certain plants which do not produce viable seeds. It is also used for growing of plants bearing superior traits, because they produce genetically identical plants. It is also used for growing plants which require longer time to grow and become mature. Plant which require lot of care during early stages of development are also grown by this method.

Q5. Why is DNA copying an essential part of the process of reproduction?

Ans:

Chromosome in the nucleus of a cell contain information for inheritance of features from parent to next generation in the form of DNA. The DNA in the cell nucleus is the information source of making proteins. Therefore, a basic event in reproduction is creation of DNA copy for the next generation.

SEXUAL REPRODUCTION

SEXUAL REPRODUCTION IN PLANTS

Sexual reproduction is the process in which two components (male and female) are involved to produce offsprings of their own kind.

A bull alone cannot produce new calves. It needs a cow. Female sheep alone cannot produce new ones. It needs a male sheep.

Both the sexes, male and female, are needed to produce new offspring.

PARTS OF A TYPICAL FLOWER

A flower is a modified shoot with a limited growth.

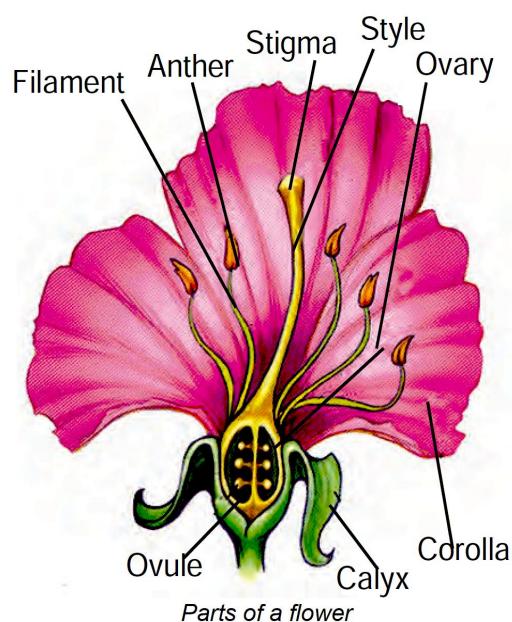
Flowers vary in size, shape, structure and colour.

The main parts of a flower are,

1. *Calyx*
2. *Corolla*
3. *Androecium and*
4. *Gynoecium.*

Androecium is the male part of a flower, and Gynoecium is the female part.

Androecium is a group of stamens. Each Stamen consists of a stalk called the filament and a small



bag like structure called the anther at the tip. The pollen grains are contained in the anther within the pollen sacs.

Gynoecium

Gynoecium is the female part of the flower and consists of the carpels or ovary. Gynoecium has three parts 1) Stigma 2) Style and 3) Ovary. The ovary contains the ovules and each ovule carries within it an embryo sac, within which lies the egg cell or the female gamete.

The sexual reproduction in flowering plants involves

1. Pollination
2. Fertilization

1. POLLINATION

Transfer of pollen grains from the anther to the stigma is called pollination. Pollen grains are transferred mainly by wind, water and insects. They are called as pollinating agents.

Pollination is the first and important event in the development of the fruit and seed. Pollination is followed by fertilization.

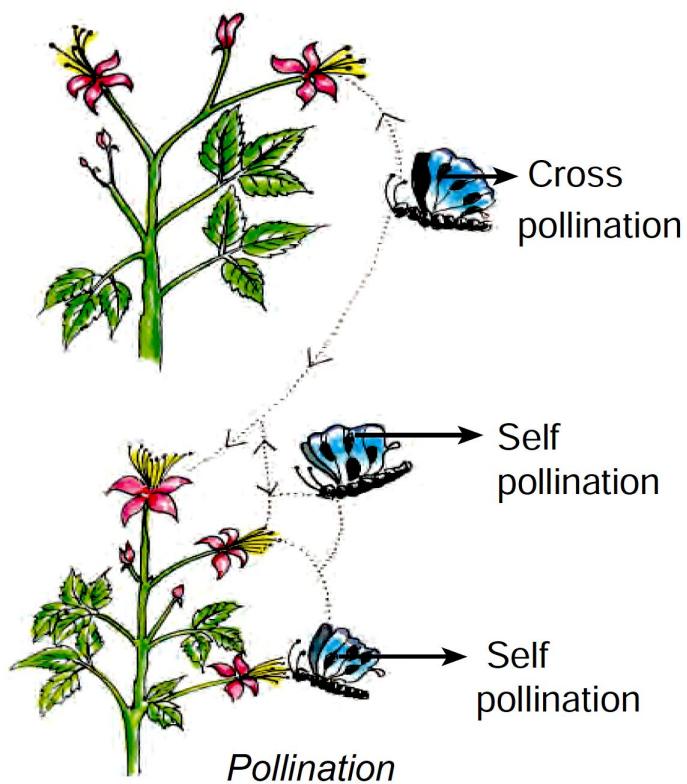
TYPES OF POLLINATION

Pollination is of two types. They are

1. Self pollination
2. Cross pollination

SELF POLLINATION

Self pollination is also known as autogamy. The transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower of the same plant is known as self pollination.



ADVANTAGES OF SELF POLLINATION

- ☞ Self pollination is certain in bisexual flowers.
- ☞ Flowers need not depend on agents of pollination.
- ☞ There is no wastage of pollen grains.

DISADVANTAGES OF SELF POLLINATION

- ☞ The seeds are less in number.
- ☞ Endosperm is minute. Therefore, the seeds produce weak plants.
- ☞ New varieties of plants cannot be produced resulting in the degradation of the plant.

CROSS POLLINATION (ALLOGAMY)

The transfer of pollen grains of a flower to the stigma of another flower of a different plant of the same species is called cross pollination or allogamy.

ADVANTAGES OF CROSS POLLINATION

- ☞ The seeds produced as a result of cross pollination develop, germinate properly and grow into better plants, i.e., cross pollination leads to the production of new varieties.
- ☞ More viable seeds are produced.

AGENTS OF CROSS POLLINATION

In order to bring about cross pollination, it is necessary that the pollen should be carried from one flower to another of a different plant. This takes place through agency of animals, insects, wind and water.

- ☞ Pollination by birds (Ornithophily)
- ☞ Pollination by insects and animals

ZOOPHILY

Animals and insects – Birds, squirrels and insects are attracted to the bright petals of the flowers. These flowers are also large in size and have a sweet smell. Some of these flowers have nectar and a sweet scent. This is the most common of all methods of pollination. This kind of pollination is called Zoophily. (Pollination by animals and birds).

ANEMOPHILY (POLLINATION BY WIND)

The flowers pollinated by air are mostly small in size and without any attractive colour, smell and nectar. They produce a large number of pollen grains to make up for the wastage of pollen in times of transit.

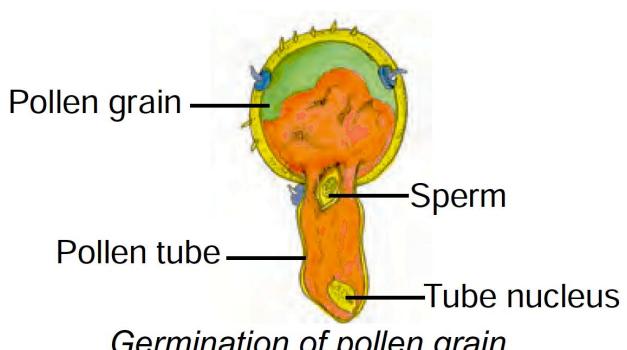
The pollen grains are dry and powdery, and hence are easily carried by the wind. Some pollen grains even have wings. Stigmas are large and protruding, even branched and feathery. e.g. Maize. Flowers pollinated by wind are called Anemophilous, e.g. Grass and pine.

POLLINATION BY WATER (HYDROPHILY)

This pollination takes place in water plants or plants that are adapted to water habitat. e.g. Vallisneria. This pollination is known as hydrophily. The flowers are small and inconspicuous.

FERTILIZATION

Pollination is the transfer of pollen grains from the anther to the stigma. Each pollen grain has protective walls called exine and intine. The outer wall exine is thick and it has small pores called germination pores. The inner wall is thin and elastic.



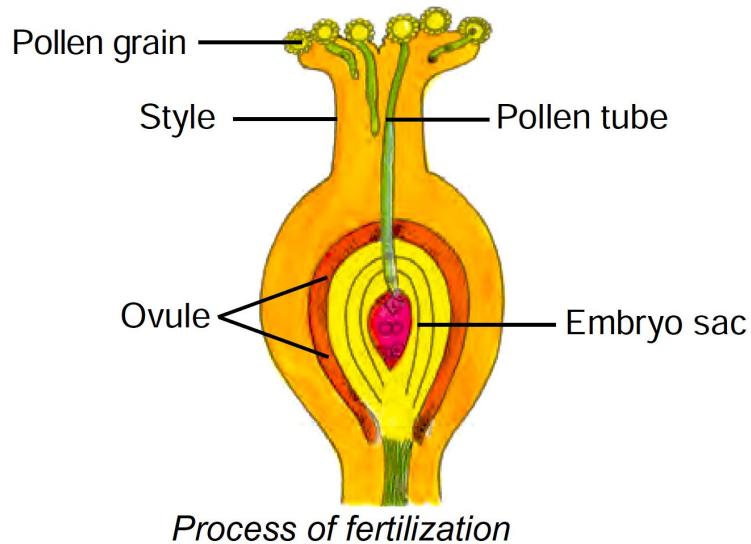
GERMINATION OF POLLEN GRAIN

If pollen grain falls on a suitable stigma, it starts germinating. A mature pollen consists of

two cells. The larger one is vegetative cell and the smaller one is generative cell. The vegetative cell starts growing and emerges through the germination pore. It develops through the style as a long tube known as pollen tube. The generative cell gets into the tube and divides into two male gametes (sperms).

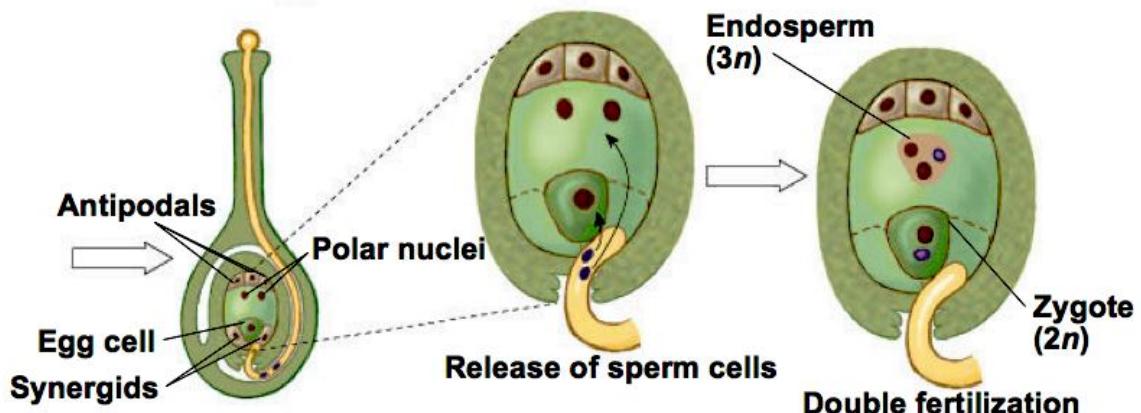
PROCESS OF FERTILIZATION

The pollen tube enters into the embryo sac through micropyle. At this time, the pollen tube bursts open, gametes released from the pollen tube and enter into the embryosac. One of the gametes fuses with the egg, and the other fuses with the secondary nucleus. The fusion of a male gamete with egg is known as fertilization. The fertilized egg is known as zygote which develops into embryo.



DOUBLE FERTILIZATION

The other male gamete fuses with the secondary nucleus. The secondary nucleus is diploid in nature.



The fusion of this nucleus with the second male gamete is known as triple fusion. The triple fusion nucleus is called endosperm nucleus because it develops into endosperm.

Endosperm is a nutritive tissue meant for the development of the embryo. The process of fusion of a male gamete with egg and the other gamete with secondary nucleus is known as double fertilization.

POST FERTILIZATION CHANGES :

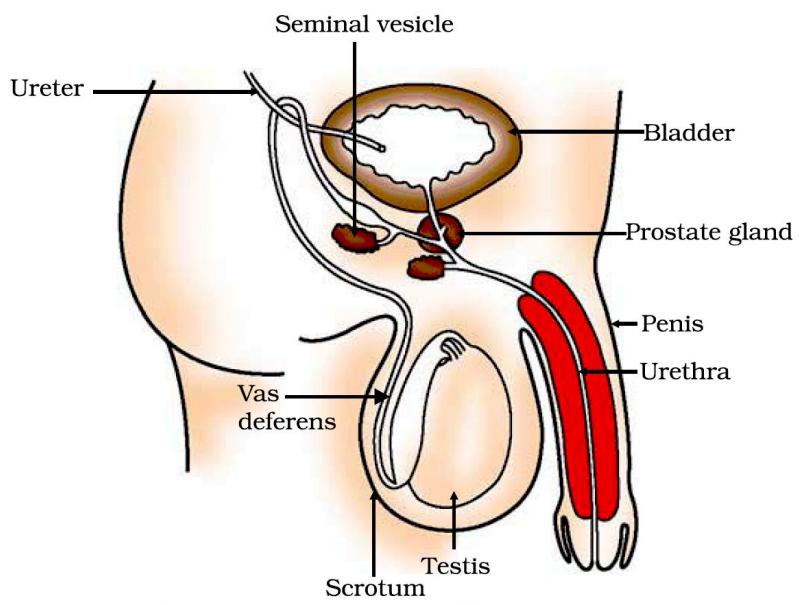
- ☞ The ovule develops into seed.
- ☞ The integuments of the ovule develop into seed coats.
- ☞ The ovary enlarges and develops into fruit.

REPRODUCTION IN HUMAN BEINGS

MALE REPRODUCTIVE SYSTEM

The male reproductive system in human beings is composed of following parts:

Testis: There is a pair of testes; which lie in a skin pouch; called scrotum. Scrotum is suspended outside the body; below the abdominal cavity. This helps in maintaining the temperature of testes below the body temperature. This is necessary for optimum sperm production. Testis primarily serves the function of sperm production. Sperms are the male gametes. Apart from that, testis also produces testosterone. Testosterone is also called the male hormone, as it is responsible for developing certain secondary sexual characters in boys.



Human-male reproductive system

Vas Deferens: Vas deferens is the tube which carries sperms to the seminal vesicle.

Seminal Vesicle: This is the place where sperms are stored. Secretions from the seminal vesicle and prostate gland add up to make the semen.

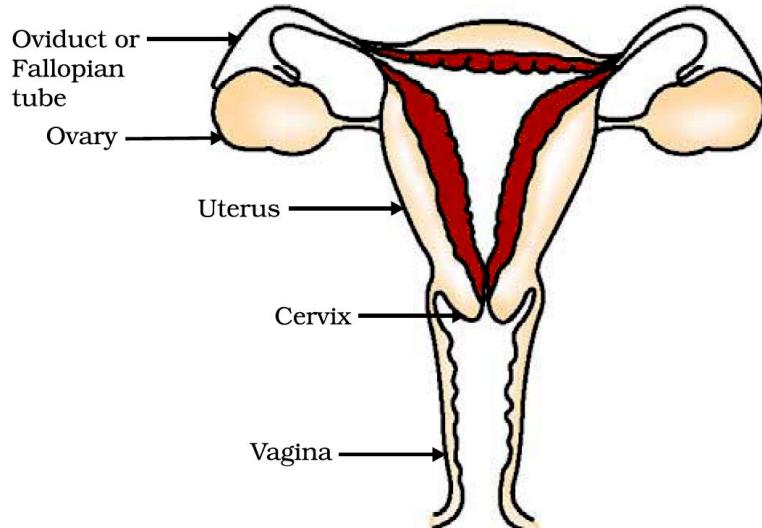
Penis: It is a muscular organ which serves the genitor-urinary functions. The urethra works as the common passage for urine as well as for sperms.

FEMALE REPRODUCTIVE SYSTEM

The female reproductive system in human beings is composed of following parts:

Uterus: This is pear-shaped hollow muscular organ. Uterus is the place where the embryo gets implanted and develops into a newborn baby. The wall of the uterus provides safety and nutrition to the growing foetus.

Fallopian Tubes: One fallopian tube comes out from each side at the top of the uterus. The fallopian tubes end in finger-like structures; called flimbriae. Fertilization happens in the fallopian tube.



Human-female reproductive system

Ovary: There are two ovaries; one near each fallopian tube. Ovary produces the eggs or the female gametes. All the eggs are produced by the ovary when the female child is still in the womb. One egg matures in each ovulation cycle and is released from the ovary. The egg is caught by the fimbriae and transferred to the fallopian tube.

Vagina: The cervix (mouth of the uterus) opens into the vagina. Vagina is a muscular tube-like organ; which serves as the passage for the sperms and also as the canal during the child birth.

PUBERTY

Human beings are complex animals and hence there is a distinct phase in their life cycle which marks the onset and attainment of sexual maturity. This period is called puberty. It usually starts at around 10 – 11 years of age in girls and at around 12 – 13 years of age in boys. It usually ends at around 18th year of age in girls and at around 19th year of age in boys. Since the years during puberty end in 'teens'; hence this phase is also called teenage.

Changes in Boys during Puberty: The boys suddenly grow in height dramatically. Voice becomes deep and the Adam's apple becomes prominent. Shoulders become broad and body becomes muscular. Facial hairs begin to grow. Hairs also grow under the armpit and in the pubic region.

Changes in Girls during Puberty: The voice becomes thin. Shoulders and hip become rounded. Breasts get enlarged. Hairs grow under the armpit and in the pubic region.

Sexual Dimorphism: The physical dissimilarities in the male and female of a species which give them different appearances is called sexual dimorphism.

Secondary Sexual Characters: Features which highlight sexual dimorphism are called secondary sexual characters.

Menstruation: Menstruation is a trait which is unique to humans and some primates. During each ovulation cycle, the uterus prepares itself in anticipation of a possible pregnancy. The uterine wall develops an additional lining. When the egg is not fertilized, it gets disintegrated and so does the additional lining in the uterine wall. The fragments of disintegrated tissues are shed; along with blood. This is observed in the form of bleeding through the vagina which can last from 3 to 7 days. The whole sequence of events during an ovulation cycle is called menstrual cycle. The bleeding which occurs for few days is called menstruation. The first

menstrual flow is called menarche and the last menstrual flow (which happens in the late 40s) is called menopause.

REPRODUCTIVE HEALTH

Human beings are different than other animals because they have the power of thinking. They have to obey certain moral values and need to behave sensibly in most of the aspects of life. Beginning of puberty does not mean that a person is psychologically ready for the process of reproduction. For a human being, reproduction involves more than just producing an offspring. As any act of sex has the potential of fertilization, so taking care of contraception becomes important. Moreover, the act of sex also has the potential of creating many sexually transmitted diseases. Examples of STDs are; gonorrhea, Herpes, syphilis, AIDS, Hepatitis B. AIDS and Hepatitis B are incurable till date. Even the curable STDs are potential dangerous; not only physically but also psychologically.

Reproductive health involves preventing the chances of STDs and preventing unwanted children. Reproductive health means a couple should be able to enjoy the reproductive phase of its life; without taking the burden of gigantic family.

INTEXT QUESTIONS PAGE NO. 140

Q1. How is the process of pollination different from fertilisation?

Ans:

S. No.	Pollination	Fertilization
1	The transfer of pollen grains from anther to the stigma of a flower is called pollination.	The fusion of male and female gamete to form zygote is called fertilisation.
2	It involves only the male gamete (pollen grain).	It involves both male and female gametes.

Q2. What is the role of the seminal vesicles and the prostate gland?

Ans:

Secretions from seminal vesicles and prostate gland provide nutrition to the sperms and make their transport easier by providing them a fluid medium.

Q3. What are the changes seen in girls at the time of puberty?

Ans:

Changes seen in girls at the time of puberty are as follows:

- (i) Growth of hair in armpits and public region.
- (ii) Mammary glands (breast) develop and hips broaden.
- (iii) Uterus, vagina, Fallopian tube enlarge and pelvis widens. Menstruation and ovulation also starts.

Q4. How does the embryo get nourishment inside the mother's body?

Ans:

The embryo gets nutrition from the mothers blood with the help of special tissue called placenta. This is a disc-like tissue which develops between the uterine wall and embryo. It has villi on embryo side of the tissue. On the mothers side are blood spaces which the villi. This gives a large surface area for oxygen and glucose to pass from the mother to the embryo.

Q5. If a women is using a copper-T, will it help in protecting her from sexually transmitted diseases?

Ans:

No, copper-T does not prevent the transmission of sexually transmitted diseases. Copper-T only prevents implantation. The only safe method used to prevent the transmission of sexually transmitted diseases is the use of condoms.

EXERCISE QUESTIONS PAGE NO. 141

Q1. Asexual reproduction takes place through budding in

- (a) amoeba.
- (b) yeast.
- (c) plasmodium.
- (d) leishmania.

Ans:

(b) Asexual reproduction in *Hydra* and yeast takes place by budding.

Q2. Which of the following is not a part of the female reproductive system in human beings?

- (a) Ovary
- (b) Uterus
- (c) Vas deferens
- (d) Fallopian tube

Ans:

(c) Vas deferens is a part of male reproductive system in human.

Q3. The anther contains

- (a) sepals.
- (b) ovules.
- (c) carpel.
- (d) pollen grains.

Ans:

(d) Anther is the female reproductive part in plants. It contains pollen grains the first cell of male gametophyte.

Q4. What are the advantages of sexual reproduction over asexual reproduction?

Ans:

There are a number of advantages of sexual reproduction over asexual one. These include

- (i) Sexual reproduction creates variations which are useful for ensuring survival of species and species formation.
- (ii) Two different individuals in a population would have quite different patterns of accumulated variations.
- (iii) The desired phenotype can be promoted by sexual reproduction.

These advantages are not available with asexual reproduction.

Q5. What are the functions performed by the testis in human beings?

Ans:

Functions of testes

- (i) Produce male sex cells-sperms.
- (ii) Produce male sex hormone testosterone.

Q6. Why does menstruation occur?

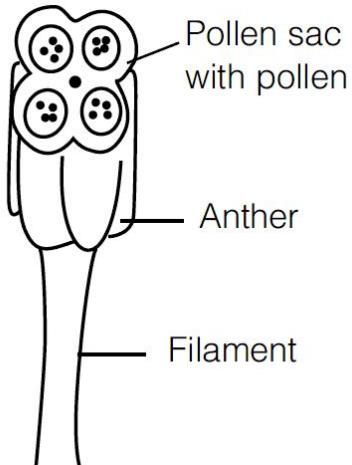
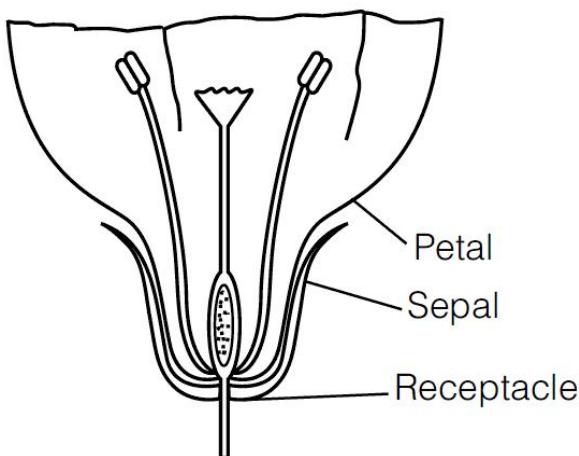
Ans:

Menstruation occurs when the egg is not fertilised. Every month uterus prepares itself to receive a fertilised egg, to nourish the embryo its lining becomes thick and spongy. In case egg

is not fertilised this lining breaks and discharged out of the body through the vagina in the form of blood.

Q7. Draw a labelled diagram of the longitudinal section of a flower.

Ans:



PARTS

Petals (corolla)

- ☞ Brightly coloured.
- ☞ Attracts insects for pollination.
- ☞ Base contains nectary which produces nectar.

Sepals (calyx)

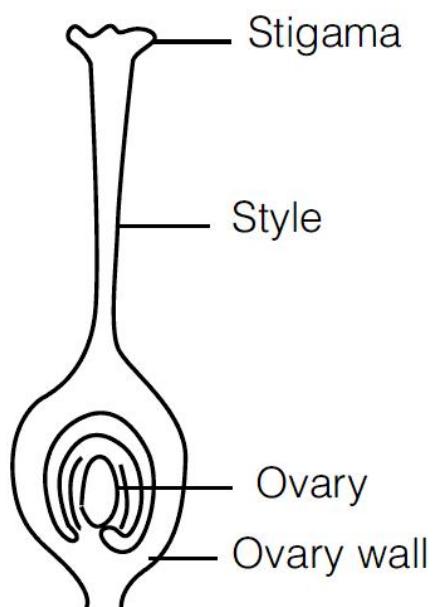
- ☞ Protect the flower while in bud.
- ☞ Generally green and serves to photosynthesize food.

Receptacle (thalamus)

- ☞ Base of the flower to which all parts are attached.
- ☞ In some cases, after fertilization become fleshy (apple).

Pistil (carpel)

- ☞ Female reproductive part of the flower, known as gynoecium.
- ☞ Comprises of stigma, style and ovary.
- ☞ Stigma is sticky and receives pollen during pollination.
- ☞ Style links stigma to the ovary. It is a elongated tube through which pollen tubes grow.
- ☞ Ovary contains ovules (female gametes), which develop into seeds.



Stamen

- ☞ Male reproductive part of the flower, known as androecium.
- ☞ Comprises of anther and filament.
- ☞ Anther is bilobed. Each lobe contains two pollen sacs which produce pollen grains.
- ☞ Filament is the stalk of the stamen that supports anther.

Q8. What are the different methods of contraception?

Ans:

The different methods of contraception are:

(i) **Barrier Methods** In barrier methods, the physical devices such as condoms and diaphragm are used. Condoms are used by male by putting rubber covering on the penis. They prevent sperms from meeting the egg.

(ii) **Chemical Methods** In the chemical methods, the females use pills-oral pills and vaginal pills. The oral pills contain hormones which stop ovaries from releasing ovum. The vaginal pills contain the chemicals called spermicides which kill the sperms.

(iii) **Surgical Methods** In males, a small portion of sperm duct is cut by surgical methods and the cut end is tied properly (vasectomy). This prevents the sperms from coming out. In females, a small part of the oviduct is cut and tied (tubectomy). This prevents the egg from entering the oviduct.

Q9. How are the modes for reproduction different in unicellular and multicellular organisms?

Ans:

Unicellular organisms are made up of only single cell, in which all the functions are performed by the single cell. So, reproduction is done by simple, asexual methods but in multicellular organisms various cells perform different functions. So, production of all these specialised cells/tissues is required and simple methods for reproduction are insignificant.

Q10. How does reproduction help in providing stability to populations of species?

Ans:

Reproduction leads to certain variations in the characteristics of the offspring. This may allow organism to exist in diverse habitats and niches. Certain variations present in the individuals of certain population may enable the individuals to survive those unfavourable conditions. Organism with such favourable traits transmit the characters to their offsprings, thereby providing stability to the population of a species.

Q11. What could be the reasons for adopting contraceptive methods?

Ans:

The reasons for adopting contraceptive methods are:

- (i) To avoid frequent pregnancies, which in turn helps in population control
 - (ii) To prevent the spread of sexually transmitted diseases.
-

ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 8
HOW DO ORGANISMS REPRODUCE?

- 1.** Define reproduction.
- 2.** Define fertilization.
- 3.** Where the fertilization does takes place in human female?
- 4.** Name two type of reproduction.
- 5.** What method will you use for growing jasmine and rose plant?
- 6.** Define menstruation.
- 7.** Write the name of male and female reproductive part of a flower.
- 8.** Define gestation period. What is the gestation period in human?
- 9.** Why do testes in mammals descend in scrotum?
- 10.** Name the type of fission carried out by Amoeba.
- 11.** Name two sexually transmitted diseases.
- 12.** What is vegetative propagation?
- 13.** Name the male and female gonads and what are the products they produce.
- 14.** Which part of human female reproduction system is called —birth canal and the —womb?
- 15.** Write the full form of IUCD and AIDS,
- 16.** What is syngamy?
- 17.** What is advantage of fruit formation in plant?
- 18.** What is ovulation?
- 19.** What is menopause?
- 20.** What is the importance of the process of reproduction?
- 21.** What is species?
- 22.** Do organisms produce exact copies of themselves during reproduction?
- 23.** What is the importance of variations?
- 24.** Why is variation beneficial to the species but not necessarily for the individuals?

- 25.** What is the importance of DNA copying in reproduction?
- 26.** What are the different methods of asexual reproduction?
- 27.** Name the following:
An organism which reproduces by
a. Binary fission
b. Multiple fission
c. Budding
d. Fragmentation
e. Spore Formation
- 28.** How does binary fission in amoeba differ from binary fission in Leishmania?
- 29.** How will an organism be benefitted if it reproduces through spores?
- 30.** Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?
- 31.** Why is vegetative propagation practised for growing some types of plants?
- 32.** What are the advantages of sexual reproduction over asexual reproduction?
- 33.** What is asexual reproduction? Explain briefly various methods of asexual reproduction?
- 34.** How is specific chromosome number maintained in a sexually reproducing organism?
- 35.** Draw and label the parts of a flower.
- 36.** What are the functions of the following parts of a flower?
- 37.** What is pollination?
- 38.** What are the steps involved in fertilization and formation of seeds?
- 39.** What are the secondary sexual characteristics seen in males?
- 40.** Why are the testis located outside the abdominal cavity in the scrotum?
- 41.** Draw the female reproductive system and label the parts.
- 42.** What is ovulation?
- 43.** Draw the longitudinal section of pistil to show pollen grains' germination.
- 44.** List the events after fertilization in an angiosperm takes place.
- 45.** Draw the male reproductive system and label the parts.
- 46.** What is the role of the seminal vesicles and the prostate glands?
- 47.** What are the changes seen in females at the time of puberty?

- 48.** What happens when the egg is not fertilized?
- 49.** How does the embryo get nourishment inside the mother's body?
- 50.** What are the functions performed by the testis in males?
- 51.** How are the modes of reproduction different in unicellular and multi-cellular organisms?
- 52.** How does reproduction help in providing stability to population of species?
- 53.** What could be the reasons for adopting contraceptive methods?
- 54.** What is the importation of DNA copying in reproduction?
- 55.** Why is variation beneficial to the species but not necessarily for the individual?
- 56.** How will an organism be benefited if it reproduces through spores?
- 57.** Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?
- 58.** Why vegetative reproduction is practiced for growing some type of plants?
- 59.** Why is DNA copying an essential part of the process of reproduction?
- 60.** What are the changes seen in girl's at the time of puberty?
- 61.** What is the role of the seminal vesicles and the prostate gland?
- 62.** How is the process of pollination different from fertilization?
- 63.** How does the embryo get nourishment inside the mother's body?
- 64.** Show by a series of labeled diagram, the manner in which reproduction in Hydra.
- 65.** Describe regeneration.
- 66.** Define the terms unisexual and bisexual flowers by giving one example of each.
- 67.** Leaves of the bryophyllum fallen on the ground produce new plants whereas the leaves of rose do not. Why?
- 68.** Why does menstruation occur?
- 69.** How does reproduction help in providing stability to populations of species?
- 70.** What are advantages of sexual reproduction over asexual reproduction?
- 71.** What are functions performed by testis in human beings.?
- 72.** Differentiate between natural and artificial vegetative propagation.

- 73.** Draw a diagram of a flower to show its male and female reproductive parts. Label on it : a.- the ovary b- the anther c- the filament d- the stigma .
- 74.** Describe the fertilization in flower.
- 75.** What is meant by pollination? How it takes place?
- 76.** What is 'vegetative propagation'? Write two examples where it is used. State two reasons of practicing vegetative propagation for giving same types of plants.
- 77.** Illustrate the following with the help of suitable diagram: a) Regeneration in Planaria. b) Budding in Hydra.
- 78.** Describe why : a) Scrotum remains outside the body of human males ? b) Some plants are propagated only by vegetative propagation ?
- 79.** How does reproduction help in providing stability to populations of species ?
- 80.** Describe the changes taking place in female reproductive organs every month
- 81.** What will happen if ovum is not fertilized? Describe the events in a sequence wise manner.
- 82.** How do following organisms reproduce? a)Amoeba b) Planaria c) Yeast d) Frog e)Rose f) Bacteria
-

ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 8
HOW DO ORGANISMS REPRODUCE?

- 1.** Mention the common mode of reproduction found in (i) Amoeba (ii) Planaria.
- 2.** Name any two types of asexual reproduction.
- 3.** Define reproduction.
- 4.** Name two organisms that show asexual reproduction.
- 5.** How does Hydra reproduce? Name another organism that reproduces by a similar method.
- 6.** What is a spore?
- 7.** Name two plants which reproduce through spores.
- 8.** Why is regeneration considered a method of reproduction?
- 9.** Which vegetative part is used in the propagation of Bryophyllum and mint?
- 10.** Name two types of layering.
- 11.** Name some plants where layering is used.
- 12.** Which technique would you use for propagating improved varieties of mango and rose?
- 13.** Name various types of asexual reproduction.
- 14.** Mention the reproductive parts of a flower.
- 15.** Define fertilisation.
- 16.** What is self-pollination?
- 17.** What is cross pollination?
- 18.** What are the agents of pollination?
- 19.** Which process results in formation of zygote?
- 20.** What grows to form a fruit?
- 21.** What is carpel?
- 22.** Which parts of the flower transform into the seed and fruit?
- 23.** What are gonads?
- 24.** What is puberty?
- 25.** When is ovum released in human female?
- 26.** What is endometrium?
- 27.** What is implantation?
- 28.** What is parturition?
- 29.** What is ovulation?
- 30.** Where are the ova produced in woman?
- 31.** Name two sex hormones.
- 32.** What is the normal reproductive life in human female?

- 33.** What are oral contraceptives?
- 34.** What is epididymis?
- 35.** What are the functions of urethra?
- 36.** What are the secondary sex characters in human male?
- 37.** Why do testes lie outside the abdominal cavity?
- 38.** When does puberty occur in human male and female?
- 39.** State the methods used for growing rose plants.
- 40.** State what type of method is used for growing jasmine plant.
- 41.** Name the hormone, secretion of which is responsible for dramatic changes in appearance in girls when they approach 10-12 years of age.
- 42.** The organisms formed by asexual reproduction are considered as clones. Why? State the advantage of sexual reproduction over asexual reproduction.
- 43.** What is the effect of DNA copying which is not perfectly accurate on the reproduction process?
- 44.** How does the process of budding differ from the process of spore formation?
- 45.** Name the type of asexual reproduction in : (a) *Planaria* (b) *Rhizopus* (iii) *Spirogyra* (iv) *Hydra*
- 46.** With the help of a diagram only show regeneration in *Planaria*. Regeneration is not possible in all types of animals. Why?
- 47.** How does the process of seed germination take place in plants? Describe in brief.
- 48.** Name the sex hormones secreted by male and female sex organs in human beings. State one function of each.
- 49.** State the mode of reproduction in following organisms : Earthworm, Frog, *Rhizopus*, *Plasmodium*.
- 50.** State in brief any two functions of copper-T used by some women.
- 51.** In what respect is the human male gamete different from the female gamete?
- 52.** What is reproduction? What are its two types? Which one of the two confers new characteristics on the offsprings and how?
- 53.** What is binary fission? Draw a diagram to show binary fission in *Amoeba*.
- 54.** What is regeneration? State a reason why a more complex organism cannot give rise to new individuals through this method.
- 55.** Name the male and female gametes in animals. What is fertilisation and where does it take place in human females?
- 56.** What is reproduction? Mention the importance of DNA copying in reproduction.

- 57.** Mention the information source of making proteins in the cell. What is the basic event in reproduction?
- 58.** Name one sexually transmitted disease each caused due to bacterial infection and viral infection. How can these be prevented?
- 59.** Describe briefly four ways in which individuals with a particular trait may increase in a population.
- 60.** Why is it said that —sexual reproduction promotes diversity of characters in the offspring?
- 61.** Why cannot fertilisation take place in flowers if pollination does not occur?
- 62.** Why does bread mould grow profusely on a moist slice of bread rather than on a dry slice of bread?
- 63.** Leaves of Bryophyllum fallen on the ground produce new plants whereas the leaves of Jasmine do not, why?
- 64.** What is clone? Why do offspring formed by asexual reproduction exhibit remarkable similarity?
- 65.** Write one disadvantage of asexual reproduction. When and how does multiple fission take place?
- 66.** State in brief the function of the following organs in the human female reproductive system. (a) Ovary (b) Fallopian tube (c) Uterus
- 67.** Differentiate between : (a) Asexual and sexual reproduction. (b) Plumule and Radicle (c) Pollination and Fertilisation
- 68.** Why is vegetative propagation practised for growing some types of plants? (b) Name the different parts of a flower that has germ cells. (c) List any two agents of pollination.
- 69.** What happens to the pollen which falls on a suitable stigma? Explain.
- 70.** List and describe in brief any three ways devised to avoid pregnancy.
- 71.** What are sexually transmitted diseases? Name four such diseases. Which one of them damages the immune system of human body?
- 72.** Define grafting. Suggest any two advantages and disadvantages of grafting.
- 73.** Name any two mechanical barriers of pregnancy. What are the benefits of using mechanical barriers during sexual act?
- 74.** State in brief the functions of the following parts of the human male reproductive system :
(i) Scrotum (ii) Testes (iii) Vas deferens
- 75.** State the role of ovary and fallopian tube in human body.
- 76.** What could be the possible reason for declining female to male sex ratio in our country. Suggest two measures to achieve 1:1 ratio.
- 77.** What is the advantage of reproducing through spores?

78. How does variation lead to the survival of species overtime?

79. What will happen when :

(a) A mature *Spirogyra* filament attains considerable length?

(b) *Planaria* gets cut into two pieces?

80. (a) Give reason : Regeneration is not the same as Reproduction.

(b) State the mode of asexual reproduction in *Plasmodium*

81. (a) Surgical methods can be used to create a block in the reproductive system for contraceptive purposes. Name such parts where blocks are created in : (i) males (ii) females
(b) State any two reasons for using contraceptive devices.

82. (a) What is vegetative propagation?

(b) Write any two advantages of practising this method.

83. (a) Out of the following plants which two plants are reproduced by vegetative propagation? jasmine, wheat, mustard, banana
(b) List any one advantage of practising this kind of propagation.

84. (a) Identify the asexual method of reproduction in each of the following organisms : (i) rose
(ii) yeast (iii) *planaria*

(b) What is fragmentation? Name a multicellular organism which reproduces by this method.

85. (a) How do the oral pills function as contraceptives?

(b) The use of these pills may be harmful. Why?

86. (a) Explain the terms : (i) implantation (ii) placenta

(b) What is the average duration of human pregnancy?

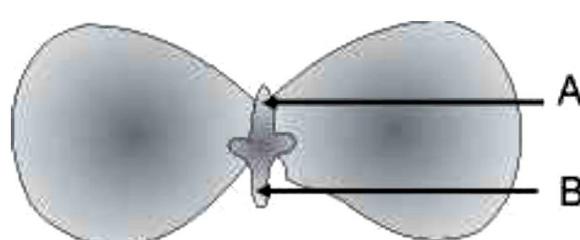
87. (a) Why do testes located in scrotum outside the abdominal cavity?

(b) What will happen to ovary and ovule after fertilization in angiospermic plants.

88. In a bisexual flower inspite of the young stamens being removed artificially, the flower produces fruit. Give reasons.

(a) Name the parts of the flower which ripens to form fruit and seed?

(b) In the following diagram label A and B.



ASSIGNMENT QUESTIONS SET – 3
CHAPTER – 8
HOW DO ORGANISMS REPRODUCE?

1. In the list of organisms given below, those that reproduce by the asexual method are
 - (i) banana
 - (ii) dog
 - (iii) yeast
 - (iv) Amoeba
2. In a flower, the parts that produce male and female gametes (germ cells) are
 - (a) stamen and anther
 - (b) filament and stigma
 - (c) anther and ovary
 - (d) stamen and style
3. Which of the following is the correct sequence of events of sexual reproduction in a flower?
 - (a) pollination, fertilisation, seedling, embryo
 - (b) seedling, embryo, fertilisation, pollination
 - (c) pollination, fertilisation, embryo, seedling
 - (d) embryo, seedling, pollination, fertilisation
4. Offspring formed by asexual method of reproduction have greater similarity among themselves because
 - (i) asexual reproduction involves only one parent
 - (ii) asexual reproduction does not involve gametes
 - (iii) asexual reproduction occurs before sexual reproduction
 - (iv) asexual reproduction occurs after sexual reproduction
 - (a) (i) and (ii) (b) (i) and (iii)
 - (c) (ii) and (iv) (d) (iii) and (iv)
5. Characters transmitted from parents to offspring are present in
 - (a) cytoplasm
 - (b) ribosome
 - (c) golgi bodies
 - (d) genes
6. Characters that are transmitted from parents to offspring during reproduction show
 - (a) only similarities with parents

- (b) only variations with parents
 - (c) both similarities and variations with parents
 - (d) neither similarities nor variations
7. A feature of reproduction that is common to *Amoeba*, *Spirogyra* and Yeast is that
- (a) they reproduce asexually
 - (b) they are all unicellular
 - (c) they reproduce only sexually
 - (d) they are all multicellular
8. In *Spirogyra*, asexual reproduction takes place by
- (a) breaking up of filaments into smaller bits
 - (b) division of a cell into two cells
 - (c) division of a cell into many cells
 - (d) formation of young cells from older cells.
9. The ability of a cell to divide into several cells during reproduction in *Plasmodium* is called
- (a) budding
 - (b) reduction division
 - (c) binary fission
 - (d) multiple fission
10. The correct sequence of reproductive stages seen in flowering plants is
- (a) gametes, zygote, embryo, seedling
 - (b) zygote, gametes, embryo, seedling
 - (c) seedling, embryo, zygote, gametes
 - (d) gametes, embryo, zygote, seedling
11. The number of chromosomes in parents and offsprings of a particular species remains constant due to
- (a) doubling of chromosomes after zygote formation
 - (b) halving of chromosomes during gamete formation
 - (c) doubling of chromosomes after gamete formation
 - (d) halving of chromosomes after gamete formation
12. In *Rhizopus*, tubular thread-like structures bearing sporangia at their tips are called
- (a) filaments
 - (b) hyphae
 - (c) rhizoids
 - (d) roots
13. Vegetative propagation refers to formation of new plants from

- (a) stem, roots and flowers
- (b) stem, roots and leaves
- (c) stem, flowers and fruits
- (d) stem, leaves and flowers

14. Factors responsible for the rapid spread of bread mould on slices of bread are

- (i) large number of spores
 - (ii) availability of moisture and nutrients in bread
 - (iii) presence of tubular branched hyphae
 - (iv) formation of round shaped sporangia
- (a) (i) and (iii) (b) (ii) and iv
 - (c) (i) and (ii) (d) (iii) and (iv)

15. Length of pollen tube depends on the distance between

- (a) pollen grain and upper surface of stigma
- (b) pollen grain on upper surface of stigma and ovule
- (c) pollen grain in anther and upper surface of stigma
- (d) upper surface of stigma and lower part of style

16. Which of the following statements are true for flowers?

- (i) Flowers are always bisexual
 - (ii) They are the sexual reproductive organs
 - (iii) They are produced in all groups of plants
 - (iv) After fertilisation they give rise to fruits
- (a) (i) and (iv) (b) (ii) and (iii)
 - (c) (i) and (iii) (d) (ii) and (iv)

17. Which among the following statements are true for unisexual flowers?

- (i) They possess both stamen and pistil
 - (ii) They possess either stamen or pistil
 - (iii) They exhibit cross pollination
 - (iv) Unisexual flowers possessing only stamens cannot produce fruits
- (a) (i) and (iv) (b) (ii), (iii) and (iv)
 - (c) (iii) and (iv) (d) (i), (iii) and (iv)

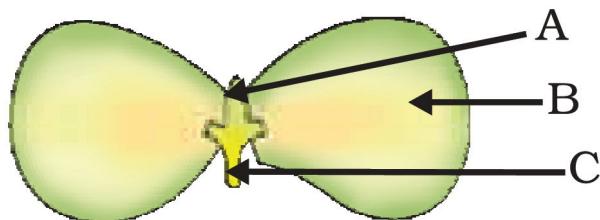
18. Which among the following statements are true for sexual reproduction in flowering plants?

- (i) It requires two types of gametes
- (ii) Fertilisation is a compulsory event
- (iii) It always results in formation of zygote

- (iv) Offspring formed are clones
- (a) (i) and (iv) (b) (i), (ii) and (iv)
- (c) (i), (ii) and (iii) (d) (i), (ii) and (iv)

19. In the below Figure, the parts A, B and C are sequentially

- (a) cotyledon, plumule and radicle
- (b) plumule, radicle and cotyledon
- (c) plumule, cotyledon and radicle
- (d) radicle, cotyledon and plumule



20. Offspring formed as a result of sexual reproduction exhibit more variations because

- (a) sexual reproduction is a lengthy process
- (b) genetic material comes from two parents of the same species
- (c) genetic material comes from two parents of different species
- (d) genetic material comes from many parents

21. Reproduction is essential for living organisms in order to

- (a) keep the individual organism alive
- (b) fulfill their energy requirement
- (c) maintain growth
- (d) continue the species generation after generation

22. During adolescence, several changes occur in the human body. Mark one change associated with sexual maturation in boys

- (a) loss of milk teeth
- (b) increase in height
- (c) cracking of voice
- (d) weight gain

23. In human females, an event that reflects onset of reproductive phase is

- (a) growth of body
- (b) changes in hair pattern
- (c) change in voice
- (d) menstruation

24. In human males, the testes lie in the scrotum, because it helps in the

- (a) process of mating
- (b) formation of sperm
- (c) easy transfer of gametes
- (d) all the above

25. Which among the following is not the function of testes at puberty?

- (i) formation of germ cells
 - (ii) secretion of testosterone
 - (iii) development of placenta
 - (iv) secretion of estrogen
- (a) (i) and (ii) (b) (ii) and (iii)
 - (c) (iii) and (iv) (d) (i) and (iv)

26. The correct sequence of organs in the male reproductive system for transport of sperms is

- (a) testis → vas deferens → urethra
- (b) testis → ureter → urethra
- (c) testis → urethra → ureter
- (d) testis → vas deferens → ureter

27. Which among the following diseases is not sexually transmitted?

- (a) Syphilis
- (b) Hepatitis
- (c) HIV - AIDS
- (d) Gonorrhoea

28. In a bisexual flower inspite of the young stamens being removed artificially, the flower produces fruit. Provide a suitable explanation for the above situation.

29. Can you consider cell division as a type of reproduction in unicellular organism? Give one reason.

30. What is a clone? Why do offsprings formed by asexual reproduction exhibit remarkable similarity?

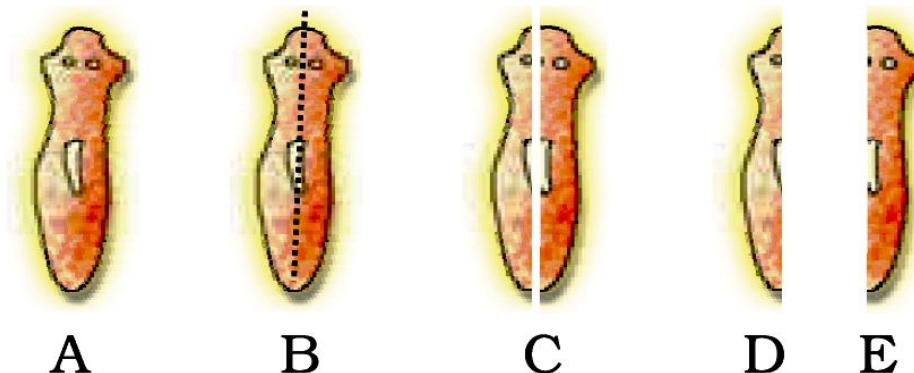
31. Explain how, offspring and parents of organisms reproducing sexually have the same number of chromosomes?

32. Colonies of yeast fail to multiply in water, but multiply in sugar solution. Give one reason for this.

33. Why does bread mould grow profusely on a moist slice of bread rather than on a dry slice of bread?

34. Give two reasons for the appearance of variations among the progeny formed by sexual reproduction.

35. Would a *Planaria* cut vertically into two halves regenerate into two individuals? Complete the below Figure D and E by indicating the regenerated regions.



36. From the internet, gather information about the chromosome numbers of five animals and five plants. Correlate the number with the size of organism and answer the following questions.

- (a) Do larger organisms have more number of chromosomes/cells?
- (b) Can organism with fewer chromosomes reproduce more easily than organisms with more number of chromosomes?
- (c) More the number of chromosomes/cells greater is the DNA content. Justify.

37. In tobacco plant, the male gametes have twenty four chromosomes. What is the number of chromosomes in the female gamete? What is the number of chromosomes in the zygote?

38. Why cannot fertilisation take place in flowers if pollination does not occur?

39. Is the chromosome number of zygote, embryonal cells and adult of a particular organism always constant? How is the constancy maintained in these three stages?

40. Where is the zygote located in the flower after fertilization?

41. Reproduction is linked to stability of population of a species. Justify the statement.

42. How are general growth and sexual maturation different from each other?

43. Trace the path of sperm during ejaculation and mention the gland and their functions associated with the male reproductive system.

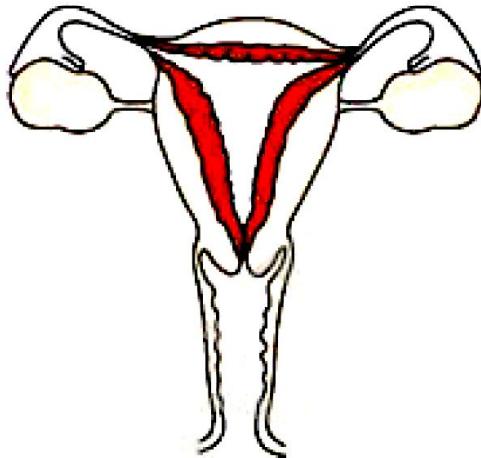
44. What changes are observed in the uterus if fertilisation does not occur?

45. What changes are observed in the uterus subsequent to implantation of young embryo?

46. What are the benefits of using mechanical barriers during sexual act?

47. In the given below Figure label the parts and mention their functions

- (a) Production of egg
- (b) Site of fertilisation
- (c) Site of implantation
- (d) Entry of the sperms



- 48.** What would be the ratio of chromosome number between an egg and its zygote? How is the sperm genetically different from the egg?
- 49.** Why are budding, fragmentation and regeneration all considered as asexual types of reproduction? With neat diagrams explain the process of regeneration in *Planaria*.
- 50.** Write two points of difference between asexual and sexual types of reproduction. Describe why variations are observed in the offspring formed by sexual reproduction.
- 51.** Distinguish between pollination and fertilisation. Mention the site and product of fertilisation in a flower.
- 52.** Draw a neat, labelled diagram of a pistil showing pollen tube growth and its entry into the ovule.
- 53.** Distinguish between a gamete and zygote. Explain their roles in sexual reproduction.
- 54.** Draw the diagram of a flower and label the four whorls. Write the names of gamete producing organs in the flower.
- 55.** What is placenta? Mention its role during pregnancy?
- 56.** What are various ways to avoid pregnancy? Elaborate any one method.
- 57.** What are placenta? Explain its structure and function.
- 58.** How does fertilisation take place? Fertilisation occurs once in a month. Comment.
- 59.** Reproduction is essentially a phenomenon that is not for survival of an individual but for the stability of a species. Justify.
- 60.** Describe sexually transmitted diseases and mention the ways to prevent them.

CHAPTER – 9

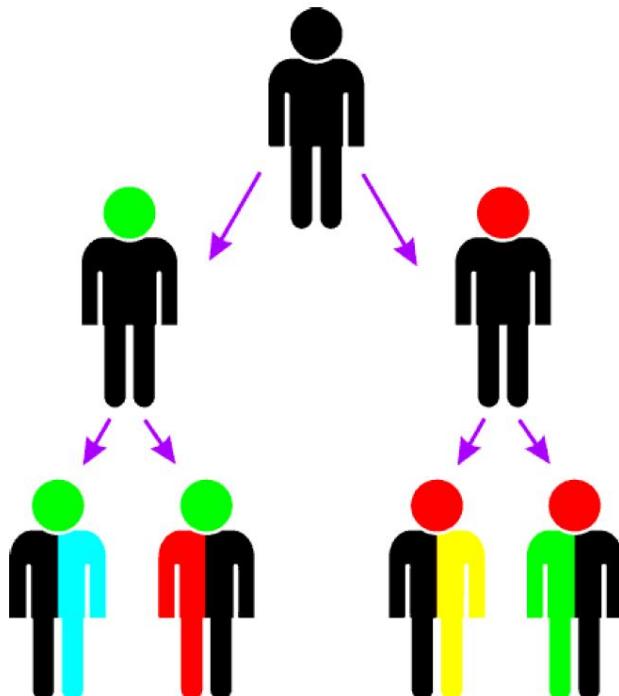
HEREDITY AND EVOLUTION

ACCUMULATION OF VARIATION DURING REPRODUCTION

By virtue of being the progeny of the parent, the progeny individual, need not just be the replica of what its parents are. (Inheritance of characters from the parents to the progeny (i.e. , Heredity) ensures the passing of the parental characters to the progeny). The difference or change in the characteristics between the individuals is called Variation. Human population shows a great deal of variation.

Inheritance from the previous generation provides both a common basic body design, and subtle changes in it, for the next generation. The second generation will have differences that they inherit from the first generation, as well as newly created differences.

The below figures shows Creation of diversity over succeeding generations. The original organism at the top will give rise to, say, two individuals, similar in body design, but with subtle differences. Each of them, in turn, will give rise to two individuals in the next generation. Each of the four individuals in the bottom row will be different from each other. While some of these differences will be unique, others will be inherited from their respective parents, who were different from each other.



INTEXT QUESTIONS PAGE NO. 143

Q1. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?

Ans: Trait 'B'.

Percentage of any gene in a population increases from generation to generation.

Q2. How does the creation of variations in a species promote survival?

Ans:

During reproduction (also inaccuracies in DNA replications), many variations occur in the offspring. Some individuals have more favourable variations than the other. Such individuals

survive and pass these variations on their progeny. For example, let us consider the population of beetles. Due to certain conditions, a colour arises during reproduction so that one beetle is green in colour (instead of red). This beetle can pass this colour to its progeny. Crows now cannot see these green-coloured beetles on green leaves and hence, their population becomes more than that of red-coloured beetles.

HEREDITY

The progeny produced through the reproductive process is similar to its parents, in body design, function etc., The rules of heredity determine the process by which the traits and the characteristics are relatively inherited.

“The inheritance of characteristics through generation is called heredity”

The inheritable characteristics may be morphological/anatomical/physiological/ reproductive and are also known as traits.

If we take a very close look at the rules of inheritance, both father and mother contribute equal amount of genetic material to the child. This means that each trait can be influenced by both paternal and maternal genetic material – i.e., DNA.

RULES FOR THE INHERITANCE OF TRAITS – MENDEL’S CONTRIBUTIONS

Gregor Johann Mendel (1822-1884) worked out the first ever scientific experimental study on heredity.

Mendel, an Austrian Augustinian monk observed variations in the characteristics of garden pea plant (*Pisum sativum*) which he had cultivated in his monastery garden. Mendel was curious to find out the results of crossing of pea plants with the variation in traits. The visible contrasting characters that Mendel observed in the garden pea plants were given below:

Seed shape - Round/Wrinkled

Character Dominant trait



Seed shape
Round

Recessive trait



Wrinkled

Seed colour - Yellow/Green

Character Dominant trait



Seed colour
Yellow

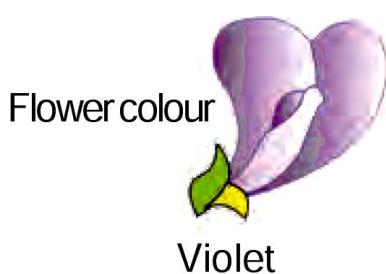
Recessive trait



Green

Flower colour - Violet / White

Character Dominant trait



Recessive trait



Pod shape - Full / Constricted

Character Dominant trait

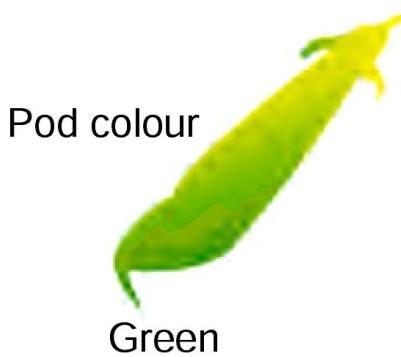


Recessive trait



Pod colour - Green / Yellow

Character Dominant trait

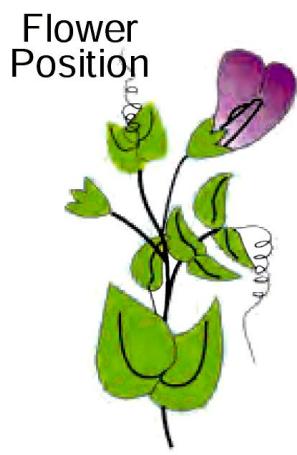


Recessive trait

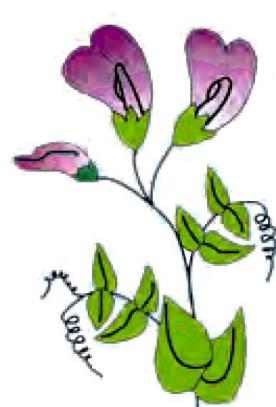


Flower position - Axillary / Terminal

Character Dominant trait



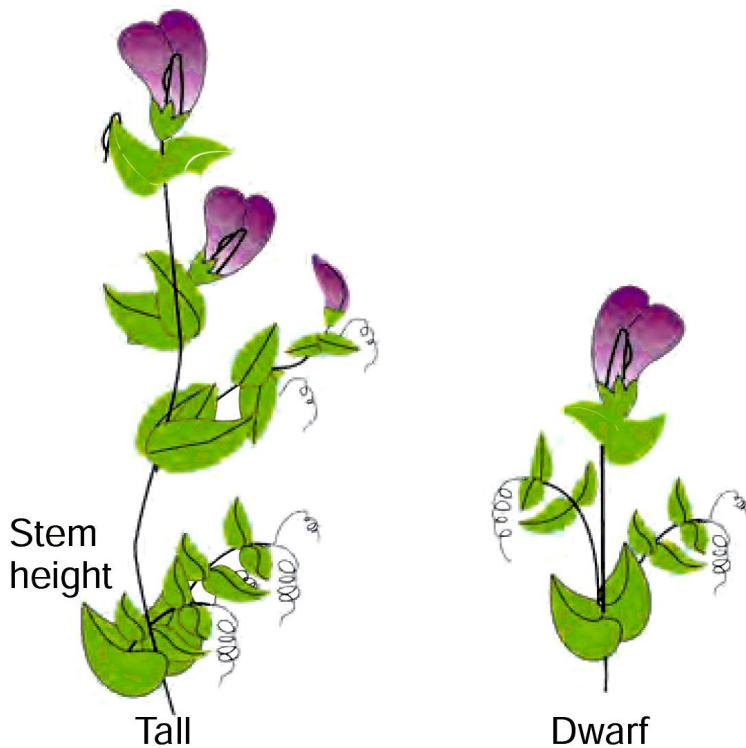
Recessive trait



Stem height - Tall / Dwarf

Character Dominant trait

Recessive trait



MENDEL'S MONOHYBRID CROSS

Mendel selected the garden pea plant, *Pisum sativum* for his experiments. He selected tall and dwarf plants and allowed them to grow naturally. As pea plants produce seeds only by self pollination, he observed that tall plants produced always tall plants generation after generation under natural condition. Similarly, dwarf plants produced always dwarf plants generation after generation. Hence, he termed the tall and dwarf plants as wild types or pure breeding varieties.

Then he crossed a tall plant with a dwarf plant, produced progeny and calculated the percentage of tallness and dwarfness in subsequent generations. When a pure breeding tall plant was crossed with a pure breeding dwarf plant, all plants were tall in the first filial generation (F1) i.e., there was not any medium height plants or dwarf plants.

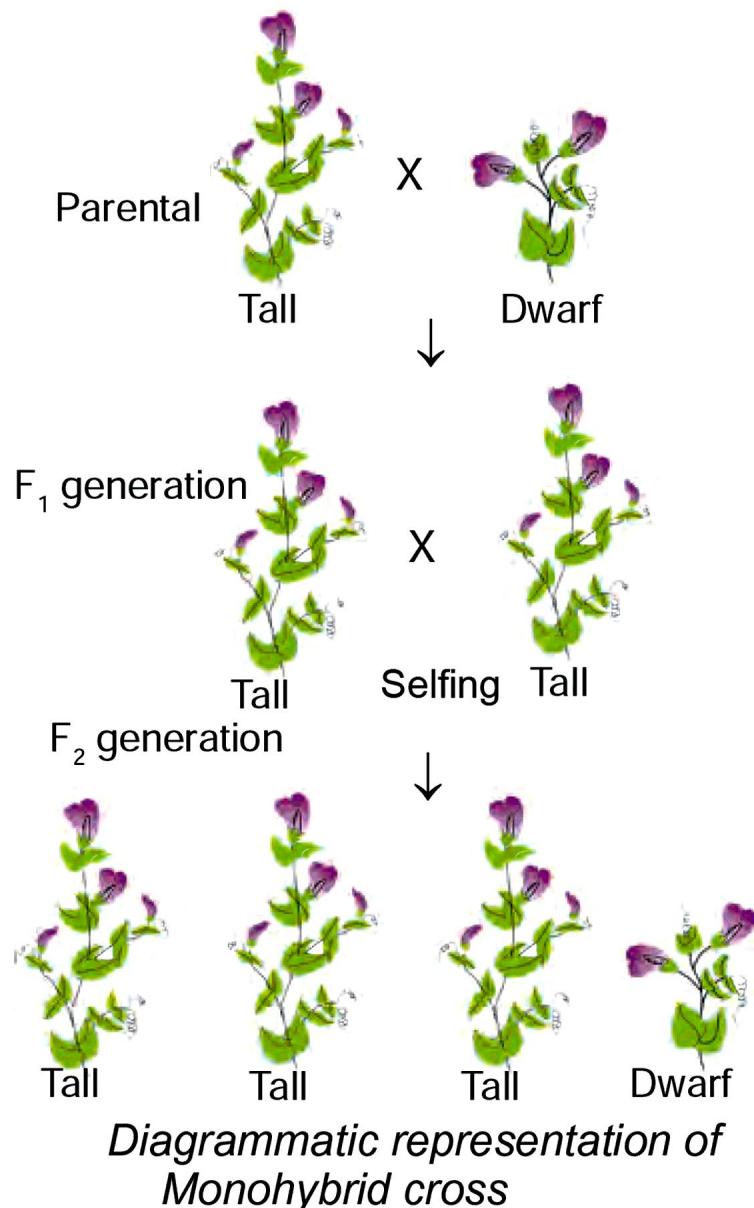
This means that only one of the parental traits were seen and not the mixture of the two. When such a F1 tall plant was allowed to have self pollination, both the tall and dwarf plants appeared in second filial generation (F2). in the ratio of 3:1.

This indicates that both tallness and dwarfness were inherited in the F1 plants but only tallness trait was expressed.

The first experiment of Mendel considering the inheritance of a single trait (Height of the plant Tall/Dwarf) is called Monohybrid Cross.

Expression of morphological characters as tall or dwarf plant, violet or white flower is called Phenotype.

The expression of gene (or Chromosomal make up) of an individual for a particular trait is called Genotype.



POINTS TO REMEMBER:

- ☞ **Heredity:** The passing of traits from the parents to offspring is called heredity. **Genotype:** The complete set of genes in an organism's genome is called genotype.
- ☞ **Phenotype:** The observable characters in an organism make the phenotype. Phenotype is a result of genotype's interaction with the environment. Due to this reason, many phenotypes are not inheritable.
- ☞ **Acquired Traits:** Traits; which are acquired due to interaction with the environment; are called acquired traits. Acquired traits are not inheritable.
- ☞ **Inheritable Traits:** Traits; which can be expressed in subsequent generations; are called inheritable traits. Such traits bring a change in the genotype of the organism and hence become inheritable.

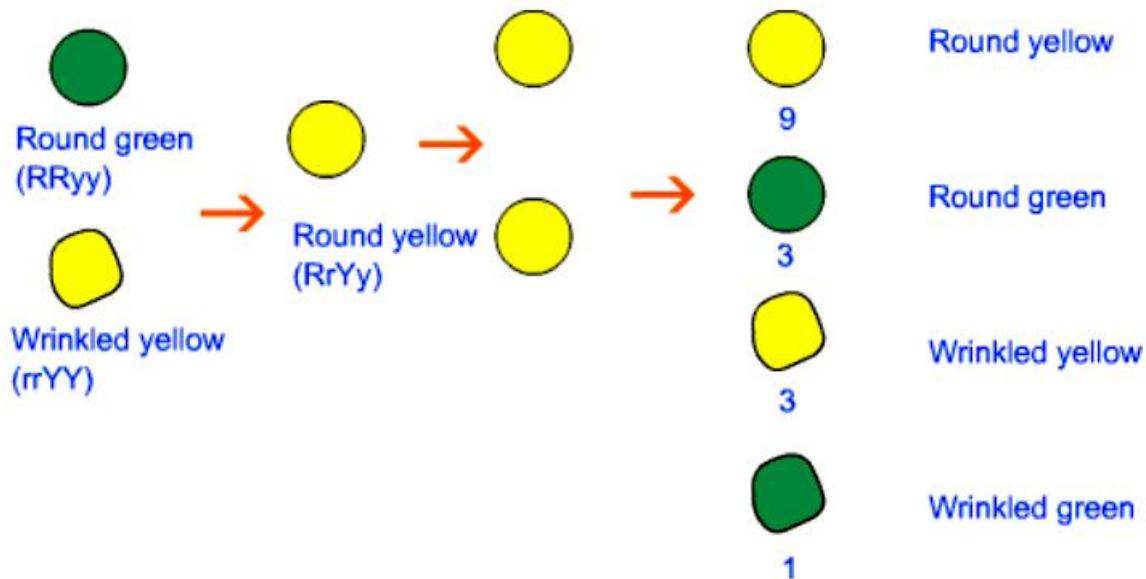
MENDEL'S FIRST LAW

Law of Segregation: Every individual possesses a pair of alleles for a particular trait. During gamete formation, a gamete receives only one trait from the alleles. A particular trait can be dominant or recessive in a particular generation.

DIHYBRID CROSS

The cross in which two pairs of characters are studied is called dihybrid cross. In his second experiment, Mendel used dihybrid cross.

Let us take example between plants with round and green seeds and those with wrinkled and yellow seeds. The genotype of round and green seeds is shown by $RRyy$ and that of wrinkled and yellow seeds is shown by $rrYY$. In the F1 generation, all plants produced round and yellow seeds; which means that wrinkled texture was the recessive character and so was the green colour of seeds. When plants of F1 generation were allowed to self pollinate; it was observed that most of the plants in F2 generation produced round and yellow seeds. Some plants produced round green seeds, some produced wrinkled yellow seeds and some produced wrinkled green seeds. The ratio was 9 : 3 : 3 : 1; as shown in the below figure.



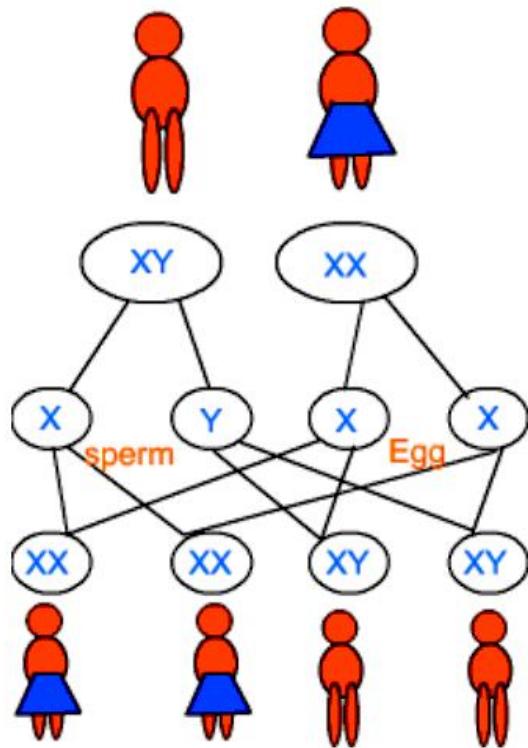
MENDEL'S SECOND LAW:

Law of Independent Assortment: Alleles of different characters separate independent from each other during gamete formation.

In the above example; alleles of texture were assorted independently from those of seed colour.

SEX DETERMINATION IN HUMANS:

Somatic cells in human beings contain 23 pairs of chromosomes. Out of them the 23rd pair is composed of different types of chromosomes which are named as X and Y chromosomes. The 23rd pair contains one X and one Y chromosome in a male. On the other hand, the 23rd pair in a female contains X chromosomes. This means that all the eggs would have X chromosome as the 23rd chromosome, while a sperm may have either X or Y chromosome as the 23rd chromosome. When a sperm with X chromosome fertilizes the egg, the resulting zygote would develop into a female child. When a sperm with Y chromosome fertilizes the egg, the resulting zygote would develop into a male child.

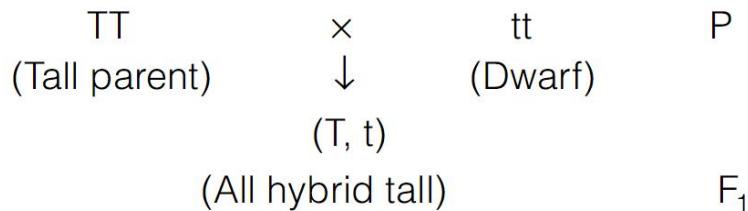


INTEXT QUESTIONS PAGE NO. 147

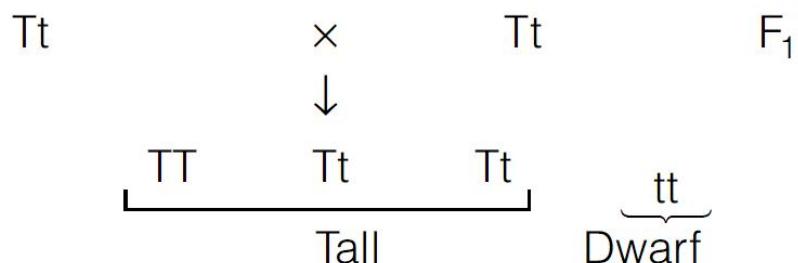
Q1. How do Mendel's experiments show that traits may be dominant or recessive?

Ans:

Mendel crossed a pure tall pea plant (TT) with pure dwarf pea plant (tt) and observed that all the progeny were hybrid tall (Tt), i.e., only one of the trait was able to express itself in the F_1 generation, which is the **dominant trait**. The other trait called the **recessive trait** remain suppressed.



However, when he self crossed plants of F_1 generation, he observed that **one fourth** of the plants were dwarf and three fourth were tall.



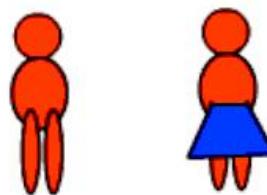
Q2. How do Mendel's experiments show that traits are inherited independently?

Ans: Please refer the above section **DIHYBRID CROSS**

Q3. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits – blood group A or O – is dominant? Why or why not?

Ans:

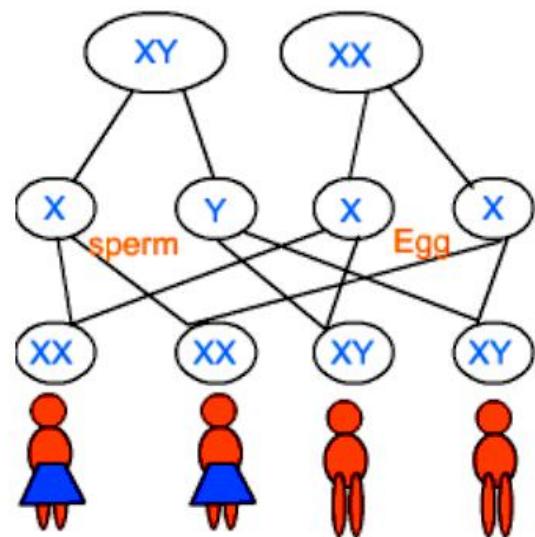
This shows that blood group 'O' is dominant and 'A' is recessive because blood group 'O' was able to express itself in heterozygous condition, due to which the progeny had blood group 'O'.



Q4. How is the sex of the child determined in human beings?

Ans:

Somatic cells in human beings contain 23 pairs of chromosomes. Out of them the 23rd pair is composed of different types of chromosomes which are named as X and Y chromosomes. The 23rd pair contains one X and one Y chromosome in a male. On the other hand, the 23rd pair in a female contains X chromosomes. This means that all the eggs would have X chromosome as the 23rd chromosome, while a sperm may have either X or Y chromosome as the 23rd chromosome. When a sperm with X chromosome fertilizes the egg, the resulting zygote would develop into a female child. When a sperm with Y chromosome fertilizes the egg, the resulting zygote would develop into a male child.



EVOLUTION

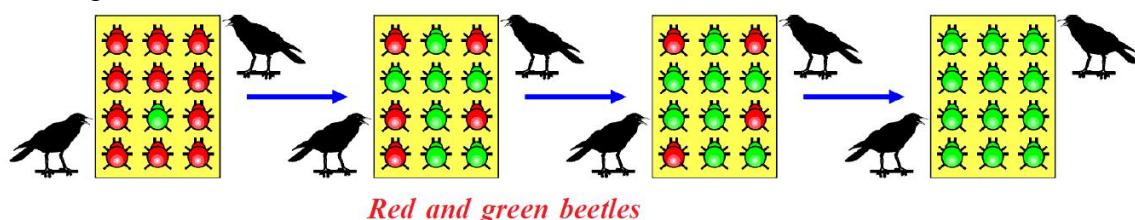
The change in inherited traits in biological population over subsequent generations is called evolution. Scientists have proven that life evolved in the form of simple unicellular organisms on this earth; and all the organisms which are present today have evolved from a common ancestor. The idea of evolution is based on the premise of a common ancestry.

Let us consider a group of twelve beetles. They live in bushes on green leaves. Their population will grow by sexual reproduction. So they were able to generate variations in population. Let us assume crows eat these red beetles. If the crows eat more Red beetles their population slowly reduced.

Let us think of different situations.

Situation-1:

In this situation a colour variation arises during reproduction. So that there appears one beetle that is green in colour instead of red.



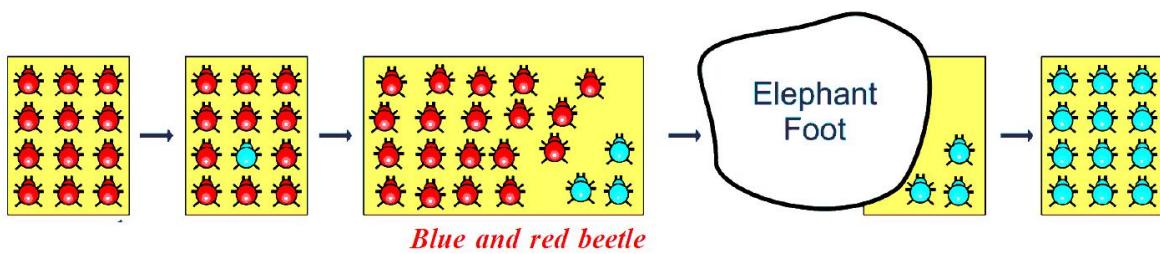
Moreover this green coloured beetle passes its colour to its off spring (Progeny). So that all its progeny are green. Crows cannot see the green coloured beetles on green leaves of the bushes and therefore crows cannot eat them. But crows can see the red beetles and eat them. As a result there are more and more green beetles than red ones which decrease in their number.

The variation of colour in beetle 'green' gave a survival advantage to 'green beetles' than red beetles. In other words it was naturally selected.

We can see that the 'natural selection' was exerted by the crows. The more crows there are, the more red beetles would be eaten and the more number of green beetles in the population would be. Thus the natural selection is directing evolution in the beetle population. It results in adaptation in the beetle population to fit in their environment better.

Situation-2:

In this situation a colour variation occurs again in its progeny during reproduction, but now it results in 'Blue' colour beetles instead of 'red' colour beetle. This blue colour beetle can pass its colour to its progeny. So that all its progeny are blue.



Crows can see blue coloured beetles on the green leaves of the bushes and the red ones as well. And therefore crows can eat both red and blue coloured beetles. In this case there is no survival advantage for blue coloured beetles as we have seen in case of green coloured beetles.

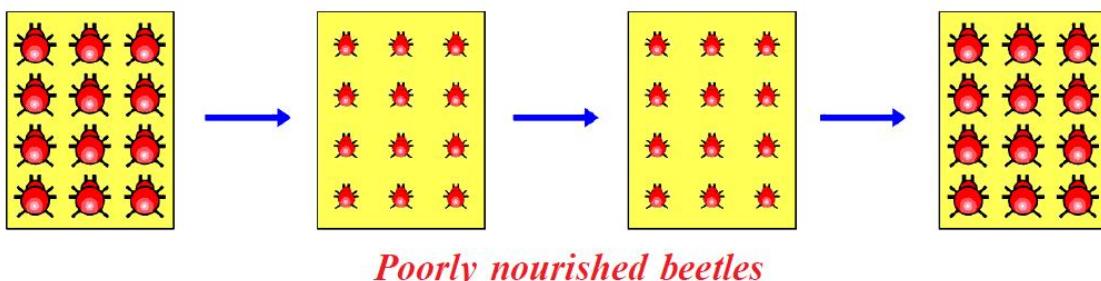
What happens initially in the population, there are a few blue beetles, but most are red. Imagine at this point an elephant comes by and stamps on the bushes where the beetles live. This kills most of the beetles. By chance the few beetles survived are mostly blue. Again the beetle population slowly increases. But in the beetle population most of them are in blue colour.

Thus sometimes accidents may also result in changes in certain characters of the a population. Characters as we know are governed by genes. Thus there is change in the frequency of genes

in small populations. This is known as “Genetic drift”, which provides diversity in the population.

Situation-3:

In this case beetles population is increasing, but suddenly bushes were affected by a plant disease in which leaf material were destroyed or in which leaves are affected by this beetles got less food material. So beetles are poorly nourished. So the weight of beetles decrease but no changes take place in their genetic material (DNA). After a few years the plant disease are eliminated. Bushes are healthy with plenty of leaves.



ACQUIRED AND INHERITED CHARACTERS AND EVOLUTION

The germ cells of sexually reproducing population are formed in specialised reproductive tissue. If the weight of the beetles is reduced because of starvation, that will not change the DNA of the germ cells. Therefore, low weight is not a trait that can be inherited by progeny of a starving beetle. Therefore even if some generations of beetles lose their weight because of starvation, that is not an example of evolution, since the change is not inherited over generations. Change in non reproductive tissues cannot be passed on to the DNA of the germ cells. Therefore the experiences of an individual during its lifetime cannot be passed on to its progeny, and cannot direct evolution.

DARWIN'S THEORY OF EVOLUTION:

Charles Darwin wrote his famous book ‘Origin of Species’. He threw new insights on evolution of species. Some salient points of Darwin’s theory are as follows:

Organisms have unlimited capacity to reproduce:

Organisms can reproduce offspring at a fast pace. This is necessary for survival, because a higher number of offspring ensures that at least some of them could survive. Each organism has to struggle for its day to day survival. For example; a frog lays thousands of eggs at one go. The spawn is released in water and it is left to fend for itself. Most of the eggs are either washed away or are eaten by predators. However, some portion of eggs from the spawn develops into tadpoles. Once again, many tadpoles are eaten up by predators; leaving a few which develop into adults. It is evident, that a large number of eggs is needed to ensure that at least some of them develop into adults.

Natural Selection:

Different individuals of a particular species have different traits. Those with more suitable traits are selected by the nature. Each organism needs a particular trait for finding food and finding a mate. Those with better traits are finally able to pass on their traits to the next generation.

Survival of the Fittest:

Those organisms which are the fittest are able to survive, while others perish. That is how many species become extinct and some species continue to evolve over a period of time.

MOLECULAR ORIGIN OF LIFE:

Stanley L. Miller and Harold C. Urey, conducted the Miller-Urey experiment in 1953 to demonstrate how the life would have originated on the earth. They created an environment in laboratory which mimicked the environment of earth as it was during the time of origin of life. Water, methane, ammonia and hydrogen were used in that experiment. The liquid was heated to initiate evaporation and electrodes were used to create electric discharge. At the end of two weeks, some organic molecules were formed in the setup. Some amino acids and sugar were also formed. This proved the hypothesis of J. B. S. Haldane that life originated from inorganic raw materials.

INTEXT QUESTIONS PAGE NO. 150

Q1. What are the different ways in which individuals with a particular trait may increase in a population?

Ans:

There are different ways in which an individual with a particular trait may increase in a population

- ☞ When a colour variation arise during reproduction, it can pass the colour on to its progeny which may protect them from prey.
- ☞ Accidents in small population can change the frequency of some genes in a population even if they give no survival advantage.
- ☞ Poor nourishment may reduce the population of individuals but when nourishment conditions improve the population starts increasing again.

Thus, the maturation, adaptation to environment and natural selection may increase a particular trait in a population.

Q2. Why are traits acquired during the life-time of an individual not inherited?

Ans:

Traits acquired during the life-time of an individual just enable an individual to adapt itself to the surrounding and do not change the genetic make up of the organism. Only those variations are inherited, which come into the germ cell of the organism.

Q3. Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics?

Ans:

Small numbers of surviving tigers are a cause of worry from the point of genetics because their loss would cause a loss of gene pool, *i.e.*, many genes will be eliminated from a gene pool.

SPECIATION

The process of origin of a new species is called speciation. A species is a group of organisms in which most of the characters are similar and members of a species are able to breed among themselves. Speciation can happen if two groups of the same species are somehow prevented from interbreeding for several generations. This can happen because of geographical segregation or because of some genetic changes. Evolution of new species, because of geographical segregation is called genetic drift.

INTEXT QUESTIONS PAGE NO. 151

Q1. What factors could lead to the rise of a new species?

Ans:

Genetic drift and natural selection could lead to rise of a new species.

Q2. Will geographical isolation be a major factor in the speciation of a selfpollinating plant species? Why or why not?

Ans:

No, geographical isolation is not a major factor in the formation of new species of self-pollinated plants. This is because self-pollinated plants receive pollen grains from the same flower or another flower on the same plant and its distance from other plants hardly affects its reproduction. Moreover, self-pollinated plants rarely, show variations in characters.

Q3. Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually? Why or why not?

Ans:

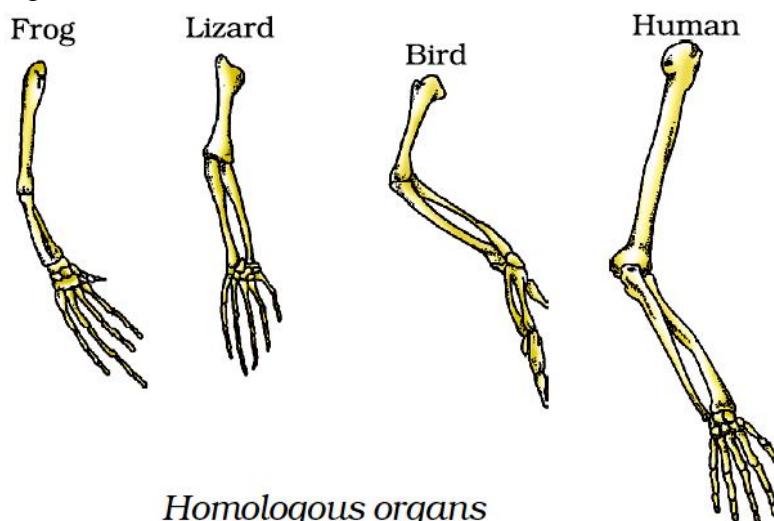
No, because asexual reproduction involves only a single parent. So, the geographical isolation do not affect its reproduction cycle. Moreover, asexually reproducing organisms rarely show any variations in characters.

EVOLUTION AND CLASSIFICATION

The modern system of classification is based on evolutionary relationship. Due to this, this is also known as phylogenetic classification. The kingdom is the highest taxa, while the species is the lowest taxa. Members of a species have a higher number of common characters, than members of a kingdom. For example; all human beings belong to the species *Homo sapiens*. Human beings can interbreed; irrespective of their race or skin colour. All human beings come under the class mammalia; as do the monkeys, elephants and cows. Apparently, each species of the class mammalian is quite different yet they have certain common characters; like hairs on the body and mammary glands in females. Similarly, all animals are eukaryotes and cell wall is absent in their cells. The degree of similarity or dissimilarity shows that all animals have evolved from a common ancestor.

HOMOLOGOUS ORGANS

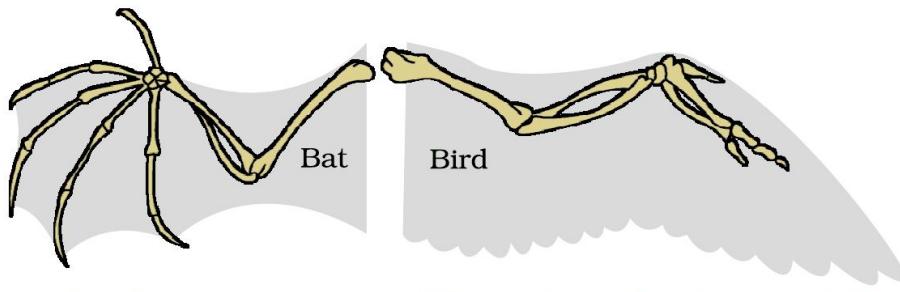
Organs which have common design but serve different functions in different animals are called homologous organs. For example; the forelimbs of all tetrapods are composed of humerus, radio-ulna, tarsals and metatarsals. Yet, the forelimbs of frogs are adapted to a jumping movement, those of birds are used for flying and those of humans are used for handling tools. This shows that frogs, birds and humans have evolved from a common ancestor.



ANALOGOUS ORGANS

Organs which have different design but serve a common function in different animals are called analogous organs. Wings of birds and wings of bat are good examples of a pair of analogous organs. Wings of birds are composed of all the bones of forelimb and are covered

with feathers. Wings of bats are mainly composed of the digital bones and a thin membrane covering the structure. Yet wings in both the organisms are used for flying.



Analogous organs – The wing of a bat and the wing of a bird

FOSSILS

The preserved remains of animals or plants or other organisms from the distant past are called fossils. Fossils provide the evidence that the present animal have originated from previously existing ones through the process of continuous evolution. Fossils can be used to reconstruct evolutionary history of an organism. The distribution pattern of fossils shows that the ancient fossils present in the bottom rocks are simple, while the most recent fossils found in the upper strata are more highly evolved. It means fossils form and become more and more complex as we proceed from earliest to recent rocks. It gives us an idea of time in history when different species were formed or became extinct. Fossil also helps to trace the evolutionary history of some animals. Fossils also indicate connecting link between the two groups of organisms. For example, *Archaeopteryx* is a connecting link between reptiles and birds.

INTEXT QUESTIONS PAGE NO. 156

Q1. Give an example of characteristics being used to determine how close two species are in evolutionary terms.

Ans:

Homologous organs, analogous organs, vestigial organs, etc.

Q2. Can the wing of a butterfly and the wing of a bat be considered homologous organs? Why or why not?

Ans:

Butterfly belongs to phylum–Arthropoda which have chitinous exoskeleton. The bat belongs to class–Mammalia which have wings of skin. Thus, both butterfly and bat are not homologous but analogous in wing structure, *i.e.*, have similar functions not similar structure.

Q3. What are fossils? What do they tell us about the process of evolution?

Ans:

The preserved remains of animals or plants or other organisms from the distant past are called fossils.

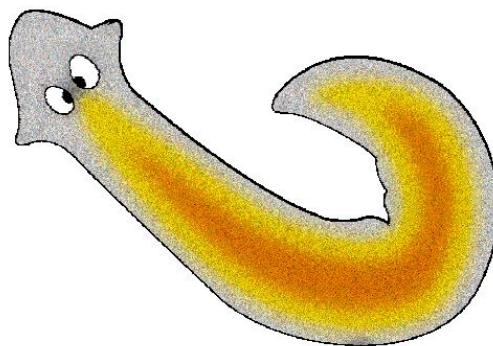
- ☞ Fossils provide the evidence that the present animal have originated from previously existing ones through the process of continuous evolution.
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EVOLUTION BY STAGES

Evolution of complex organs and thus of complex organisms has happened in stages. Let us take the example of evolution of eyes. Planaria is the first animal which shows 'eye' like structure. The dark spots on planaria are light sensitive spots but a planaria cannot distinguish between two different objects. Eyes of insects are compound eyes which are made up of thousands of optical surfaces. Eyes of higher animals are simple eyes which are composed of a single lens. Most of the animals cannot differentiate among colours. Depth perception is also weak in many animals. Human eyes are the most advanced; because humans can recognize colours and have very good depth perception.

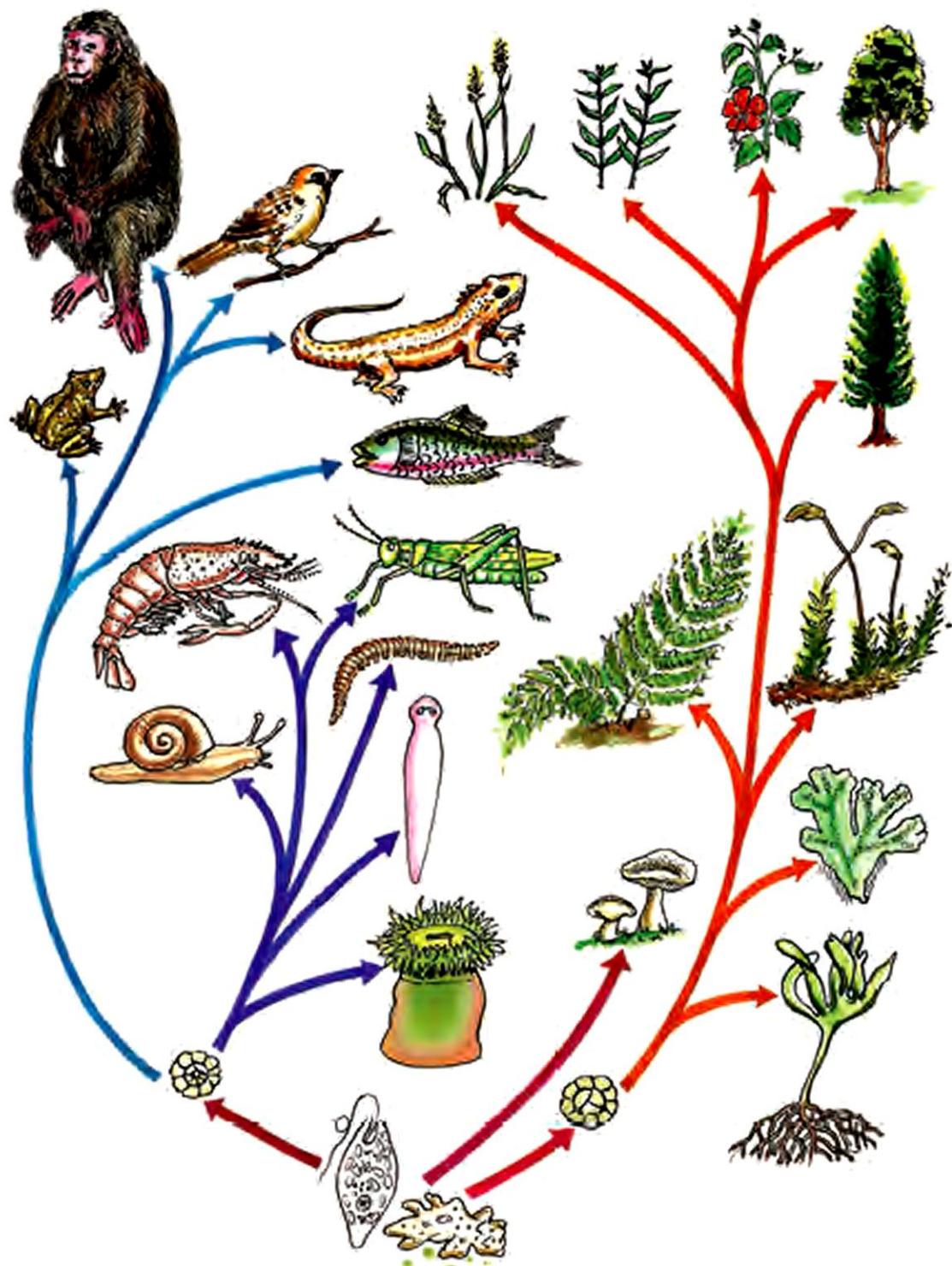
Most of the tetrapods have to use all the four limbs for locomotion. Some apes can walk up to smaller distances by using just the hind limbs. Humans have finally evolved the bipedal walking.



A flatworm named Planaria has very simple 'eyes' that are really just eye-spots which detect light.

EVOLUTION TREE

To understand evolution, a branching diagram or "Tree" is used to show the inferred evolution, relationships, among various biological species or other entities based upon similarities and differences in their physical and genetical characters. (see the below figure).



EVOLUTION vs PROGRESS

Evolution does not mean progress in every case. This can be proved by example of bacteria. Bacteria are the simplest and one of the oldest organisms on the earth. Their simple body design does not make them weak from any angle. Bacteria are known to survive some of the harshest climates; like craters of volcanoes and sulfur springs. Many animals have certain features which hamper even their routine activities. For example; the branch-like horns of antelope are a handicap for them. When an antelope runs for its life; there are times when its horns get entangled in branches or bushes. This results in the death of the antelope. Colourful feathers of a male peacock are very good when it comes to attract a female. But because of its

conspicuous feathers, it can be easily spotted by a predator. Because of its bulky feather it cannot fly away to safety.

HUMAN EVOLUTION

The modern humans are called *Homo sapiens*. Many scientific investigations have shown that the modern humans evolved in Africa. They migrated towards north; in due course of time and settled near what is known as the Mediterranean Sea. When the ice age ended, melting of ice resulted in the increase in water level. The humans migrated in different directions from that area. One branch went to the western Asia, then to the Indian Peninsula and finally to Australia. From the Indian Peninsula, a branch migrated towards China and subsequently to the North America. From North America, the humans migrated to the South America. From the Mediterranean Sea, the second branch migrated towards Europe; where they are believed to replace the Neanderthals.

Human evolution is the evolutionary process leading up to the appearance of a modern human being. We the present human beings are also have an evolutionary history like plant and other animals. Early man like forms appeared about 7 lakhs 50 thousand years ago. The first sure fossil of our own species of man the *Homosapiens*, indicate that true man appeared on the earth 2 lakhs 50 thousand years ago.

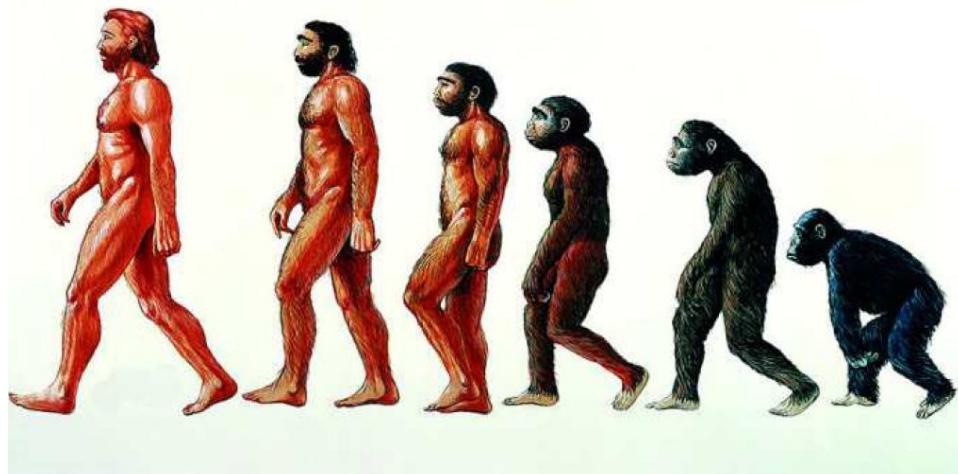
Evolution of man through ages:

Homo habilis lived between 1.6 - 2.5 million years ago.

Homo erectus lived between 1 - 1.8 million years ago.

Homo sapiens neanderthalensis lived between 2,30,000 - 3,00,000 thousands years ago.

Homo sapiens (present man) appeared about 40 thousand years ago.



Human evolution

There is a great diversity in human forms and features across the planet. So that for a long time, people used to talk about human 'races'. Skin colour used to be the commonest way of identifying the so called races. Some were called black, some white or brown. Over recent years, the evidence has become very clear. There is no biological basis to the notion of human races. All humans are a single species with a common ancestor.

INTEXT QUESTIONS PAGE NO. 158

Q1. Why are human beings who look so different from each other in terms of size, colour and looks said to belong to the same species?

Ans:

All human beings, even though they have different size, colour and looks, belong to the same species because they have similar DNA sequences and have descended from same ancestors. Also, they are capable of reproducing among themselves. These variations may have arisen due to environmental factors, mutation and mixing of characters during reproduction.

Q2. In evolutionary terms, can we say which among bacteria, spiders, fish and chimpanzees have a 'better' body design? Why or why not?

Ans:

Evolution is the generation of diversity due to environmental selection. More and more body designs have emerged over time. Among bacteria, spiders, fish and chimpanzees, we can say that the chimpanzees have a better body design because of a more complex body design. Various organisms evolve in their own separate ways to give rise to the current forms and have a basic difference in their body design because of specialization of all types and tissues. The chimpanzees are best adapted to survive the present day conditions and have proper division of labour in their body, *i.e.*, they have different organs for performing different vital functions inside the body.

For example, respiratory, excretory, circulatory and nervous system, etc.

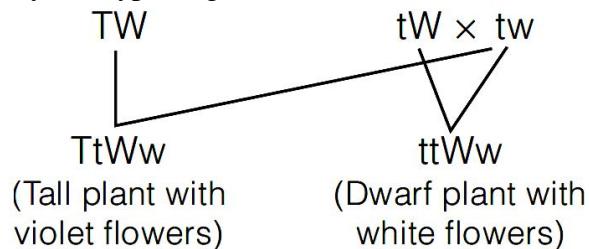
EXERCISE QUESTIONS PAGE NO. 159

Q1. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as

- (a) TTWW
- (b) TTww
- (c) TtWW
- (d) TtWw

Ans: (c) TtWW.

Parent with genotype TtWW produce two types of gametes TW and tW, while the other with genotype ttww produce only one type of gamete 'tw'



Q2. An example of homologous organs is

- (a) our arm and a dog's fore-leg.
- (b) our teeth and an elephant's tusks.
- (c) potato and runners of grass.
- (d) all of the above.

Ans: (a)

Our arms and a dog's fore-leg is the example of homologous organs.

Q3. In evolutionary terms, we have more in common with

- (a) a Chinese school-boy.
- (b) a chimpanzee.
- (c) a spider.
- (d) a bacterium.

Ans: (a)

A Chinese school-boy because both have almost similar DNA.

Q4. A study found that children with light-coloured eyes are likely to have parents with light-coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

Ans:

From this study, we cannot make any inference whether light eye colour trait is recessive or dominant, because as both the parents have light colour eye, all the children will definitely have light colour eye (though certain variations may occur.)

Q5. How are the areas of study – evolution and classification – interlinked?

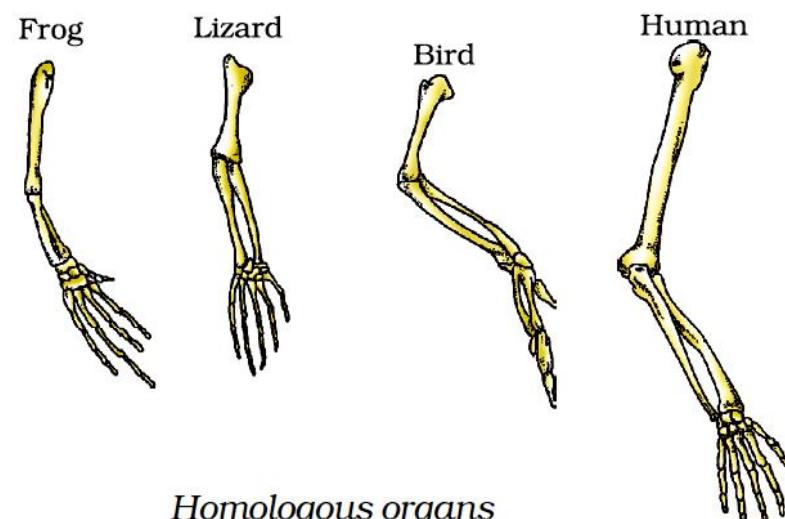
Ans:

The study of classification of various organisms give us idea about the evolutionary history of an organisms. Organism which have certain similar characteristics are placed in one group. It can be thus concluded that the organisms placed in one group may have evolved from common ancestors and may have common evolutionary history.

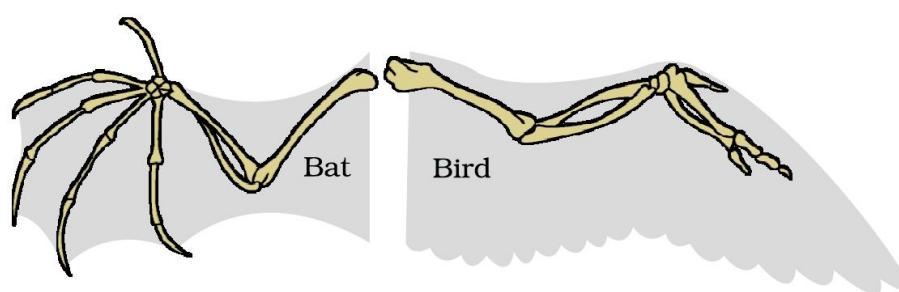
Q6. Explain the terms analogous and homologous organs with examples.

Ans:

Homologous organs have the same basic structure and origin but perform different functions. For example, the forelimb of a frog, a bird and a man have the same basic design of bones, but they perform different functions (frog use them to jump, birds use them to fly and man use them to grasp).



Analogous organs have different basic structure and origin but have similar appearance and perform similar functions, e.g., wings of insects and wings of birds have different basic structure as the wings of insect is a fold of membrane and wings of a bird are modified forelimbs.



Q7. Outline a project which aims to find the dominant coat colour in dogs.

Ans:

Coat colour 'T' is a dominant factor and white colour 't' is recessive.

TT	\times	tt	
Coat colour		White colour	
	↓		
All coat coloured		Tt	
	t t		
T	Tt	Tt	Gametes
T	Tt	Tt	

Q8. Explain the importance of fossils in deciding evolutionary relationships.

Ans:

The preserved remains of animals or plants or other organisms from the distant past are called fossils.

- ☞ Fossils provide the evidence that the present animal have originated from previously existing ones through the process of continuous evolution.
- ☞ Fossils can be used to reconstruct evolutionary history of an organism. The distribution pattern of fossils shows that the ancient fossils present in the bottom rocks are simple, while the most recent fossils found in the upper strata are more highly evolved. It means fossils form and become more and more complex as we proceed from earliest to recent rocks.
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- ☞ Fossils also indicate connecting link between the two groups of organisms.
- ☞ For example, *Archaeopteryx* is a connecting link between reptiles and birds.

Q9. What evidence do we have for the origin of life from inanimate matter?

Ans:

Life must have developed from the simple inorganic molecules which were present on Earth soon after it was formed. Conditions on Earth could have given rise to more complex organic molecules that were necessary for life. The first primitive organism would have arisen from further chemical synthesis. The organic molecules were assembled in an atmosphere similar to that thought to exist on early Earth over water. This was maintained at a temperature just below 100°C and sparks were passed through the mixture of gases to stimulate lightning. At the end, carbon was converted to simple compounds of carbon including amino acids which make up protein molecules. This experiment set up demonstrates that life originated from inorganic molecules.

Q10. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

Ans:

Sexual reproduction involves fusion of gametes. The offsprings show variations from their parents due to crossing over and exchange of gene segments. They are not carbon copies of their parents, due to recombination of parental genes and produce better offsprings. Also, due to environmental factors certain favourable variations are also produced. Due to production of variations, sexually reproducing animals show very quick evolution.

Whereas in asexual reproduction, organisms raised are the exact copies of parents. They rarely show any variation.

Q11. How is the equal genetic contribution of male and female parents ensured in the progeny?

Ans:

The male and female reproductive cells divide by meiosis to form haploid gametes. These gametes have equal genetic material. The zygote is formed by the fusion of male and female gamete, *i.e.*, it has equal genetic contribution from male and female parents. The individual is developed from the zygote these after.

Q12. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

Ans:

All the variations in a species do not have equal chances of surviving in the environment. Depending on the nature of variations different individuals would have different kinds of advantages. Selection of variants by environmental factors forms the basis of evolutionary process. The variations which confer disadvantages to an individual organism will not survive because the environmental factor cannot support this.

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ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 9
HEREDITY AND EVOLUTION

- 1.** What is heredity?
- 2.** Name the plant on which Mendel performed his experiments?
- 3.** Define variation?
- 4.** Define a gene?
- 5.** Who proposed the theory of inheritance of acquired characters?
- 6.** State one of the evolutionary forces leading to the origin of a new species according to the synthetic theory of evolution.
- 7.** Give an example of a vestigial organ present in human body.
- 8.** What is the evolutionary significance of the fossil Archaeopteryx?
- 9.** Who proposed the double helical model of DNA? Answer: Watson and Crick.
- 10.** Who proposed the theory of natural selection? Answer: Charles Darwin.
- 11.** What is retro virus?
- 12.** What is a genetically modified organism (GMO)?
- 13.** Name any two genetic diseases.
- 14.** Write the expanded form of DNA?
- 15.** What are the components of chromosome?
- 16.** What is a retrovirus?
- 17.** What is sex chromosome?
- 18.** How is sex determined in human beings?
- 19.** What do you understand by evolution?
- 20.** Define homologous organs?
- 21.** Explain Darwin's theory of evolution?
- 22.** Define genetics. What is the contribution of Mendel in this branch of biology?
- 23.** Where are the genes located? What is the chemical nature of gene?
- 24.** During which stage of cell division can chromosome be seen? Write the features of prokaryotic and eukaryotic chromosome.
- 25.** Who provided the evidence of DNA as a genetic material? Write the names of components of DNA?
- 26.** What do you understand by the double helical structure of DNA? Who proposed this structure?
- 27.** Describe the different types of chromosomes.
- 28.** How many types of nitrogenous bases are present in DNA? Name them.

- 29.** How do embryological studies provide evidence for evolution?
- 30.** Define evolution. And Describe the contribution of Lamarck?
- 31.** What are homologous organs? How do they provide evidence in support of evolution?
- 32.** Define the following terms? (i) Vestigial organs (ii) Analogous organs.
- 33.** What are transgenic organisms? Which property of DNA is used as a tool in genetic engineering?
- 34.** Explain how the sex of the child is determined at the time of conception in human beings.
- 35.** One of the examples of two analogous organs can be the wing of parrot and
- a) Flippers of whale.
 - c) Foreleg of horse
 - b) Front leg of frog
 - d) Wing of housefly
- 36.** Mention the ways by which variant genotypes are produced in organism?
- 37.** In human beings blue eye colour is recessive to brown eye colour. If a brown eyed man has a blue eyed mother then find
- a) What are the possible genotypes of his father?
 - b) What is the genotype of the man and his mother?
- 38.** What are fossils? Of what interest are fossils to the evolutionary biologists?
- 39.** Who isolated DNA for the first time from pus cells?
- 40.** Why is DNA called polynucleotide?
- 41.** Name two purine nitrogenous bases found in a DNA molecule.
- 42.** Who put forward the double helical model of DNA?
- 43.** What are the three chemically essential parts of nucleotides constituting a DNA?
- 44.** Guinea pig having black colour when crossed with guinea pig having same colour produced 80 offspring, out of which 60 were black and 20 were white. Now, find out: (a) What is the possible genotype of the guinea pigs?
- (b) Which trait is dominant and which trait is recessive?
 - (c) What is this cross called as and what is its phenotypic ratio?
- 45.** Distinguish between acquired and inherited traits giving one example of each.
- 46.** Why did Mendel chosen pea plant for his experiments?
- 47.** Cat's paw, human hand and horse's legs-are these organs homologous or analogous? Give reason
- 48.** Wings of bird and wings of insect-are these organs homologous or analogous? Give one suitable reason to support your answer.
- 49.** Give one difference between eyes and eye spot. Which animal possesses eye spots?

- 50.** Give one difference between artificial selection and natural selection.
- 51.** What is true- humans have evolved from chimpanzees or humans and chimpanzees both have evolved from a common ancestor?
- 52.** What is the mechanism behind the expression of a particular trait? explain briefly.
- 53.** What will happen to the expression of a particular trait if a gene get altered?
- 54.** What are various ways by which genes can enter a population?
- 55.** How will new species arise in case:
- (a) Two sub-populations are separated due to a huge mountain in between them?
 - (b) A small population of individuals gets drifted away from the main land due to sea?
- 56.** Only advantageous variations help in the evolution of an organism giving rise to a new species. Explain with the help of an example.
- 57.** A trait may be inherited, but may not be expressed." Justify this statement with the help of a suitable example.
- 58.** (a). What is genetics?
- (b). Give the common name of plant on which Mendel performed his experiments. (c). What for did Mendel use the term factors and what are these factors called now. (d). What are genes? Where are the genes located?
- 59.** It is a matter of chance whether a couple will give birth to a male child or a female child." Justify this statement with the help of a flow chart showing the fusion of sex chromosomes.
- 60.** What are homologous organs? How do they provide evidence in support of evolution?
- 61.** Who provided the evidence of DNA as a genetic material? Write the names of components of DNA? How many types of nitrogenous bases are present in DNA? Name them.
- 62.** Name the two homologous structures in vertebrates. Why are they so called? How do such organs help in understanding an evolutionary relationship?
- 63.** Will geographical isolation be a major factor in the speciation of a self-pollination plant species? Why or why not?
- 64.** What are vestigial organs? Name any two vestigial organs in man and name organ which is vestigial in man but not in birds.
- 65.** All dead organisms do not leave their fossil records, but in some cases their fossils are formed. How do these fossils records form a direct evidence of past happenings?
- 66.** Evolution is a process in which simple life forms change into complex life forms by gradual changes. But, there is a difference between chemical and organic evolution. Differentiate by giving three points.
- 67.** There are a number of ways by which the genes enter a population. Explain briefly the three ways.

- 68.** Why can the wings of a bird and the wings of a bat not be considered analogous? (Imp.)
- 69.** How did the Mendelian 'factors' acquire a change in the terminology? Who changed it?
- 70.** What is palaeontology? What is its importance? (Imp.)
- 71.** The genotype of green stemmed tomato plants is denoted as GG and that of purple stemmed tomato plants is denoted as gg. When these two are crossed with each other: (a) What colour of stem would you expect in the F1 progeny?
(b) Give the percentage of purple stemmed plants if F1 plants are self pollinated.
(c) In what ratio would you find the genotypes GG and gg in the progeny?
Draw flow chart in support of your answer.
- 72.** How has the method of artificial selection by humans helped in the evolution of different vegetables? Explain in brief giving an example.
- 73.** (a) Write two factors which could lead to the rise of a new species.
(b) (i) What is the scientific term of the organs shown below? (ii) How do these organs provide evidence in support of evolution?
- 74.** (a) Name the type of sex chromosome present in human male and human female.
(b) With the help of a flow chart determine genetically in human beings the sex of the offspring if a sperm carrying Xchromosome fertilizes the egg?
- 75.** In pea plant round seed is dominant over the wrinkled. If a cross is carried between these two plants, give answer to the following questions.
(a) Mention the genes for the traits of parents.
(b) State the trait of F1 hybrids.
(c) Write the ratio of F2 progeny obtained from this cross. What is the name of the cross?
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- 76.** Give appropriate terms for the following :
(a) The trait which can express itself in next generation.
(b) The trait an organism have due to inheritance.
(c) Origin of a new species from pre-existing one.
- 77.** If a pure tall pea plant is crossed with a pure dwarf plant, then in the first generation only tall plants appear.
(a) What happens to the traits of the dwarf plant?
(b) In the second generation, the dwarf trait reappears. Why?
- 78.** How was it established that genes are located on the chromosomes?
- 79.** Clarify the terms 'haploid' and 'diploid'. What is the relation between the two terms?
- 80.** Explain the law of segregation by taking an example.

- 81.** If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same species, which trait is likely to have arisen earlier?
- 82.** How does creation of variations in a species promote survival?
- 83.** 'Variations that confer an advantage to an individual organism only will survive in a population.' Justify.
- 84.** Suggest three similarities between Mendel's 'factors' and 'chromosomes'.
- 85.** Justify logically that many genes are present on one chromosome.
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ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 9
HEREDITY AND EVOLUTION

1. Exchange of genetic material takes place in
 - (a) vegetative reproduction
 - (b) asexual reproduction
 - (c) sexual reproduction
 - (d) budding
2. Two pink coloured flowers on crossing resulted in 1 red, 2 pink and 1 white flower progeny. The nature of the cross will be
 - (a) double fertilisation
 - (b) self pollination
 - (c) cross fertilisation
 - (d) no fertilisation
3. A cross between a tall plant (TT) and short pea plant (tt) resulted in progeny that were all tall plants because
 - (a) tallness is the dominant trait
 - (b) shortness is the dominant trait
 - (c) tallness is the recessive trait
 - (d) height of pea plant is not governed by gene 'T' or 't'
4. Which of the following statement is incorrect?
 - (a) For every hormone there is a gene.
 - (b) For every protein there is a gene.
 - (c) For production of every enzyme there is a gene.
 - (d) For every molecule of fat there is a gene
5. If a round, green seeded pea plant (RR yy) is crossed with wrinkled, yellow seeded pea plant, (rr YY) the seeds produced in F1 generation are
 - (a) round and yellow
 - (b) round and green
 - (c) wrinkled and green
 - (d) wrinkled and yellow
6. In human males all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are
 - (i) large chromosome
 - (ii) small chromosome

- (iii) Y-chromosome
 - (iv) X-chromosome
 - (a) (i) and (ii) (b) (iii) only
 - (c) (iii) and (iv) (d) (ii) and (iv)
- 7.** The maleness of a child is determined by
- (a) the X chromosome in the zygote
 - (b) the Y chromosome in zygote
 - (c) the cytoplasm of germ cell which determines the sex
 - (d) sex is determined by chance
- 8.** A zygote which has an X-chromosome inherited from the father will develop into a
- (a) boy
 - (b) girl
 - (c) X- chromosome does not determine the sex of a child
 - (d) either boy or girl
- 9.** Select the incorrect statement
- (a) Frequency of certain genes in a population change over several generations resulting in evolution
 - (b) Reduction in weight of the organism due to starvation is genetically controlled
 - (c) Low weight parents can have heavy weight progeny
 - (d) Traits which are not inherited over generations do not cause evolution
- 10.** New species may be formed if
- (i) DNA undergoes significant changes in germ cells
 - (ii) chromosome number changes in the gamete
 - (iii) there is no change in the genetic material
 - (iv) mating does not take place
- (a) (i) and (ii) (b) (i) and (iii)
 - (c) (ii), (iii) and (iv) (d) (i), (ii) and (iii)
- 11.** Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F1 progeny that have round, yellow (RrYy) seeds. When F1 plants are selfed, the F2 progeny will have new combination of characters. Choose the new combination from the following
- (i) Round, yellow
 - (ii) Round, green
 - (iii) Wrinkled, yellow
 - (iv) Wrinkled, green

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

12. A basket of vegetables contains carrot, potato, radish and tomato. Which of them represent the correct homologous structures?

- (a) Carrot and potato
- (b) Carrot and tomato
- (c) Radish and carrot
- (d) Radish and potato

13. Select the correct statement

- (a) Tendril of a pea plant and phylloclade of *Opuntia* are homologous
- (b) Tendril of a pea plant and phylloclade of *Opuntia* are analogous
- (c) Wings of birds and limbs of lizards are analogous
- (d) Wings of birds and wings of bat are homologous

14. If the fossil of an organism is found in the deeper layers of earth, then we can predict that

- (a) the extinction of organism has occurred recently
- (b) the extinction of organism has occurred thousands of years ago
- (c) the fossil position in the layers of earth is not related to its time of extinction
- (d) time of extinction cannot be determined

15. Which of the following statements is not true with respect to variation?

- (a) All variations in a species have equal chance of survival
- (b) Change in genetic composition results in variation
- (c) Selection of variants by environmental factors forms the basis of evolutionary processes.
- (d) Variation is minimum in asexual reproduction

16. A trait in an organism is influenced by

- (a) paternal DNA only
- (b) maternal DNA only
- (c) both maternal and paternal DNA
- (d) neither by paternal nor by maternal DNA

17. Select the group which shares maximum number of common characters

- (a) two individuals of a species
- (b) two species of a genus
- (c) two genera of a family
- (d) two genera of two families

18. According to the evolutionary theory, formation of a new species is generally due to

- (a) sudden creation by nature
- (b) accumulation of variations over several generations
- (c) clones formed during asexual reproduction
- (d) movement of individuals from one habitat to another

19. From the list given below, select the character which can be acquired but not inherited

- (a) colour of eye
- (b) colour of skin
- (c) size of body
- (d) nature of hair

20. The two versions of a trait (character) which are brought in by the male and female gametes are situated on

- (a) copies of the same chromosome
- (b) two different chromosomes
- (c) sex chromosomes
- (d) any chromosome

21. Select the statements that describe characteristics of genes

- (i) genes are specific sequence of bases in a DNA molecule
 - (ii) a gene does not code for proteins
 - (iii) in individuals of a given species, a specific gene is located on a particular chromosome
 - (iv) each chromosome has only one gene
- (a) (i) and (ii) (b) (i) and (iii)
 - (c) (i) and (iv) (d) (ii) and (iv)

22. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F₂ is

- (a) 1 : 3
- (b) 3 : 1
- (c) 1 : 1
- (d) 2 : 1

23. The number of pair (s) of sex chromosomes in the zygote of humans is

- (a) one
- (b) two
- (c) three
- (d) four

24. The theory of evolution of species by natural selection was given by

- (a) Mendel (b) Darwin

(c) Morgan (d) Lamarck

25. Some dinosaurs had feathers although they could not fly but birds have feathers that help them to fly. In the context of evolution this means that

- (a) reptiles have evolved from birds
- (b) there is no evolutionary connection between reptiles and birds
- (c) feathers are homologous structures in both the organisms
- (d) birds have evolved from reptiles

26. State one advantage of variation of a species. [2009]

27. What is the effect of DNA copying which is not perfectly accurate on the reproduction process? [2008]

28. What decides that humans give rise to humans? (Imp.)

29. What are hereditary characteristics?

30. Are the variations created by sexual reproduction heritable or non-heritable? (Imp.)

31. What are the components of a chromosome? (Imp.)

32. What is a retrovirus?

33. What is a sex chromosome?

34. How many chromosomes are there in a human ovum?

35. Who coined the term 'factor'? (Imp.)

36. Give the monohybrid ratio.

37. Write the dihybrid ratio.

38. Define the term 'speciation'.

39. What is a factor?

40. Name the most accepted theory of evolution.

41. Define the term 'evolution'.

42. Whose theory influenced Darwin? What did Darwin fail to explain? (Imp.)

43. Define 'recessive characteristic'.

44. What is the basis of sex determination in most plants and animals? (Imp.)

45. What are fossils? What do they tell about the process of evolution? [2008]

46. What do you understand by the term heredity? [2008]

47. What constitutes the link between one generation and the next? [2008]

48. "The sex of the children is determined by the what they inherit from their father and not from the mother." Justify. [2008]

49. Explain the terms analogous and homologous organs with one example of each. [2008]

- 50.** A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits "blood group A or O" is dominant? Why? [2008]
- 51.** Define variation in relation to a species. Why is variation beneficial to the species? [2008]
- 52.** Describe briefly four ways in which individuals with a particular trait may increase in a population. [2008]
- 53.** What are acquired characteristics? (Imp.)
- 54.** What is variation?
- 55.** Why is variation less common in asexually reproducing organisms?
- 56.** Clarify the term heredity and variation. (Imp.)
- 57.** Define variation in relation to a species. Why is variation beneficial to the species? (Imp.)
- 58.** What are autosomes?
- 59.** What is the reason that a male is called 'heterogametic'? (Imp.)
- 60.** What was the basic study material of Mendel? How did he bring in the term 'factor'?
- 61.** Why are the traits acquired during lifetime of an individual not inherited? [2009]
- 62.** How is the sex of a newborn determined in humans?
- 63.** Do genetic combination of mothers play a significant role in determining the sex of a newborn?
- 64.** Mention three important features of fossils which help in the study of evolution.
- 65.** Why do all the gametes formed in human females have an X chromosome?
- 66.** In human beings, the statistical probability of getting either a male or female child is 50 : 50. Give a suitable explanation.
- 67.** A very small population of a species faces a greater threat of extinction than a larger population. Provide a suitable genetic explanation.
- 68.** What are homologous structures? Give an example. Is it necessary that homologous structures always have a common ancestor?
- 69.** Does the occurrence of diversity of animals on earth suggest their diverse ancestry also? Discuss this point in the light of evolution.
- 70.** Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive (i) yellow seed (ii) round seed
- 71.** Why did Mendel choose pea plant for his experiments?
- 72.** A woman has only daughters. Analyse the situation genetically and provide a suitable explanation.
- 73.** Does geographical isolation of individuals of a species lead to formation of a new species? Provide a suitable explanation.

- 74.** Bacteria have a simpler body plan when compared with human beings. Does it mean that human beings are more evolved than bacteria? Provide a suitable explanation.
- 75.** All the human races like Africans, Asians, Europeans, Americans and others might have evolved from a common ancestor. Provide a few evidences in support of this view.
- 76.** Differentiate between inherited and acquired characters. Give one example for each type.
- 77.** Give reasons why acquired characters are not inherited.
- 78.** Evolution has exhibited a greater stability of molecular structure when compared with morphological structures. Comment on the statement and justify your opinion.
- 79.** Give the basic features of the mechanism of inheritance.
- 80.** Give reasons for the appearance of new combinations of characters in the F₂ progeny.
-

CHAPTER – 15

OUR ENVIRONMENT

Environment: Our surrounding is called environment.

Living organisms live in different surroundings. Some plants and animals completely live in water and some others live on land.

Man also leads life in different surroundings. Some live in cities, some in towns and some in villages.

Plants, animals, human beings survive with the interaction between them and the non-living things like air, water and land.

Human beings depend on the resources of nature. These resources include soil, water, coal, electricity, oil, gas, etc. These resources improve the life style of human beings.

Environmental science can be defined as the study of organisms in relation to their surrounding.

Human activities related to livelihood and welfare generate waste. All wastes are pollutants and they create pollution in one way or another. Air, land and water surroundings are affected due to improper disposal of wastes which create an imbalance in the environment.

Pollution: Any undesirable change in the physical, chemical or biological characteristics of air, land and water that affect human life adversely is called pollution.

Pollutant: A substance released into the environment due to natural or human activity which affects adversely the environment is called pollutant. e.g. Sulphur-di-oxide, carbon-monoxide, lead, mercury, etc.

CLASSIFICATION OF WASTES

1. Bio-degradable wastes
2. Non-bio-degradable wastes

Substances that are broken down by biological process of biological or microbial action are called bio-degradable waste. e.g. wood, paper and leather.

Substances that are not broken down by biological or microbial action are called non-bio-degradable wastes. e.g. Plastic substances and mineral wastes.

INTEXT QUESTIONS PAGE NO. 257

Q1. Why are some substances biodegradable and some non-biodegradable?

Ans:

Some substances such as metal, glass, plastic, etc. which cannot be decomposed by the living organisms are non-biodegradable wastes. These substances are non-biodegradable because the micro-organisms do not have enzymes that can digest these substances. Therefore, we classify them as non-biodegradable wastes. Other substances such as paper, vegetable wastes, etc. that can be easily broken down by enzymes are biodegradable wastes.

Q2. Give any two ways in which biodegradable substances would affect the environment.

Ans:

(i) Biodegradable substances act as a medium to return back the nutrients to the environment.

(ii) Their degradation may release certain gases in the atmosphere thereby polluting the environment.

Q3. Give any two ways in which non-biodegradable substances would affect the environment.

Ans:

- (i) They make the environment poisonous and unfit for survival.
- (ii) They block the transfer of energy and minerals in the ecosystem.

ECO-SYSTEM — WHAT ARE ITS COMPONENTS?

A community of organisms that interact with one another and with the environment is called an ecosystem.

An ecosystem has two types of components, viz. biotic component and abiotic component.
Producers, consumers and decomposers are biotic factors.

ABIOTIC COMPONENT

All the non-living things make the abiotic component of an ecosystem. Air, water and soil are the abiotic components.

- ☛ Air provides oxygen (for respiration), carbon dioxide (for photosynthesis) and other gases for various needs of the living beings.
- ☛ Water is essential for all living beings because all the metabolic activities happen in the presence of water.
- ☛ Soil is the reservoir of various nutrients which are utilised by plants. Through plants, these nutrients reach other living beings.

BIOTIC COMPONENT

All living beings make the biotic component of an ecosystem.

- ☛ Green plants play the role of producers; because they prepare the food by photosynthesis.
- ☛ Animals and other living beings play the role of consumers; because they take food (directly or indirectly) from plants.
- ☛ Bacteria and fungi play the role of decomposers; as they decompose dead remains of plants and animals so that raw materials of organisms can be channelized back to the environment.

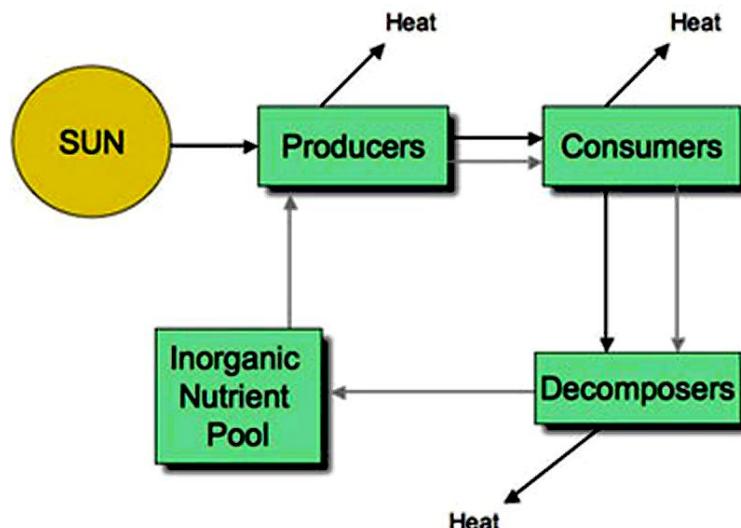


Fig. Flow of energy in an ecosystem

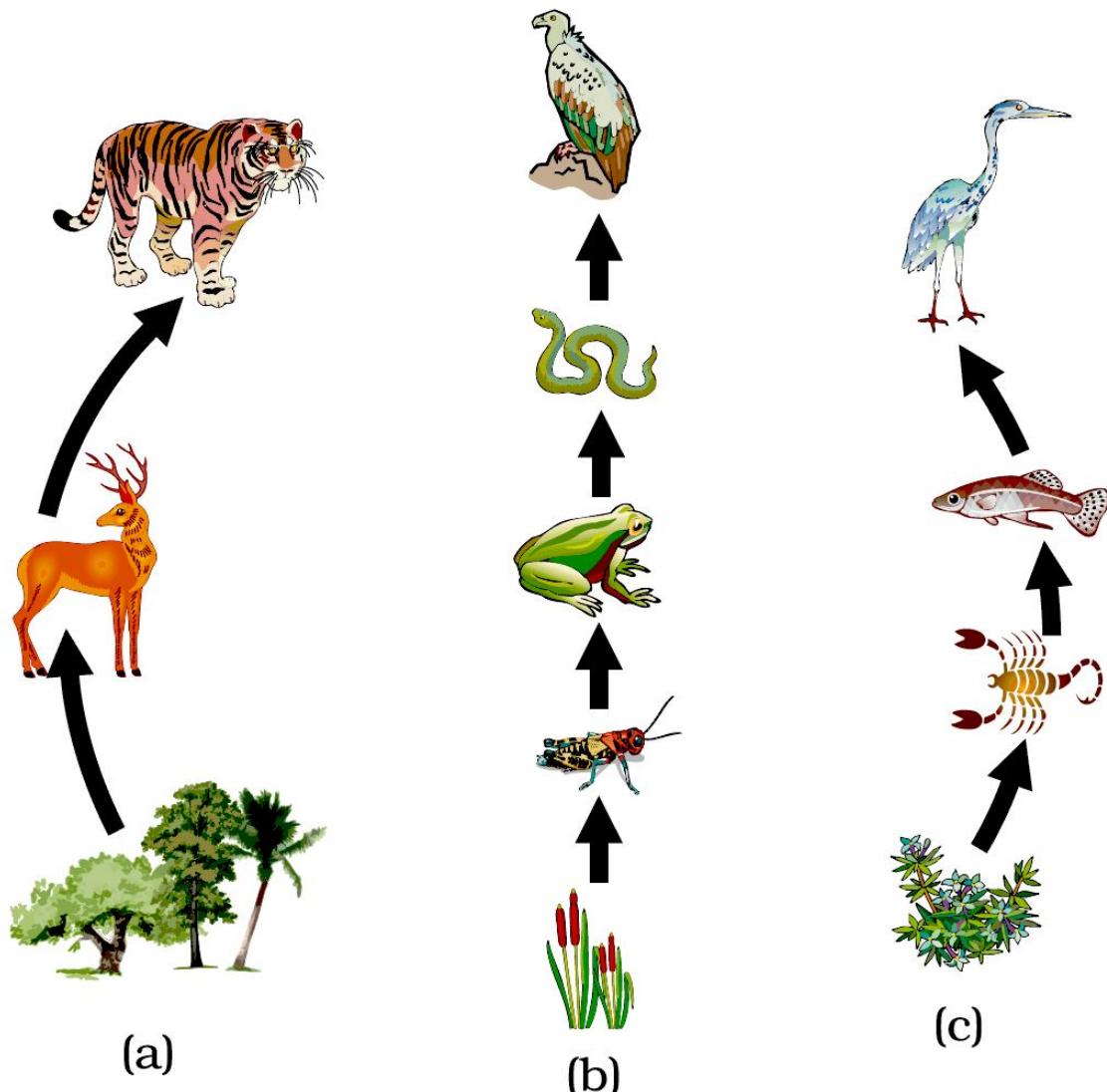
BALANCE IN ECO-SYSTEM

A balanced ecosystem is an ecological community together with its environment and functioning as a complex unit. An ecosystem is maintained by the balance in nature such as the balance between hawks and mice, if hawk population is larger than the mice population, then it is not balanced. They are balanced between resources like a banana tree and monkeys. If the banana trees stop growing, the monkeys won't get bananas.

An ecosystem maintains the balance between the number of resources and the number of users or the balance between prey and predators.

FOOD CHAIN AND FOOD WEB

The ultimate source of this energy is the sun. Producers like green plants trap solar energy and convert it into the chemical energy of food. When a primary consumer eats the producer, a part of this energy is passed on to it.



The primary consumer is then eaten by a secondary consumer. And the secondary consumer may be eaten by a tertiary consumer, and so on. In this way energy gets transferred from one consumer to the next higher level of consumer. A series of organisms through which food energy flows in an ecosystem is called a food chain. It may also be defined as follows.

“A food chain in an ecosystem is a series of organisms in which each organism feeds on the one below it in the series.”

In a forest ecosystem, grass is eaten by a deer, which in turn is eaten by a tiger. The grass, deer and tiger form a food chain. In this food chain, energy flows from the grass (producer) to the deer (primary consumer) to the tiger (secondary consumer) [see figure (a)].

A food chain in a grassland ecosystem may consist of grasses and other plants, grasshoppers, frogs, snakes and hawks [see figure (b)].

In a freshwater aquatic ecosystem like a pond, the organisms in the food chain include algae, small animals, insects and their larvae, small fish, big fish and a fish-eating bird or animal [see figure (c)].

A food chain always begins with producers. Herbivores (plant-eaters) come next in the chain. They are consumed by carnivores (flesh-eaters). A few food chains can be long and may extend to the fourth, fifth or even sixth order of consumers.

Some common food chains are mentioned below:

Plants → Deer → Lion

Plants → Worm → Bird → Cat

Plants → Grasshopper → Frog → Snake → Hawk

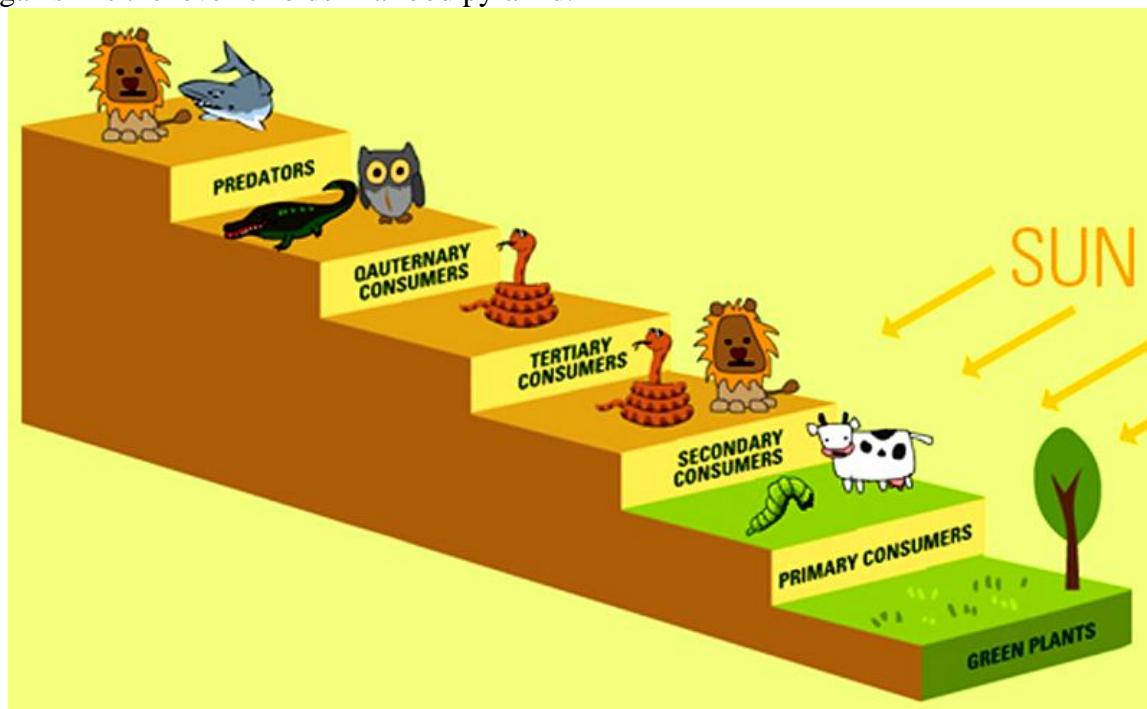
Algae → Small animal → Small fish → Big fish → Bird

FOOD WEB

A food web is a graphical depiction of feeding connections among species of an ecological community. Food web consists of food chains of a particular ecosystem. The food web is a illustration of various methods of feeding that links the ecosystem. The food web also defines the energy flow through species of a community as a result of their feeding relationships. All the food chains are interconnected and overlapping within an ecosystem and they make up a food web. It increases the stability of ecosystem. It provides other source of food and allows the endangered species to grow.

TROPHIC LEVELS OF FOOD CHAINS

The levels of a food chain (food pyramid) is called **Trophic levels**. The trophic level of an organism is the level it holds in a food pyramid.



- ☞ The sun is the source of all the energy in food chains. Green plants, usually the first level of any food chain, absorb some of the Sun's light energy to make their own food by photosynthesis. Green plants (autotrophs) are therefore known as 'Producers' in a food chain.
- ☞ The second level of the food chains is called the Primary Consumer. These consume the green plants. Animals in this group are usually herbivores. Examples include insects, sheep, caterpillars and even cows.
- ☞ The third in the chain are Secondary Consumers. These usually eat up the primary consumers and other animal matter. They are commonly called carnivores and examples include lions, snakes and cats.
- ☞ The fourth level is called Tertiary Consumers. These are animals that eat secondary consumers.
- ☞ Quaternary Consumers eat tertiary consumers.
- ☞ At the top of the levels are Predators. They are animals that have little or no natural enemies. They are the 'bosses' of their ecosystems. Predators feed on prey. A prey is an animal that predators hunt to kill and feed on. Predators include owls, snakes, wild cats, crocodiles and sharks. Humans can also be called predators.
- ☞ When any organism dies, detritivores (like vultures, worms and crabs) eat them up. The rest are broken down by decomposers (mostly bacteria and fungi), and the exchange of energy continues. Decomposers start the cycle again.

ENERGY FLOW IS UNIDIRECTIONAL AND REQUIRES CONTINUOUS INPUTS.

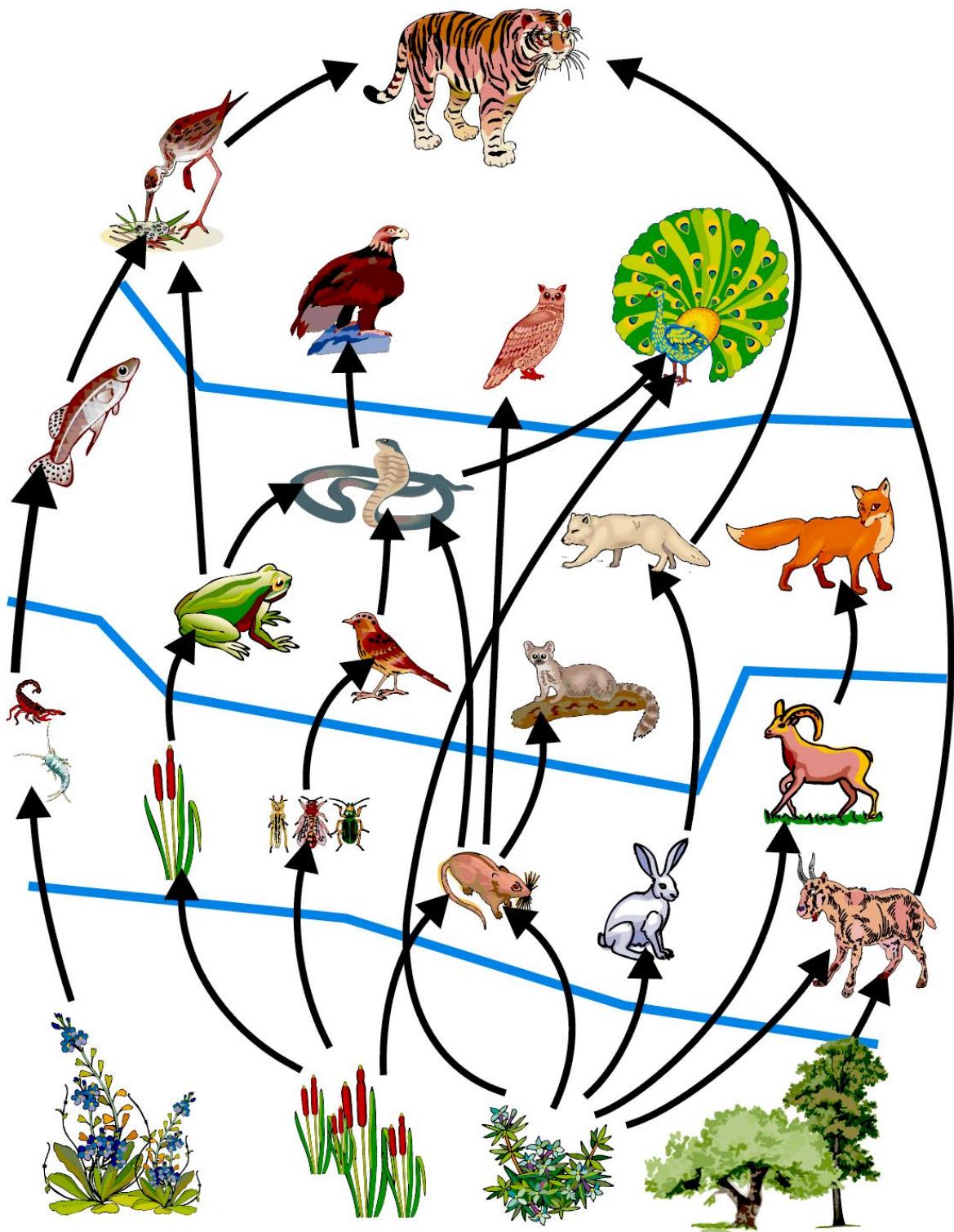
Ecosystem energy processes conform to the thermodynamic laws.

- Energy cannot be made or destroyed
- Energy transformations are not perfect and energy is lost in each transformation in the form of heat.

The flow of energy in the ecosystem is unidirectional. The energy enters the plants (from the sun) through photosynthesis during the making of food. This energy is then passed on from one organism to another in a food chain.

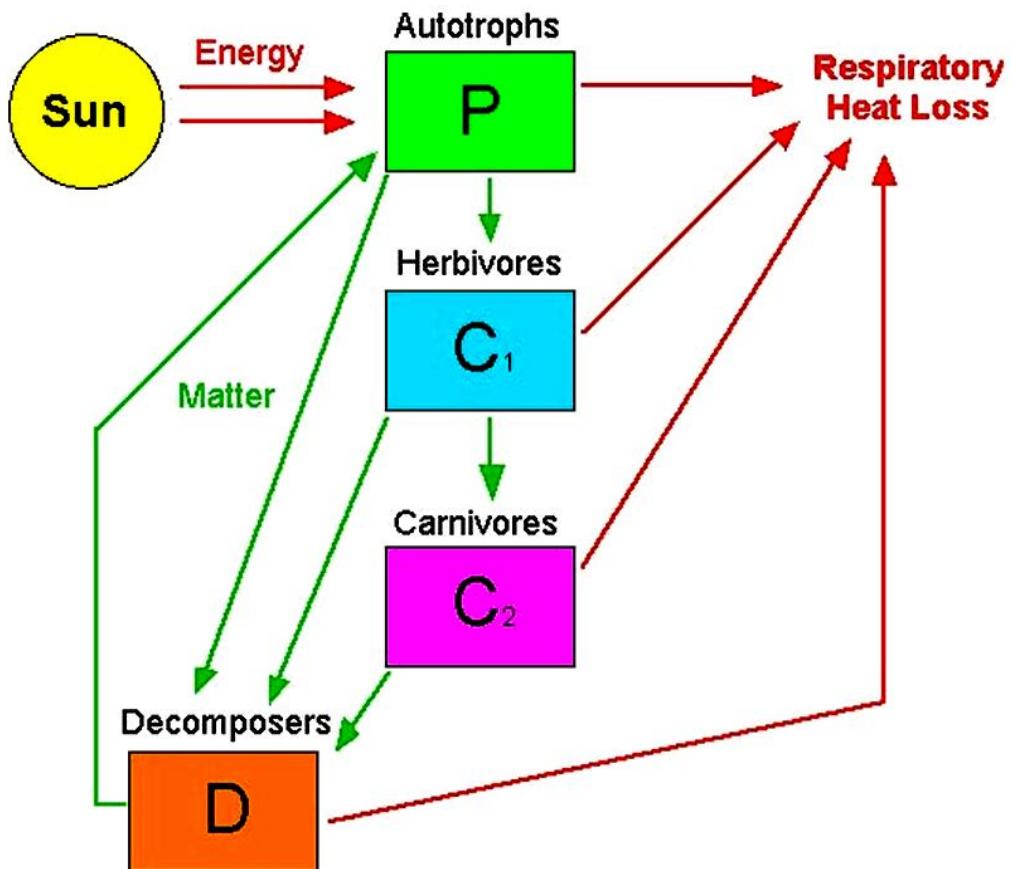
Energy given out by the organisms as heat is lost to the environment, it does not return to be used by the plants again. This makes the flow of energy in ecosystem 'unidirectional'. Thus, the flow of energy in the ecosystem is said to be unidirectional because the energy lost as heat from the living organisms of a food chain cannot be reused by plants in photosynthesis.

During the transfer of energy through successive trophic levels in an ecosystem, there is a loss of energy all along the path. No transfer of energy is 100 per cent. The energy available at each successive trophic level is 10 per cent of the previous level. Thus, there is a progressive decline (gradual reduction) in the amount of energy available as we go from producer level to the higher trophic levels of organisms.



Food web, consisting of many food chains

The nutrient movement is a cyclic movement where the nutrients revolve round with an ecosystem, hence cyclic. Nutrients pass from abiotic nutrient stores, such as the soil and the atmosphere, into biotic, plant and animal stores (the biomass). The nutrients are then recycled, within the ecosystem, following death and decomposition.



INTEXT QUESTIONS PAGE NO. 261

Q1. What are trophic levels? Give an example of a food chain and state the different trophic levels in it.

Ans:

Each stage of a **food chain** is known as trophic level.

Trees	→	Rabbit	→	Snake	→	Hawk
(First trophic level)		(Second trophic level)		(Third trophic level)		(Fourth trophic level)
(Producers)		(I consumers)		(II consumer)		(III consumer)

Q2. What is the role of decomposers in the ecosystem?

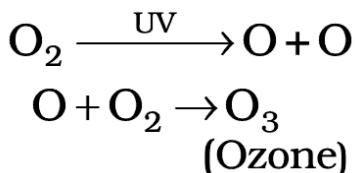
Ans:

Decomposers include micro-organisms such as bacteria and fungi that obtain nutrients by breaking down the remains of dead plants and animals. They help in the breakdown of organic matter or biomass from the body of dead plants and animals into simple inorganic raw materials, such as CO_2 , H_2O , and some nutrients.

OZONE LAYER DEPLETION

Ozone (O_3) is a molecule formed by three atoms of oxygen. While O_2 , which we normally refer to as oxygen, is essential for all aerobic forms of life. Ozone, is a deadly poison. However, at the higher levels of the atmosphere, ozone performs an essential function. It shields the surface of the earth from ultraviolet (UV) radiation from the Sun. This radiation is highly damaging to organisms, for example, it is known to cause skin cancer in human beings.

Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen (O_2) molecule. The higher energy UV radiations split apart some molecular oxygen (O_2) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone as shown—



The amount of ozone in the atmosphere began to drop sharply in the 1980s. This decrease has been linked to synthetic chemicals like chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers. In 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels.

HOW TO PROTECT US FROM THESE HAZARDOUS WASTES ?

The following methods are adopted for the disposal of harmful waste materials.

1. Land Fills

There are permanent storage facilities in secured lands for military related liquid and radioactive waste materials. High level radioactive wastes are stored in deep underground storage.

2. Deep well injection

It involves drilling a well into dry porous material below ground water. Hazardous waste liquids are pumped into the well. They are soaked into the porous material and made to remain isolated indefinitely.

3. Incineration

The burning of materials is called incineration. Hazardous bio-medical wastes are usually disposed off by means of incineration. Human anatomical wastes, discarded medicines, toxic drugs, blood, pus, animal wastes, microbiological and bio-technological wastes etc., are called bio-medical wastes.

MANAGEMENT OF NON-HAZARDOUS WASTES – SOLID WASTE MANAGEMENT

Reuse and recycling technique

The separating out of materials such as rubber, glass, paper and scrap metal from refuse and reprocessing them for reuse is named as reclamation of waste or recycling.

Paper

(54% recovery) Can be repulped and reprocessed into recycled paper, cardboard and other products.

Glass

(20% recovery) Can be crushed, remelted and made into new containers or crushes used as a substitute for gravel or sand in construction materials such as concrete and asphalt. Food waste and yard wastes (leaves, grass etc.,) can be composted to produce humus soil conditioner.

INTEXT QUESTIONS PAGE NO. 264

Q1. What is ozone and how does it affect any ecosystem?

Ans:

Ozone is chemically O_3 molecule. Ozone layer is present in the stratosphere layer of atmosphere. It absorbs most of ultraviolet radiations coming from the Sun.

Ozone gas is poisonous in nature, if inhaled.

Q2. How can you help in reducing the problem of waste disposal? Give any two methods.

Ans:

- (i) Using biodegradable materials
- (ii) Using recyclable materials.

EXERCISE QUESTIONS PAGE NO. 159

Q1. Which of the following groups contain only biodegradable items?

- (a) Grass, flowers and leather
- (b) Grass, wood and plastic
- (c) Fruit-peels, cake and lime-juice
- (d) Cake, wood and grass

Ans:

- (c) Fruit-peels, cake, and lime-juice
- (d) Cake, wood, and grass

Substances that are broken down by the biological processes are said to be biodegradable, e.g., fruit, cake, lime-juice, wood, grass, etc.

Q2. Which of the following constitute a food-chain?

- (a) Grass, wheat and mango
- (b) Grass, goat and human
- (c) Goat, cow and elephant
- (d) Grass, fish and goat

Ans:

- (b) Grass, goat and human

Each step of food chain form a trophic level. Producers (grass) form the first trophic level, herbivore (goat) the second and carnivore (human) the third trophic level.

Q3. Which of the following are environment-friendly practices?

- (a) Carrying cloth-bags to put purchases in while shopping
- (b) Switching off unnecessary lights and fans
- (c) Walking to school instead of getting your mother to drop you on her scooter
- (d) All of the above

Ans:

- (d) All of the above

Cloth-bags are biodegradable, switching off unnecessary light and fans and limited use of petrol/diesel cause less pollution hence, environment friendly practices.

Q4. What will happen if we kill all the organisms in one trophic level?

Ans:

If we kill all the organisms in one trophic level, the lower trophic level will grow more in number and the higher trophic level will not survive and flow of energy from one trophic level to other will not take place.

Q5. Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

Ans:

The impact of removing all the organism in a trophic level will be different for different trophic levels. The lower trophic level of an ecosystem has a greater number of individuals

than the higher trophic levels. If the organisms of any trophic level are removed they cause a damage to the ecosystem. Removal of producers will affect all the organisms and they won't survive. The removal of higher trophic level will lead to increase in organisms of lower trophic level and the organisms die due to shortage of food.

Q6. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

Ans:

The accumulation of chemicals in the individuals of higher trophic level is called biological magnification.

No, the levels of magnification is not same in all trophic levels. The chemicals are not degraded and get accumulate progressively at each trophic level which lead to biomagnification. Biomagnification is more in organisms of higher trophic levels.

Q7. What are the problems caused by the non-biodegradable wastes that we generate?

Ans:

Non-biodegradable substances affect the environment in the following ways:

- (i) Since the non-biodegradable substances cannot be broken down, they get accumulated and thus contaminate the soil and the water resources.
- (ii) These substances, when accidentally eaten by some stray animal, can harm them and can even cause their death.
- (iii) These substances occupy more space in the landfills and require special disposal techniques.
- (iv) These materials can accumulate in the environment and can also enter the food chain.

Q8. If all the waste we generate is biodegradable, will this have no impact on the environment?

Ans:

If all the waste is biodegradable, then there will be no accumulation of waste and the Earth would be a cleaner place to live. But if this biodegradable waste is too large in amount then its degradation may lead to air pollution (due to release of gases).

Q9. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

Ans:

The thinning of ozone layer present in stratosphere is called depletion of ozone layer. Due to depletion of ozone layer, harmful ultraviolet radiations will reach the surface of Earth which may lead to skin diseases and cancer.

To reduce the depletion of ozone layer, the use of chlorofluorocarbons has been minimised.

ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 15
OUR ENVIRONMENT

- 1.** What percentage of sunlight is captured by plants to convert it into food energy?
 - (a) 1%
 - (b) 10%
 - (c) 50%
 - (d) more than 50%
- 2.** Flow of energy in an ecosystem is always
 - (a) unidirectional
 - (b) bidirectional
 - (c) multidirectional
 - (d) none of these
- 3.** Which of the following is non-biodegradable?
 - (a) Tea leaves
 - (b) Nylon
 - (c) remains of animals
 - (d) fleece of sheep
- 4.** The structural and functional unit of the environment is known as:
 - (a) ecosystem
 - (b) biosphere
 - (c) food chain
 - (d) food web
- 5.** Depletion of ozone layer is mainly due to
 - (a) Methane
 - (b) Carbon Dioxide
 - (c) ChloroFloroCarbons
 - (d) Nitrogen
- 6.** First order consumers are:
 - (a) Carnivores
 - (b) Herbivores
 - (c) Decomposers
 - (d) Omnivores

7. A detritus food chain begins with
- Carnivores
 - Herbivores
 - Omnivores
 - Decomposers
8. In an ecosystem, the 10% of energy disposable for transfer from one trophic level to next is in the form of
- heat energy
 - chemical energy
 - mechanical energy
 - light energy
9. Accumulation of non-biodegradable pesticides in the food chain in increasing amount at each higher trophic level is known as
- eutrophication
 - pollution
 - biomagnification
 - accumulation
10. Which of the following is an abiotic component
- plants
 - animals
 - soil
 - microorganisms
11. Which of the statement is incorrect?
- All green plants and blue green algae are producers
 - Green plants get their food from organic compounds
 - Producers prepare their own food from inorganic compounds
 - Plants convert solar energy into chemical energy
12. Edaphic factors are included in
- Abiotic components
 - Biotic components
 - Producers
 - Consumers
13. Only ____ % of the energy can be transferred from one trophic level to the next trophic level.
- 1

b) 5

c) 10

d) 20

14. Accumulation of non- biodegradable pesticides in different trophic levels is called

a) Biological degradation

b) Biological magnification

c) Biological concentration

d) Biological deposition

15. The UV radiation from the sun is likely to cause _____ in human.

a) Skin cancer

b) Lung cancer

c) Liver Cancer

d) Brain Cancer

16. World Environment day is celebrated on

a) July 1

b) July 5

c) June 1

d) June 5

17. Which one of the following is a non- biodegradable substance

a) DDT

b) Manure

c) paper

d) Cotton cloth

18. In a terrestrial ecosystem the biomass of _____ should be the most

a) Herbivore

b) Carnivore

c) Producer

d) Any one of the above

19. Identify the proper food chain

a) Grass ----- frog ---- insect ----- snake

b) Grass---- insect ----- frog ----- snake

c) Insect --- frog ---- grass ---- snake

d) Grass --- frog ---- snake ----- insect

20. Food web is

a) Food served through websites

- b) Display of different food items
- c) Interlinked food chains
- d) Using food items for a fashion dress

21. The best way to dispose waste is by

- a) Making a paste of all domestic waste and putting them in a river
- b) Separating biodegradable and nonbiodegradable waste before disposing in bins
- c) Throw the waste on road side
- d) Dumping all domestic waste in litter bin

22. Which of the following organism is likely to have maximum concentration of DDT : Algae, fish, water flea, frog, bird

23. What is the role of bacteria and fungi in an ecosystem?

24. What are trophic levels?

25. How much energy is transferred to the next trophic level in a food chain?

26. Which trophic level has the highest concentration of toxic substances in a food chain?

27. Mention some sources of CFC's.

28. Distinguish between a food chain & a food web

29. What would happen if there are no decomposers on earth?

30. What is a food chain? Write a five step food chain found in grass land with frog as one of the members. What will happen to organisms at different trophic levels if all the frogs are removed?

31. The number of malaria patients increased tremendously when a large number of frogs were exported from the village .What could be the cause for it? Explain with the help of a food chain.

32. What are the problems caused by the non-biodegradable wastes that we generate?

33. Food chains generally consist of only 3 or 4 trophic levels. Why is it so?

34. Observe the food chain Plant (1000 kJ) --- >Goat ---> Lion (a) If autographs occupying the first trophic level are called producers what are herbivores Called as? (b) How much energy does the lion get in the above food chain?

35. Vegetarian or non vegetarian food habit help us in getting more energy. Why?

36. How is ozone formed in the upper atmosphere? Why is the damage of ozone layer a cause of concern to us? State cause of this damage.

37. What is environment?

38. What happens when we add our waste to the environment or throw?

39. What are the different types of waste materials?

40. What happens after we throw waste away them away?

- 41.** Why are some substances biodegradable and some non-biodegradable?
- 42.** What are the harmful effects of biodegradable substance?
- 43.** What are the harmful effects of non-biodegradable substance?
- 44.** Name some of the biodegradable plastics.
- 45.** What are the differences between biodegradable and non-biodegradable wastes. What is Ecosystem? What are the different types of Ecosystem?
- 46.** Why does aquarium have to be cleaned once in a while?
- 47.** Do we have to clean ponds or lakes in the same manner of aquarium? Why or why not?
- 48.** What are the different components of echo system?
- 49.** What are trophic levels? Give an example of a food chain and state the different trophic levels in its.
- 50.** What is the role of decomposers in the ecosystem?
- 51.** What are the importances of decomposers?
- 52.** What is a food chain?
- 53.** What is food web?
- 54.** Define the term 'biome'.
- 55.** What are the significances of food Chains?
- 56.** How do flows of energy occur in tropic level?
- 57.** What are the characteristics of energy transfer in the biosphere?
- 58.** Why is energy flow considered as undirectional?
- 59.** What is biomass?
- 60.** Define biomagnifications.
- 61.** How does a food web an important factor of our environment? Describe its four benefits.
- 62.** What is 10% Law?
- 63.** How much energy will be available to hawks in the food chain comprising hawk, snake, paddy and mice, if 1,000 J of energy is available to wheat plants from the sun?
- 64.** Differentiate between food chain and food web?
- 65.** Why is damage to the ozone layer a cause of concern? What steps are being taken to limit this damage?
- 66.** Which compounds are responsible for the depletion of ozone layer?
- 67.** Which disease is caused in human being due to depletion of ozone layer in the atmosphere?
- 68.** Why is ozone layer getting depleted at higher levels of the atmosphere?
- 69.** How is ozone formed in the upper atmosphere? Which compounds are responsible for the depletion of ozone layer?
- 70.** When is World Ozone Layer Preservation Day celebrated?

- 71.** What is green house effect?
- 72.** Suggest activities in our daily life which are eco friendly.
- 73.** How can you help in reducing the problem of waste disposal? Give any two methods.
- 74.** What is the importance of phytoplankton?
- 75.** Which pollutants are contributed by airplanes?
- 76.** How is ozone layer formed in the atmosphere? What is the function of this layer?
- 77.** Name any two biodegradable wastes.
- 78.** Name any two non-biodegradable wastes.
- 79.** Name two aquatic ecosystems.
- 80.** Name two terrestrial ecosystems.
- 81.** Give two examples of Artificial ecosystems.
- 82.** Which is the ultimate source of the energy for an ecosystem?
- 83.** Name the category of organism which feed the energy into the ecosystems.
- 84.** Give the scientific term for organisms which feed directly on plants.
- 85.** How much of organic matter is available at each trophic level to reach the next level?
- 86.** Name the type of organisms that occupy (i) the first trophic level and (ii) the second trophic level.
- 87.** Define Biomagnification.
- 88.** Expand UNEP.
- 89.** Name the chemical mainly responsible for the damage of ozone layer.
- 90.** Where are CFCs used?
-

ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 15
OUR ENVIRONMENT

1. Which one of the following is an artificial ecosystem?
 - (a) Pond
 - (b) Crop field
 - (c) Lake
 - (d) Forest
2. In a food chain, the third trophic level is always occupied by
 - (a) carnivores
 - (b) herbivores
 - (c) decomposers
 - (d) producers
3. An ecosystem includes
 - (a) all living organisms
 - (b) non-living objects
 - (c) both living organisms and non-living objects
 - (d) sometimes living organisms and sometimes non-living objects
4. In the given food chain, suppose the amount of energy at fourth trophic level is 5 kJ, what will be the energy available at the producer level?

Grass → Grasshopper → Frog → Snake → Hawk

 - (a) 5 k J
 - (b) 50 k J
 - (c) 500 k J
 - (d) 5000 k J
5. Accumulation of non-biodegradable pesticides in the food chain in increasing amount at each higher trophic level is known as
 - (a) eutrophication
 - (b) pollution
 - (c) biomagnification
 - (d) accumulation
6. Depletion of ozone is mainly due to
 - (a) chlorofluorocarbon compounds
 - (b) carbon monoxide

- (c) Polluted air
- (d) Water

14. Which of the statement is incorrect?

- (a) All green plants and blue green algae are producers
- (b) Green plants get their food from organic compounds
- (c) Producers prepare their own food from inorganic compounds
- (d) Plants convert solar energy into chemical energy

15. Which group of organisms are not constituents of a food chain?

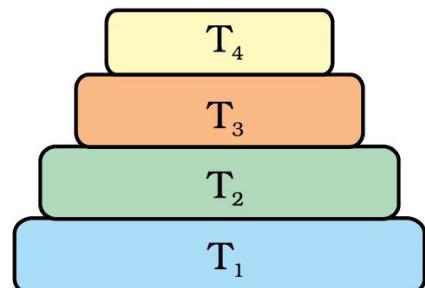
- (i) Grass, lion, rabbit, wolf
 - (ii) Plankton, man, fish, grasshopper
 - (iii) Wolf, grass, snake, tiger
 - (iv) Frog, snake, eagle, grass, grasshopper
- (a) (i) and (iii) (b) (iii) and (iv)
 - (c) (ii) and (iii) (d) (i) and (iv)

16. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about

- (a) 1 % (b) 5 % (c) 8 % (d) 10 %

17. In the given below Figure the various trophic levels are shown in a pyramid. At which trophic level is maximum energy available?

- (a) T₄
- (b) T₂
- (c) T₁
- (d) T₃



18. What will happen if deer is missing in the food chain given below?

$$\text{Grass} \rightarrow \text{Deer} \rightarrow \text{Tiger}$$

- (a) The population of tiger increases
- (b) The population of grass decreases
- (c) Tiger will start eating grass
- (d) The population of tiger decreases and the population of grass increases

19. The decomposers in an ecosystem

- (a) convert inorganic material, to simpler forms
- (b) convert organic material to inorganic forms
- (c) convert inorganic materials into organic compounds
- (d) do not breakdown organic compounds

20. If a grass hopper is eaten by a frog, then the energy transfer will be from

- (a) producer to decomposer
- (b) producer to primary consumer
- (c) primary consumer to secondary consumer
- (d) secondary consumer to primary consumer

21. Disposable plastic plates should not be used because

- (a) they are made of materials with light weight
- (b) they are made of toxic materials
- (c) they are made of biodegradable materials
- (d) they are made of non-biodegradable materials

22. Why is improper disposal of waste a curse to environment?

23. Write the common food chain of a pond ecosystem.

24. What are the advantages of cloth bags over plastic bags during shopping?

25. Why are crop fields known as artificial ecosystems?

26. Differentiate between biodegradable and non-biodegradable substances. Cite examples.

27. Suggest one word for each of the following statements/ definitions

- (a) The physical and biological world where we live in
- (b) Each level of food chain where transfer of energy takes place
- (c) The physical factors like temperature, rainfall, wind and soil of an ecosystem
- (d) Organisms which depend on the producers either directly or indirectly for food

28. Explain the role of decomposers in the environment?

29. We do not clean ponds or lakes, but an aquarium needs to be cleaned. Why?

30. Indicate the flow of energy in an ecosystem. Why is it unidirectional? Justify.

31. What are decomposers? What will be the consequence of their absence in an ecosystem?

32. Suggest any four activities in daily life which are eco-friendly.

33. Give two differences between food chain and food web.

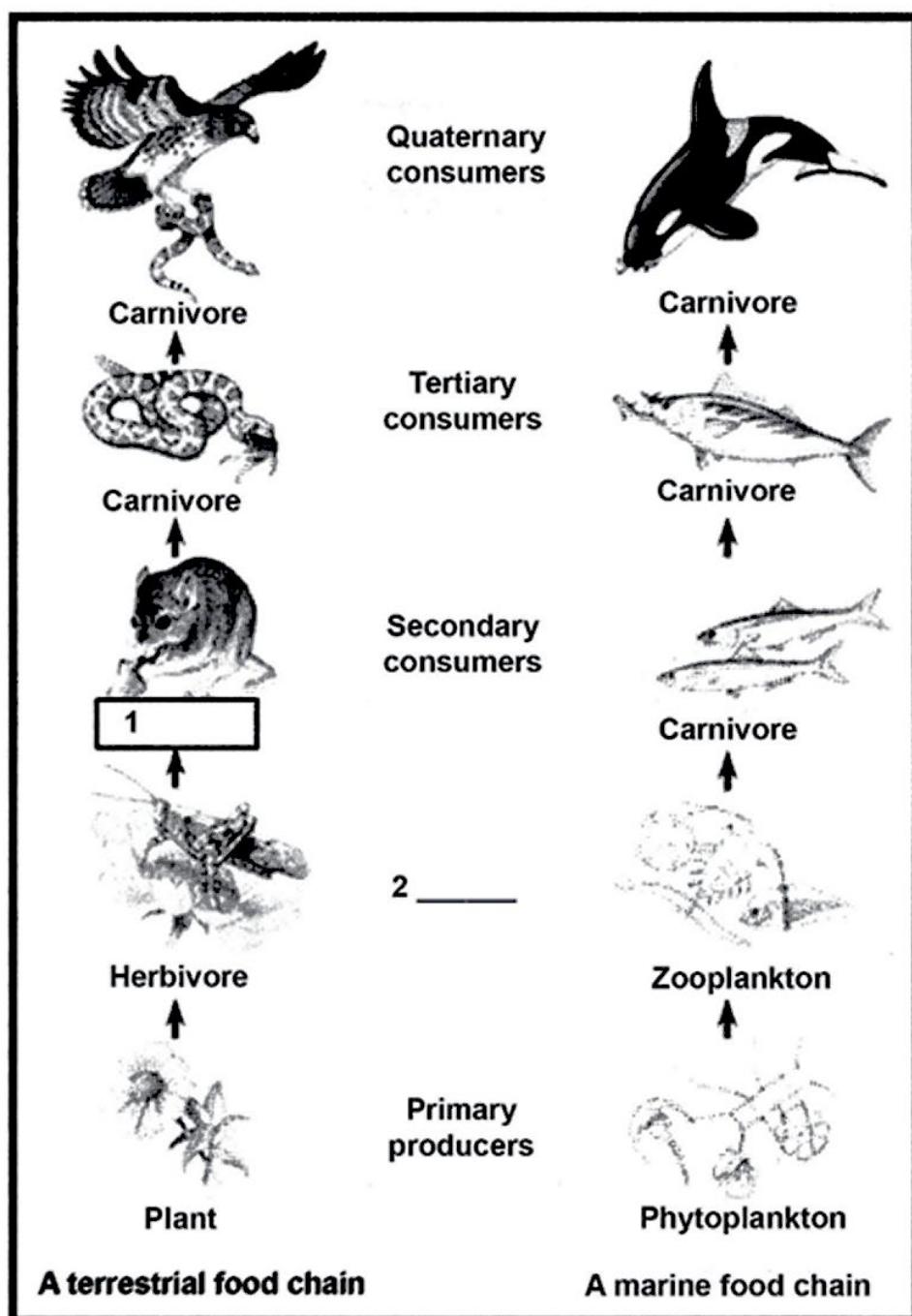
34. Name the wastes which are generated in your house daily. What measures would you take for their disposal?

35. Suggest suitable mechanism (s) for waste management in fertiliser industries.

36. What are the by-products of fertiliser industries? How do they affect the environment?

37. Explain some harmful effects of agricultural practices on the environment.

38. ACTIVITY BASED QUESTION: Given below is the pictorial representation of a terrestrial food chain and a marine chain. Observe them carefully and answer the questions given in the worksheet.



- ☞ Fill in the blank in the terrestrial food chain (Blank no. 1). Why is the rat given this term?
- ☞ Can the rat come at a lower position in the terrestrial food chain? Give reasons for your answer.
- ☞ Fill up the blank no. 2. Write one common feature of all organisms that are placed at this level in a food chain.
- ☞ What will be the fate of this terrestrial food chain if all the rats were removed?

☛ Will the food chains be affected if the animals at the top carnivore level were removed?

Give reasons for your answer.

39. Name four biotic and four abiotic components observed in this area.

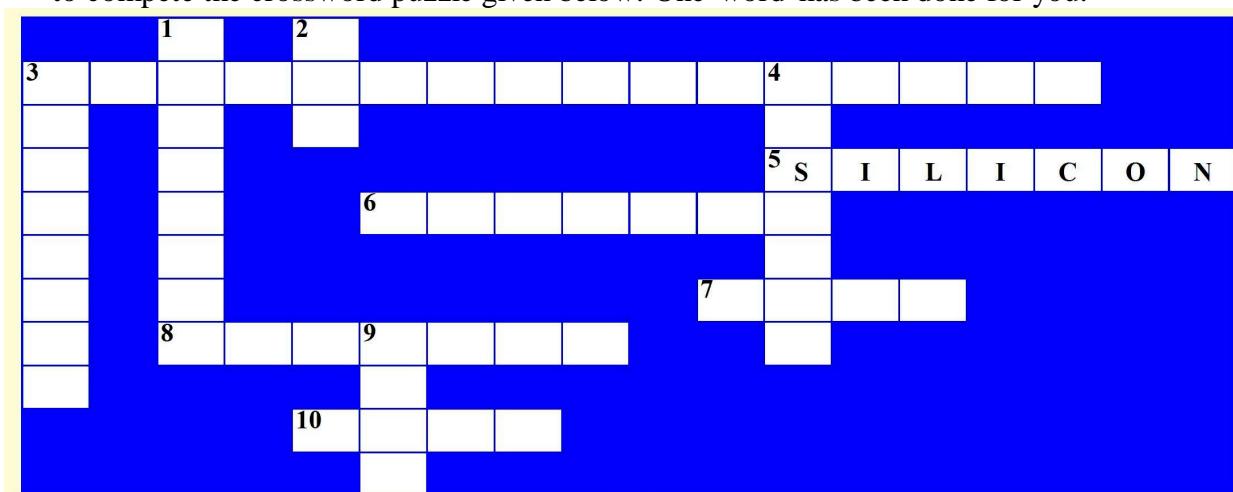
40. Will this place be called a natural ecosystem or an artificial ecosystem? Give reasons for your answer.

41. List four producers and four consumers present in this area.

42. Construct one food chain that operates in this area. Identify the producers, primary consumers, secondary consumers and tertiary consumers (if any) in the food chain.

43. Write any two points of environmental concern that have arisen in the area due to human intervention.

44. Instruction: Read the clues given below and fill up the blocks with appropriate word/term to complete the crossword puzzle given below: One 'word' has been done for you.



The Clues

Across:

3 This principle is useful in solar cooker but can be harmful on earth (5, 5, 6)

5 Element used to make solar cells

6 A black surface _____ heat.

7 This fossil fuel made industrial revolution possible

8 A green house gas

10 High rise structures constructed on rivers to produce hydro electricity.

Down:

1. Its construction, on River Ganga, was opposed

2. Clean Fuel (abbreviation)

3. Bio-gas is commonly called

4. Nuclear power generation is based on this process

9. This energy is converted to electrical energy in a thermal power plant

CHAPTER – 16

MANAGEMENT OF NATURAL RESOURCES

Natural resources can be broadly categorized into two types, viz. exhaustible and non-exhaustible. Management of natural resources is all about their judicious use in a way that the exhaustible resources can last for many generations to come and non-exhaustible resources can be maintained in as pristine form as possible.

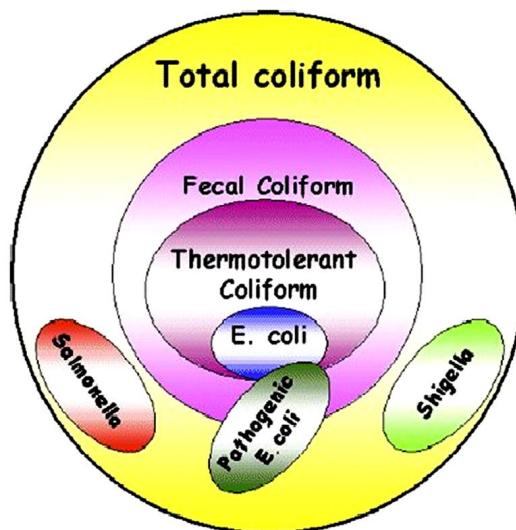
CONSEQUENCES OF EXPLOITATION OF NATURAL RESOURCES

There are many consequences of exploitation of natural resources. Some examples are given below:

- ☞ Burning of fossil fuels creates air pollution. Excess amount of carbon dioxide in the atmosphere leads to global warming. Some polluting gases; like oxides of nitrogen and sulphur lead to acid rain, which is harmful for living beings. Acid rain is also harmful for monuments and buildings.
- ☞ Excess exploitation of groundwater leads to a drastic fall in water table. This is the reason many places are experiencing acute shortage of drinking water.
- ☞ Overuse of fertilisers and insecticides leads to soil pollution and soil erosion.
- ☞ Many pollutants are directly flown into water bodies. This has resulted in water pollution in many rivers, lakes and even in oceans.

COLIFORM BACTERIA

Coliform bacteria originate as organisms in soil or vegetation and in the intestinal tract of warm-blooded animals (fecal coli). This group of bacteria has long been an indicator of water contamination and possible presence of intestinal parasites and pathogens. Coliform bacteria are relatively simple to identify, are present in much larger numbers than more dangerous pathogens, and react to the natural environment and treatment processes similarly to pathogens. By observing coliform bacteria, the increase or decrease of many pathogenic bacteria can be estimated.



Where are these bacteria found?

Sources of bacterial pollution include runoff from woodlands, pastures, and feedlots; septic tanks and sewage plants; and animals and wild fowl. Domestic animals contribute heavily to the bacterial population. Many coliform bacteria may be directly deposited into natural streams from waste in water and runoff from areas with high concentrations of animals or humans.

How could coliform bacteria enter a water system?

The most likely sources come from where the water is used—the spigot, sink, or unclean containers. Another is backflow from a contaminated source such as a sink-top carbon filter, bucket of water, or puddle at the end of a hose. Also, reduced pressure or suction in long water lines can draw in bacteria-laden water or soil into pipes through joints.

However, the presence of bacteria is not always related to illness. The water could have been contaminated through improper sampling. Children may become ill because of unsanitary conditions in the home. Who sampled the water and how? How sanitary are your practices in food handling, personal hygiene, etc.? Do the children wash regularly? These are more likely routes for contamination than the water itself.

POLLUTION OF THE GANGA

The Ganga runs its course of over 2500 km from Gangotri in the Himalayas to Ganga Sagar in the Bay of Bengal. It is being turned into a drain by more than a hundred towns and cities in Uttar Pradesh, Bihar and West Bengal that pour their garbage and excreta into it. Largely untreated sewage is dumped into the Ganges every day. In addition, think of the pollution caused by other human activities like bathing, washing of clothes and immersion of ashes or unburnt corpses. And then, industries contribute chemical effluents to the Ganga's pollution load and the toxicity kills fish in large sections of the river.

GANGA ACTION PLAN (GAP)

Inertia in taking action to reduce the level of pollution stemmed largely from a widespread belief that the Ganga, as a holy river, had the ability to purify all that came into contact with it. Although there is some scientific evidence for the Ganga river's high capacity to assimilate (i.e. biodegrade) a large level of organic waste input, including pathogens, but no river can sustain its self-purifying power with this kind of over-use, misuse and abuse of its waters.

The Ganga Action Plan (GAP) originated from the personal intervention and interest of our late Prime Minister Mrs Indira Gandhi who had directed the Central Board for the Prevention and Control of Water Pollution, now Central Pollution Control Board (CPCB) to do a comprehensive survey of the situation in 1979. CPCB published two comprehensive reports which formed the base for GAP in Oct 1984 but was not presented to the nation formally due to assassination of Smt Indira Gandhi.

In Feb 1985, the Central Ganga Authority (CGA) with the PM as Chairman was formed, with an initial budget of Rs 350 crore to administer the cleaning of the Ganga and to restore it to pristine condition by our late PM Sh Rajiv Gandhi. In June 1985, the Ganga Project Directorate (GPD) was established as a wing of the Department of Environment. GAP was launched on June 14, 1986 by Sh Rajiv Gandhi at Varanasi.

SUSTAINABLE DEVELOPMENT

Development is necessary for making all around economic development. But development often comes with a price in the form of environmental damage. Sustainable development means following certain practices which help in saving our environment from damage. This is necessary for maintaining the earth in a good shape so that future generations can also enjoy the bounty of nature.

THREE R's (REDUCE, RECYCLE AND REUSE):

- ☞ **Reduce:** We should reduce the consumption of various resources wherever possible. For example; we can reduce the consumption of electricity by switching off lights and other appliances when they are not required. While leaving the home, one should always check for fans and lights and switch them off. This can not only help in saving electricity but also in saving the fuels which are utilised in electricity production. We should immediately repair a leaking tap so that precious water can be saved.
- ☞ **Recycle:** There are many items which can be recycled again and again. Recycling is another way of reducing the demand for natural resources. For example; by recycling paper, we reduce the demand for wood and thus help in saving the forest.
- ☞ **Reuse:** Many items can be reused many times. For example; old newspaper can be used for packing many items. Old envelopes can be used for doing rough work while doing your homework. Old plastic bottles can be used for many other purposes.



INTEXT QUESTIONS PAGE NO. 269

Q1. What changes can you make in your habits to become more environment friendly?

Ans:

We should try and know about how our choices affect environment. Use of renewable resources and biodegradable stuffs should be promoted. For example (a) Use of paper bags instead of plastic, (b) Use sources of energy like LPG, alcohol, etc., which do not cause pollution, (c) Use of substances which can be recycled or can be reused.

Q2. What would be the advantages of exploiting resources with short-term aims?

Ans:

There should be a judicious use of natural resources as they are limited in nature. We should not exploit resources for our short term gains as this would only lead to depletion of natural

resources for the present generation as well as generations to come. Hence, we can say that there are hardly any advantages of exploiting natural resources for short term gains.

Q3. How would these advantages differ from the advantages of using a longterm perspective in managing our resources?

Ans:

In the case of a long-time perspective in managing our resources, these resources will last for the generations to come. This management ensures uniform distribution among the people. It conserves the natural resources for many years and not just for a few years, as in the case of a short-term perspective in conserving natural resources.

Q4. Why do you think there should be equitable distribution of resources? What forces would be working against an equitable distribution of our resources?

Ans:

Natural resources of the Earth must be distributed among the people uniformly so that each and every one gets his share of the resource.

Human greed, corruption, and the lobby of the rich and powerful are the forces working against an equitable distribution of resources.

FOREST AND WILDLIFE

Conservation of forests and wildlife is necessary to protect the biodiversity. This is important because loss of biodiversity leads to ecological imbalance. But any conservation effort for forest and wildlife must keep the interests of all stakeholders in mind.

STAKEHOLDERS

The stakeholders who are directly or indirectly affected by forest are as follows:

- ☞ People living in or around forests; as they depend on various forest produce for their livelihood.
- ☞ The forest department which is the owner of the forest land.
- ☞ Various industrialists who depend on forest for many raw materials. For example; the beedi industry needs kendu leaves as raw material. Wood is used as raw material in many industries.
- ☞ The wildlife and nature enthusiasts.

Before the beginning of the colonial rule in India, forest dwellers were free to utilize the resources from forests as they wished. But things changed when the British rulers took over the control of the forests in India. They restricted the access of forest dwellers to forest resources. This created huge problems for many people who had traditionally been dependent on forests for their survival.

After the independence of India, the forest department took over but the interests of forest dwellers continued to be ignored for a long time. The forest was cut to obtain timber for making railways and for various construction activities. The cleared forest was replaced by planting eucalyptus trees which led to the problem of monoculture. Growing a single species is called monoculture. It disturbs the biodiversity of an area.

LOCAL PEOPLE AND FOREST CONSERVATION

There are many examples which suggest that involvement of local communities is necessary for any conservation effort. The Bishnoi community of Rajasthan is one such example. Amrita Devi Bishnoi is still remembered with reverence for the way she fought for protecting the khejri trees in Khejrali village. She; along with 363 other people; sacrificed her life for the

protection of khejri trees in 1731. The 'Amrita Devi Bishnoi National Award for Wildlife Conservation' has been named in her honour.

Another example is of the nomadic herders of the Himalayas. The nomadic herders used to graze their animals near the great Himalayan National Park. Every summer, the nomadic people brought their herds down the valley so that the sheep could get plenty of grass to eat. When the National Park was made in that area, the nomadic herders were stopped from grazing their sheep in the protected area. Now, in the absence of grazing by the sheep, the grasses grow very tall in the region. Tall grasses fall over and prevent fresh growth of grass. This shows that by excluding and alienating the local people from forests, proper conservation efforts cannot be carried out.

CHIPKO MOVEMENT

The Chipko Movement began in the early 1980s from a small village; Reni in Garhwal district. The women of the village began hugging a tree to prevent the cutting of trees by the contractors. The Chipko Movement later spread to other parts of India. It had been instrumental in stopping deforestation to a large extent.

ARABARI'S EXAMPLE OF PEOPLE'S PARTICIPATION IN FOREST MANAGEMENT

In 1972, the forest department realized its mistake while reviving the degraded sal forests of Arabari forest range. Arabari forest lies in Midnapore district of West Bengal. The earlier methods of policing and surveillance were a total failure as they often led to frequent clashes with local people. It also led to alienation of people from the conservation programme. Then came a forest officer; named A K Banerjee; who was a real visionary. He involved the local people in the revival of 1,272 hectares of forest. In lieu of that the villagers were given employment in silviculture and harvest and were given 25% of the harvest. They were also allowed to gather firewood and fodder against a nominal payment. Due to active participation of the local community there was remarkable revival of the Arabari sal forest. By 1983, the value of the forest rose to Rs. 12.5 crores.

INTEXT QUESTIONS PAGE NO. 273

Q1. Why should we conserve forests and wildlife?

Ans:

We should conserve forests and wildlife to preserve the biodiversity (range of different life-forms) so as to avoid the loss of ecological stability. A large number of tribes are the habitants in and around the forests. If the forests are not conserved, then it may affect these habitants. Without proper management of forest and wildlife, the quality of soil, the water sources, and even the amount of rainfall may be affected. Without forest and wildlife, life would become impossible for human beings.

Q2. Suggest some approaches towards the conservation of forests.

Ans:

Various approaches are required for the conservation of forests. Afforestation is one of the most important approach. Besides this

- a) Deforestation should be banned.
- b) People should be made more aware about importance of forests.
- (c) The protected areas should be managed by local people which would be quite efficient.
- (d) National parks and sanctuaries should be formed to conserve the biodiversity.
- (e) Hunting should be banned and laws should be formulated against hunting.
- (f) There should be proper laws for exploitation of forest resources.

WATER FOR ALL

Water harvesting is an age-old concept in India. Khadins, tanks and nadis in Rajasthan, bandharas and tals in Maharashtra, bundhis in Madhya Pradesh and Uttar Pradesh, ahars and pynes in Bihar, kulhs in Himachal Pradesh, ponds in the Kandi belt of Jammu region, and eris (tanks) in Tamil Nadu, surangams in Kerala, and kattas in Karnataka are some of the ancient water harvesting, including water conveyance, structures. These are still in use at many places.

The traditional water harvesting structures are location specific and have been perfected by people over a long period of time. They take into account the local geography and the need of the local people and hence are highly efficient.

The traditional water harvesting structures usually focus on recharging the groundwater rather than making an open reservoir. It has several advantages. Unlike surface water; the groundwater does not evaporate and thus loss because of evaporation is prevented. The groundwater does not provide a breeding ground for the mosquitoes and hence is good for public health as well. The groundwater is relatively protected from contamination by human activities.

DAMS

A **dam** is a barrier that impounds water or underground streams. Reservoirs created by dams not only suppress floods but also provide water for such activities as irrigation, human consumption, industrial use, aquaculture, and navigability. Hydropower is often used in conjunction with dams to generate electricity. A dam can also be used to collect water or for storage of water which can be evenly distributed between locations. Dams generally serve the primary purpose of retaining water, while other structures such as floodgates or levees (also known as dikes) are used to manage or prevent water flow into specific land regions.

ADVANTAGES:

- ☞ Once a dam is constructed, electricity can be produced at a constant rate. If electricity is not needed, the sluice gates can be shut, stopping electricity generation. The water can be saved for use another time when electricity demand is high. Dams are designed to last many decades and so can contribute to the generation of electricity for many years / decades.
- ☞ The lake that forms behind the dam can be used for water sports and leisure / pleasure activities. Often large dams become tourist attractions in their own right.
- ☞ The lake's water can be used for irrigation purposes.
- ☞ The build up of water in the lake means that energy can be stored until needed, when the water is released to produce electricity.
- ☞ When in use, electricity produced by dam systems do not produce green house gases. They do not pollute the atmosphere.

DISADVANTAGES:

- ☞ Dams are extremely expensive to build and must be built to a very high standard. The high cost of dam construction means that they must operate for many decades to become profitable.
- ☞ The flooding of large areas of land means that the natural environment is destroyed.
- ☞ People living in villages and towns that are in the valley to be flooded, must move out. This means that they lose their farms and businesses. In some countries, people are forcibly removed so that hydro-power schemes can go ahead.

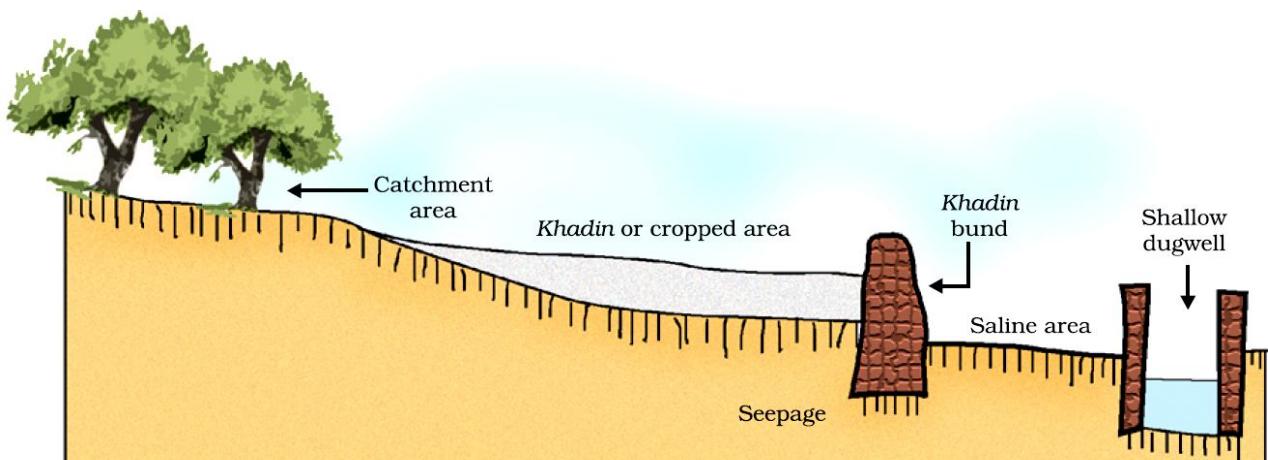
- ☞ The building of large dams can cause serious geological damage. For example, the building of the Hoover Dam in the USA triggered a number of earth quakes and has depressed the earth's surface at its location.
- ☞ Although modern planning and design of dams is good, in the past old dams have been known to be breached (the dam gives under the weight of water in the lake). This has led to deaths and flooding.
- ☞ Dams built blocking the progress of a river in one country usually means that the water supply from the same river in the following country is out of their control. This can lead to serious problems between neighbouring countries.
- ☞ Building a large dam alters the natural water table level. For example, the building of the Aswan Dam in Egypt has altered the level of the water table. This is slowly leading to damage of many of its ancient monuments as salts and destructive minerals are deposited in the stone work from rising damp caused by the changing water table level.

WATER HARVESTING

Water harvesting is the act of collecting and storing rainwater for future use. This can be done in areas of low or high rainfall amounts using tanks and cisterns. Collecting rainfall can reduce the amount of run-off, flooding, and erosion in prone areas. This is especially relevant in urban areas where the land has been used to build infrastructure, and the rainwater run-off has nowhere which can result in flooding. In more rural areas when the water is collected, the run-off into rivers and ponds is reduced which in turn slows the contamination from surface fertilizers and pesticides. If the collected water is to be used as drinking water, it can be treated and used in environments where drinking water is scarce. Another use for the water is for non-drinking purposes such as flushing toilets. Homeowners and farmers can reduce their water bills and the use of ground water by using the collected water for irrigating crops, lawns, and trees. This benefits the environment by conserving the levels of ground water, which in many areas is precariously low.

Why adopt rain water harvesting system?

- ☞ Reduces the runoff volume and the peak flow, hence mitigate floods.
- ☞ Recharges ground water thus is a solution to water shortage problem in winters.
- ☞ Reduces the cost per litre of water since a large amount of power that is consumed while pumping water from subsurface aquifers can be saved.



Traditional water harvesting system – an ideal setting of the khadin system

INTEXT QUESTIONS PAGE NO. 276

Q1. Find out about the traditional systems of water harvesting/management in your region.

Ans:

There are many traditional methods of water harvesting or management. These are khadis, ponds, tals, etc. Also wells have been dug for drinking water and irrigation purposes. Canals have been developed and water reservoirs are made by government for providing proper drinking water.

Q2. Compare the above system with the probable systems in hilly/ mountainous areas or plains or plateau regions.

Ans:

In plains, the water harvesting structures are crescent-shaped earthen embankments. These are low, straight, and concrete.

In hilly regions, the system of canal irrigation called Kulhs is used for water harvesting. This involves a collection of rain water in a stream, which is then diverted into man-made channels down the hill sides.

Q3. Find out the source of water in your region/locality. Is water from this source available to all people living in that area?

Ans:

The source of water in our region is ground water. Water from the source is available to all the people living in that area.

COAL AND PETROLEUM

Coal and petroleum are the main energy resources for us. But since these are exhaustible in nature so we need to find out alternate sources of energy. Scientists are working on developing some alternate energy sources so that dependency on coal and petroleum can be reduced. Some examples are given below:

- ☞ Solar energy is being used to produce electricity at many places. Although the technologies for solar energy are still costly but future prospects look bright.
- ☞ Fuel cell is another development which may help in replacing the internal combustion engines from automobiles.
- ☞ Hydrogen is being used as fuel in buses and cars in many countries. Hydrogen; when used as a fuel produces water as a byproduct. Thus, hydrogen can be an environment-friendly fuel.

EXERCISE QUESTIONS PAGE NO. 278-279

Q1. What changes would you suggest in your home in order to be environment-friendly?

Ans:

Certain changes can be incorporated in our daily work at home, to make it more eco-friendly

- (i) We should plant different kinds of shady plants, fruit and vegetable bearing plants, etc.
- (ii) There should be less use of insecticides and pesticides.
- (iii) Food should be properly stored to avoid its spoilage, thereby preventing the wastage of food.
- (iv) There should be proper drainage system for the water to pass in the drains.
- (v) There should be proper disposal of water.

- (vi) Dustbins and other waste products should be properly covered and the garbage should not be dumped around the houses.
- (vii) Proper sanitary and hygiene methods must be adopted.

Q2. Can you suggest some changes in your school which would make it environment friendly?

Ans:

- (i) To make our school environment eco-friendly, it is essential to plant different kinds of shady and fruity trees. Different flowering plants should also be planted.
- (ii) No waste material and used paper, foil, empty packets should be spread all over the school.
- (iii) Water facility should be in good condition.
- (iv) Rooms should be proper ventilated.
- (v) There should be proper provision of dustbins for the disposal of waste.
- (vi) There should be big and clean play grounds.

Q3. We saw in this chapter that there are four main stakeholders when it comes to forests and wildlife. Which among these should have the authority to decide the management of forest produce? Why do you think so?

Ans:

The forest department of the government should have the authority to decide the management of forest produces. This is because the forest department is the care taker of the forest land and is responsible for any damage to the forest.

Q4. How can you as an individual contribute or make a difference to the management of (a) forests and wildlife, (b) water resources and (c) coal and petroleum?

Ans:

(a) Forest and wildlife

- (i) We should judiciously use the forest products.
- (ii) Felling of trees for paper, timer, etc., should be controlled.
- (iii) Killing of wild animals for their skin, etc., should be banned.
- (iv) Afforestation should be practised.
- (v) Management of the forest should be given to local people.
- (vi) We should try and preserve biodiversity we have inherited.

(b) Water resources

- (i) Leaking taps should be repaired.
- (ii) Water from industries should not be directly dumped in the river water.
- (iii) Use of insecticides and pesticides should be minimised, which are washed away with rain and contaminate river water and underground water.
- (iv) Methods like rain water harvesting, construction of cannal should be promoted. Construction of dams may also prove beneficial.

(c) Coal and petroleum

- (i) Use of coal and petroleum as a source of energy should be minimised,
- (ii) Use of CNG or LPG as fuels in automobiles.
- (iii) Renewable sources of energy like solar power, hydropower, wind energy, tidal energy, etc., should be used. It is a better to walk over a short distance rather than going by car or scooter.

Q5. What can you as an individual do to reduce your consumption of the various natural resources?

Ans:

Natural resources such as water, forests, coal and petroleum, etc. are important for the survival of human beings. The ways in which we can reduce the consumption of various natural resources are as follows:

- (i) We should stop the cutting of trees (deforestation).
- (ii) We should use recycled paper to reduce the cutting down of trees.
- (iii) We should not waste water.
- (iv) We should practice rainwater harvesting.
- (v) We should practice car pooling to avoid the excessive use of petroleum.
- (vi) We should use alternative sources of energy such as hydro-energy and solar energy.

Q6. List five things you have done over the last one week to – (a) conserve our natural resources. (b) increase the pressure on our natural resources.

Ans:

(a) Conserve our natural resources

- (i) Limited use of water
- (ii) Plantation in free areas
- (iii) Irrigation of plants
- (iv) Limited use of petrol/diesel
- (v) Smokeless fuel utilization

(b) Increase the pressure on our natural resources

- (i) Extra use of water
- (ii) Day and night lighting
- (iii) Unnecessary trafficking by car
- (iv) Burning of polythene and wastes
- (v) Destroy the plants

Q7. On the basis of the issues raised in this chapter, what changes would you incorporate in your life-style in a move towards a sustainable use of our resources?

Ans:

One should incorporate the following changes in life-style in a move towards a sustainable use of our resources:

- (i) Stop cutting trees and practice plantation of trees.
- (ii) Stop using plastic and polythene bags for carrying goods.
- (iii) Use recycled paper.
- (iv) Throw biodegradable and non-biodegradable waste into separate bins.
- (v) Waste minimum amount of water while using and repair leaking taps.
- (vi) Practice rainwater harvesting.
- (vii) Avoid using vehicles for short distances. Instead, one can walk or cycle to cover short distances. To cover long distances, one should take a bus instead of using personal vehicles.
- (viii) Switch off electrical appliances when not in use.
- (ix) Use fluorescent tubes in place of bulbs to save electricity.
- (x) Take stairs and avoid using lifts.
- (xi) During winters, wear an extra sweater to avoid using heaters.

ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 16
MANAGEMENT OF NATURAL RESOURCES

- 1.** The three Rs to save the environment are
 - a) Remember, Reduce, Reuse
 - b) Recall, Reduce, Refund
 - c) Reduce, Recycle, Reuse
 - d) Reduce, Refund, Reuse
- 2.** Biodiversity hot spots are
 - a) Areas where large number of different species are found
 - b) Hot Areas where large number of different species are found
 - c) Areas which became hot due to large number of different species.
 - d) Areas where large spot has been created due to death of number of species
- 3.** Chipko Andolan is associated with
 - a) Protesting against pasting of posters on walls
 - b) Saving money
 - c) Using more postal stamps
 - d) Saving forest
- 4.** Stake holders of our forest are
 - a) people who live in or around forests are dependent on forest produce
 - b) Forest Department of the Government which owns the land
 - c) the industrialists – from those who use ‘tendu’ leaves to make *bidis* to the ones with paper mills
 - d) All of the above
- 5.** Amrita Bishnoi lost her life while saving forest having ____ trees
 - a) teak
 - b) khejri
 - c) bamboo
 - d) segun
- 6.** Wild life includes
 - a) Wild animals only
 - b) Wild plants only
 - c) Wild plants and animals
 - d) All plant and animals
- 7.** Ganga action plan has been initiated to
 - a) Dredge and make the river better for water transport
 - b) Increase fishery in the Ganges

- c) Clean excessive pollutants in Ganges water
 - d) All of the above.
- 8.** A local system of canal irrigation called *kulhs* is practiced in
- a) Himachal Pradesh
 - b) Arunachal Pradesh
 - c) Andhra Pradesh
 - d) Madhya Pradesh
- 9.** Indira Gandhi Canal has brought greenery to considerable areas of _____
- a) Gujarat b) Rajasthan
 - c) Haryana d) Uttar Pradesh
- 10.** Conservation of Wildlife includes
- a) Preventing poaching of animals
 - b) Construction of National parks, Sanctuaries
 - c) Ban on trading endangered species
 - d) All of the above
- 11.** What does the high level of total coli form count in river Ganga indicates?
- 12.** What are “biodiversity hot spots”? What is the measure of the biodiversity?
- 13.** Which programme was started to replenish forests?
- 14.** Why scarcity of water is there in our country in spite of nature’s monsoon bounty?
- 15.** What is the effect of continuous depletion of ground water along coastal region?
- 16.** Why is dependence of man on nature greater than that of any other organism?
- 17.** In addition to low rainfall, what are the other reasons for non-availability of water in arid and semi-arid zones of our country?
- 18.** Why is mining a big source of pollution?
- 19.** Write two points to be kept in mind while storing water in tanks.
- 20.** Write any two alternatives to dams.
- 21.** Why do you think there should be equitable distribution of resources?
- 22.** Which canal has brought greenery to considerable areas of Rajasthan?
- 23.** What were the two main problems as a result of Tawa Irrigation Project?
- 24.** Write the advantages of giving the control of water management to the residents of the area?
- 25.** State benefits of water harvesting.
- 26.** How did Chipko Andolan ultimately benefit the local population? Give any three benefits?
- 27.** Quote three instances where human intervention saved the forests from destruction.

- 28.** Why are environmentalists insisting upon sustainable natural resource management? give any four reasons.
- 29.** What is considered as eco –religion? (1)
- 30.** How did 'Chipko Andolan' ultimately benefit the local population? (2)
- 31.** What are 'Biodiversity hot spots'? What is the measure of biodiversity in an area? How is it being affected? (2)
- 32.** Why do you think there should be equitable distribution of resources? What forces would be working against an equitable distribution of our resources? (2)
- 33.** Why do we need to resort to water harvesting when we can collect rain water and use it?(2)
- 34.** Name a bacteria found in human intestine?
- 35.** What will be the result of presence of excess amount of CO₂ in environment.
- 36.** Which is the easiest method to detect water pollution?
- 37.** A person lives near a forest. Enlist 4 items which he can get from forests to meet his daily needs.
- 38.** Why are forest called "biodiversity hot spot"?
- 39.** Name four substances that can be recycled.
- 40.** What do you mean by the term sustainable development?
- 41.** How does mining lead to pollution?
- 42.** "Coal and petroleum are converted forms of solar energy".is this statement correct?
- 43.** Hydroelectric power is also an indirect form of solar energy. how?
- 44.** Write at least two ways by which people of ancient India managed water resources?
- 45.** What will happen if loss of biodiversity occurs?
- 46.** What strategies should be adopted such that forest products are used and the environment also does not get disturbed?
- 47.** Besides conservation of wildlife and forest, suggest some ways which can improve our environment.
- 48.** What is watershed management? what is its aim and what are the benefits?
- 49.** What you can do as an individual to reduce consumption of various nature resources and help in environment conservation?
- 50.** What is coliform bacteria? What does its presence in water indicate?
- 51.** State two reasons of launching "*Ganga Action Plan*". Which bacteria was found in Ganga water indicating contamination?
- 52.** What are the 3R's in sustainable development?
- 53.** What are the two kinds of natural resources?
- 54.** What changes can you make in your habits to become more environment friendly?

- 55.** List any two common methods by which solid wastes of urban areas are disposed off?
- 56.** What is reuse strategy? Why it is considered better than recycling strategy?
- 57.** What is a stakeholder?
- 58.** Name the stakeholders who have their dependence on forests?
- 59.** There are certain NGOs which ask people to donate their used clothes, toys, school books, household items. These NGOs segregate the collected items and distribute them to the needy people. What objectives do these NGOs fulfill by these initiatives?
Name 4 substances that can be recycled.
- 60.** What do you mean by the term sustainable development?
- 61.** How does mining lead to pollution?
- 62.** Hydroelectric power is also an indirect form of solar energy. How?
- 63.** Write at least two ways by which people of ancient India managed water resources?
- 64.** What will happen if loss of biodiversity occurs?
- 65.** What strategies should be adopted such that forest products are used and the environment also does not get disturbed?
- 66.** Besides conservation of wildlife and forest, suggest some ways which can improve our environment.
- 67.** What is watershed management? What is its aim and what are the benefits?
- 68.** What you can do as an individual to reduce consumption of various nature resources and help in environment conservation?
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ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 16
MANAGEMENT OF NATURAL RESOURCES

1. From the list given below pick the item that is not a natural resource
 - (a) Soil
 - (b) Water
 - (c) Electricity
 - (d) Air
2. The most rapidly dwindling natural resource in the world is
 - (a) water
 - (b) forests
 - (c) wind
 - (d) sunlight
3. The most appropriate definition of a natural resource is that it is a substance/commodity that is
 - (a) present only on land
 - (b) a gift of nature which is very useful to mankind
 - (c) a man-made substance placed in nature
 - (d) available only in the forest
4. The main cause for abundant coliform bacteria in the river Ganga is
 - (a) disposal of unburnt corpses into water
 - (b) discharge of effluents from electroplating industries
 - (c) washing of clothes
 - (d) immersion of ashes
5. The pH of water sample collected from a river was found to be acidic in the range of 3.5 – 4.5, on the banks of the river were several factories that were discharging effluents into the river. The effluents of which one of the following factories is the most likely cause for lowering the pH of river water?
 - (a) Soap and detergent factory
 - (b) Lead battery manufacturing factory
 - (c) Plastic cup manufacturing factory
 - (d) Alcohol distillery
6. The pH range most conducive for life of fresh water plants and animals is
 - (a) 6.5 – 7.5
 - (b) 2.0 – 3.5

- (c) 3.5 – 5.0
(d) 9.0 – 10.5
7. The three R's that will help us to conserve natural resources for long term use are
(a) recycle, regenerate, reuse
(b) reduce, regenerate, reuse
(c) reduce, reuse, redistribute
(d) reduce, recycle, reuse
8. Given below are a few statements related to biodiversity. Pick those that correctly describe the concept of biodiversity
(i) Biodiversity refers to the different species of flora and fauna present in an area
(ii) Biodiversity refers to only the flora of a given area
(iii) Biodiversity is greater in a forest
(iv) Biodiversity refers to the total number of individuals of a particular species living in an area
(a) (i) and (ii) (b) (ii) and (iv)
(c) (i) and (iii) (d) (ii) and (iii)
9. Among the statements given below select the ones that correctly describe the concept of sustainable development
(i) Planned growth with minimum damage to the environment
(ii) Growth irrespective of the extent of damage caused to the environment
(iii) Stopping all developmental work to conserve the environment
(iv) Growth that is acceptable to all the stakeholders
(a) (i) and (iv) (b) (ii) and (iii)
(c) (ii) and (iv) (d) (iii) only
10. In our country, vast tracts of forests are cleared and a single species of plant is cultivated. This practice promotes
(a) biodiversity in the area
(b) monoculture in the area
(c) growth of natural forest
(d) preserves the natural ecosystem in the area
11. A successful forest conservation strategy should involve
(a) protection of animals at the highest trophic level
(b) protection of only consumers
(c) protection of only herbivores
(d) comprehensive programme to protect all the physical and biological components

12. The important message conveyed by the ‘Chipko Movement’ is

- (a) to involve the community in forest conservation efforts
- (b) to ignore the community in forest conservation efforts
- (c) to cut down forest trees for developmental activities
- (d) government agencies have the unquestionable right to order destruction of trees in forests

13. In our country, there are attempts to increase the height of several existing dams like Tehri and Almati, dams across Narmada.

Choose the correct statements among the following that are a consequence of raising the height of dams

- (i) Terrestrial flora and fauna of the area is destroyed completely
 - (ii) Dislocation of people and domestic animals living in the area
 - (iii) Valuable agricultural land may be permanently lost
 - (iv) It will generate permanent employment for people
- (a) (i) and (ii)
 - (b) (i), (ii) and (iii)
 - (c) (ii) and (iv)
 - (d) (i), (iii) and (iv)

14. Expand the abbreviation GAP

- (a) Governmental Agency for Pollution Control
- (b) Gross Assimilation by Photosynthesis
- (c) Ganga Action Plan
- (d) Governmental Agency for Animal Protection

15. Select the incorrect statement

- (a) Economic development is linked to environmental conservation
- (b) Sustainable development encourages development for current generation and conservation of resources for future generations
- (c) Sustainable development does not consider the view points of stakeholders
- (d) Sustainable development is a long planned and persistent development

16. Which of the following is not a natural resource?

- (a) Mango tree
- (b) Snake
- (c) Wind
- (d) Wooden house

17. Select the wrong statement

- (a) Forests provide variety of products
- (b) Forests have greater plant diversity

- (c) Forests do not conserve soil
- (d) Forests conserve water

18. Arabari forests of Bengal is dominated by

- (a) Teak
- (b) Sal
- (c) Bamboo
- (d) Mangroove

19. Ground water will not be depleted due to

- (a) afforestation
- (b) thermal power plants
- (c) loss of forest, and decreased rainfall
- (d) cropping of high water demanding crops

20. Opposition to the construction of large dams is due to

- (a) social reasons
- (b) economic reasons
- (c) environmental reasons
- (d) all the above

21. Khadins, Bundhis, Ahars and Kattas are ancient structures that are examples for

- (a) grain storage
- (b) wood storage
- (c) water harvesting
- (d) soil conservation

22. Pick the right combination of terms which has no fossil fuel.

- (a) Wind, ocean and coal
- (b) Kerosene, wind and tide
- (c) Wind, wood, sun
- (d) Petroleum, wood, sun

23. Select the eco-friendly activity among the following

- (a) Using car for transportation
- (b) Using polybags for shopping
- (c) Using dyes for colouring clothes
- (d) Using windmills to generate power for irrigation

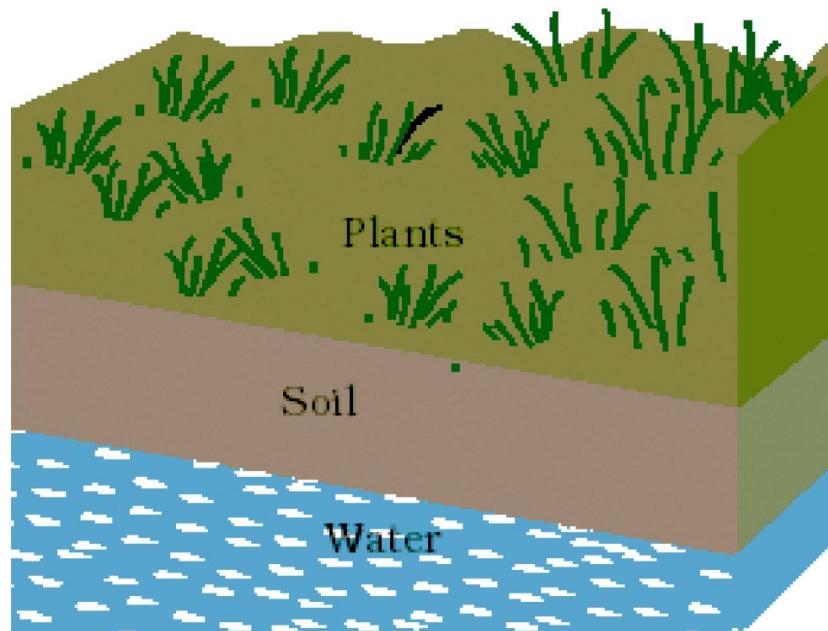
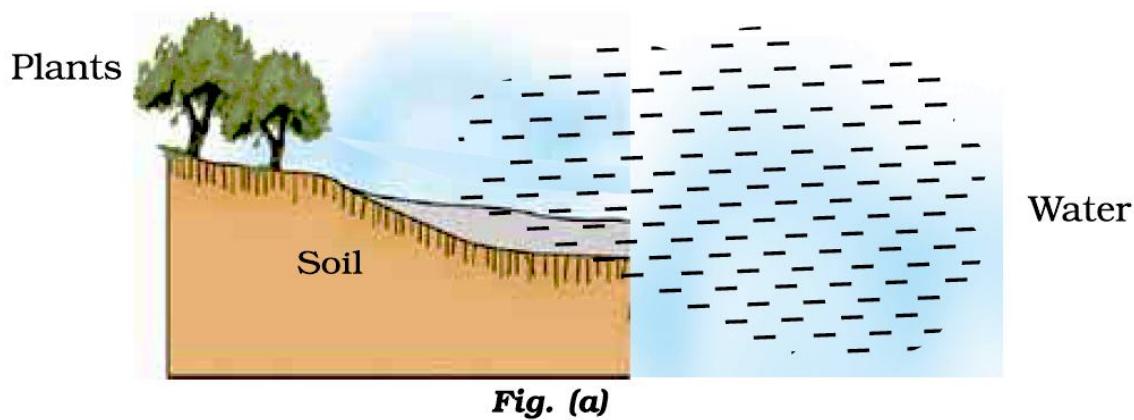
24. It is important to make small check dams across the flooded gullies because they

- (i) hold water for irrigation
- (ii) hold water and prevent soil erosion

- (iii) recharge ground water
- (iv) hold water permanently
- (a) (i) and (iv) (b) (ii) and (iii)
- (c) (iii) and (iv) (d) (ii) and (iv)

25. (a) Locate and name the water reservoirs in Figures (a) and (b).

(b) Which has an advantage over the other and why?



26. Prepare a list of five items that you use daily in the school. Identify from the list such items that can be recycled.

27. List two advantages associated with water harvesting at the community level.

28. In a village in Karnataka, people started cultivating crops all around a lake which was always filled with water. They added fertilisers to their field in order to enhance the yield. Soon they discovered that the waterbody was completely covered with green floating plants and fishes started dying in large numbers. Analyse the situation and give reasons for excessive growth of plants and death of fish in the lake.

29. What measures would you take to conserve electricity in your house?

- 30.** Although coal and petroleum are produced by degradation of bio- mass, yet we need to conserve them. Why?
- 31.** Suggest a few measures for controlling carbon dioxide levels in the atmosphere.
- 32.** In the context of conservation of natural resources, explain the terms reduce, recycle and reuse. From among the materials that we use in daily life, identify two materials for each category.
- 33.** Prepare a list of five activities that you perform daily in which natural resources can be conserved or energy utilisation can be minimised.
- 34.** Is water conservation necessary? Give reasons.
- 35.** Suggest a few useful ways of utilising waste water.
- 36.** What is the importance of forest as a resource?
- 37.** Why are the Arabari forests of Bengal known to be a good example of conserved forest?
- 38.** What will be the effect of increase in the amount of CO_2 in the atmosphere on the average temperature of the earth?
- 39.** Why is it necessary to conserve our environment?
- 40.** Which of the following is the major constituents of biogas. CO_2 , H_2 , CH_4 , CO .
- 41.** Which of the following pollutants of air would affect the capacity of blood in human bodies to absorb O_2 from lungs . NO_2 , SO_4 , CO , CO_2
- 42.** Where was CHIPKO MOVEMENT started?
- 43.** What are the two major benefits of dams?
- 44.** What are kuhls?
- 45.** List any two systems of water harvesting.
- 46.** How is the increase in demand for energy affecting atmosphere?
- 47.** Write two advantages of classifying energy sources as renewable and non renewable.
- 48.** Why should we conserve forests? Suggest any two ways of conserving forests.
- 49.** What are fossil fuels. Give two examples of fossil fuels.
- 50.** Write the ecological functions of forests.
- 51.** What is chipko movement? How did this movement ultimately benefit the local populations and the environment?
- 52.** How do the forests get depleted? What are its consequences?
- 53.** Suggest any two measures for controlling CO_2 levels in the atmosphere.
- 54.** Why are Arabari forests of Bengal known to be good example of conserved forests.
- 55.** Why are environmentalists insisting upon sustainable natural resource management? Give any three reasons.
- 56.** Suggest any two ways of utilizing waste water.

- 57.** Briefly describe Ganga action plan.
- 58.** Explain the methods of water harvesting
- 59.** Quote three instances where human interventions saved the forests.
- 60.** There are four main stake holders when it comes to forests and wild life Which among these should be the authority to decide the management of forest produce? Why?
- 61.** What is the importance of water harvesting?
- 62.** An environmentalist on your visit to your school suggested the use of three R's to save the environment. Explain the three R's
- 63.** What does sustainable management mean? The environmentalists are insisting upon sustainable natural resources management? State four advantages.
- 64.** What is a dam? Write two main advantages and two ill-effects of constructing a big dam
- 65.** Why is replenishment of forests necessary?
- 66.** List four changes you would incorporate in your life style in a move towards sustainable use of available resources.
- 67.** Name a bacteria found in human intestine?
- 68.** Which is the easiest method to detect water pollution?
- 69.** A person lives near a forest. Enlist 4 items, which he can get from forests to meet his daily needs.
- 70.** Why are forest called "biodiversity hot spot"?
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