New

NEW VISION OF SCIENCE

Teachers Manual

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CHAPTER:1–NUTRITION IN PLANTS

A. 1. d, 2. c, 3. b, 4. a, 5. a, 6. c, 7. b. **B.** 1. starch, 2. stomata, 3. sunlight, 4. Cuscuta, 5. saprophytic, 6. pitcher plant, 7. algae, fungi. **C.** 1. T, 2. F, 3. T, 4. F, 5. F, 6. T, 7. T. **D. 1.** Neem, Mango, 2. Mistletoe, Cuscuta, 3. Indian Pipe, Mushrooms, 4. Pitcher, Venus Flytrap, 5. Rhizobium Bacteria, Lichens. **E. 1.** The process of taking in food & its utilization by the body is called nutrition **2.** 'Auto' means 'self' and 'trophic' means 'nutrition'. When an organism is able to prepare their food itself with some raw materials then it is called autotrophic nutrition. **3.** The leaves of green plants contain a green pigment called chlorophyll. It traps energy from sunlight during photosynthesis.

4. $$\text{Carbon dioxide} + \text{Water} \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \text{Starch} + \text{Water} + \text{Oxygen}$$

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

5. Photosynthesis. **6.** When an organism depends on other plants for its food it is called heterotrophic nutrition. **7.** The plants which exhibit saprophytic mode of nutrition are known as saprophytes. For example: a. Indian pipe which is found on dead and rotting material inhabits fungus in its roots. b. Mushrooms are another type of plants exhibiting saprophytic nutrition. **8.** Plants which exhibit parasitic mode of nutrition are called parasites. Pararites obtain their nutrition from other plants or animals. For example, a. Mistletoe is a parasitic plant which receives water and minerals from the host plant. b. Cuscuta is a parasitic plant which develops special roots called haustoria. **F. 1.** There are two main modes by which plants and animals obtain nutrition: a. Autotrophic nutrition, b. Heterotrophic nutrition. a. **Autotrophic nutrition:** 'Auto' means 'self' and 'trophic' means 'nutrition'. When an organism is able to prepare their food itself with some raw materials then it is called autotrophic nutrition. Autotrophic nutrition is found in green plants. Green plants can make their own food through a process called photosynthesis. The leaves of green plants contain a green pigment called chlorophyll. Without chlorophyll, food cannot be prepared by the plants. b. **Heterotrophic nutrition:** When an organism depends on other plants for its food it is called heterotrophic nutrition. Organisms like animals, bacteria and fungi cannot prepare their own food. They depend directly or indirectly on green plants for their food. Heterotrophic nutrition in plants is either a parasitic, saprophytic or symbiotic mode. (a) Parasitic: Plants which obtain their nutrition from other plants and animals are called parasites. (b) Insectivorous: Insectivorous plants are the plants with special leaves that are modified into special structures to trap insects and animals. (c) Saprophytic: The plants which obtain their nutrition from dead and

decaying organic matter are knonwn as saprophyte. (d) Symbiosis : It is the phenomenon by which two organisms maintain relationship with each other to be mutually benefitted. **2.** Take a potted plant with broad leaves and keep it in a dark room for two days. Photosynthesis will not take place in dark room for two days. The leaves will become full of shred. Take two similar strips of stiff black paper. Cover both sides of leaf with these strips with the help of paper clips. Now keep the plant in sunlight . The covered part will not receive sunlight. After few hours, pluck the leaf. Remove the strips & test it as in activity 1. You will observe that covered portion of the leaf shows no change with iodine solution as there was no starch in the covered part. **3. Autotrophic nutrition**: 'Auto' means 'self' and 'trophic' means 'nutrition'. When an organism is able to prepare their food itself with some raw materials then it is called autotrophic nutrition. Autotrophic nutrition is found in green plants. Green plants can make their own food through a process called photosynthesis. The leaves of green plants contain a green pigment called chlorophyll. Without chlorophyll, food cannot be prepared by the plants. **Heterotrophic nutrition**: When an organism depends on other plants for its food it is called heterotrophic nutrition. Organisms like animals, bacteria and fungi cannot prepare their own food. They depend directly or indirectly on green plants for their food. Heterotrophic nutrition in plants is either a parasitic, saprophytic or symbiotic mode. **4.** Four things required by green plants for photosynthesis are: a. **Chlorophyll:** It is a green pigment present in the special cells called chloroplasts. It traps energy from sunlight during photosynthesis. b. Sunlight : Sunlight is absorbed by the chlorophyll present in the leaves. c. **Carbon dioxide:** Leaves take in carbon dioxide from the air through tiny pores called stomata. These stomata are present underside the leaves. They are surrounded by guard cells. These guard cells control the opening and closing of stomata. d. **Water:** The water is absorbed from the soil by the root hair present in roots. The water and minerals absorbed by the plants are transported to leaves through xylem vessels. The starch formed is transported to the various parts of the plant by structures called phloem vessels. **5.** a. Parasite: (i) An organism that depends on other organisms for its food and nourishment. (ii) It develops special organs like suckers, hooks or haustoria to obtain nourishment from the host. (iii) For example: Cuscuta, Nepenthes, etc. a. Saprophyte: (i) An organism that obtains its nourishment from dead and decaying. (ii) It is capable of secreting some enzymes which can digest complex molecules of into simpler forms. (iii) For example: Fungi, Bacteria, etc. **6.** a. **Symbiotic**: Symbiosis is the phenomenon by which two organisms maintain relationship with each other to be mutually benefitted. In symbiotic mode, organisms develop a special relationship with certain other organisms to obtain nourishment. Organisms involved in this type of relationship are called symbionts. For example: Rhizobium bacteria and

leguminous plants are symbionts. b. **Parasitic**: Plants which exhibit parasitic mode of nutrition are called parasites. Parasites obtain their nourishment from other living organisms. In this mode of nutrition, plants depend on other plants or animals for their nourishment. Such plants are called parasites and the ones on which parasites depend are called as hosts. For example, Mistletoe is a parasitic plant which receives water and minerals from the host plant. **HOTS: 1.** Some patches appear of brown, green or other colour. These are fungi. This happens due to saprotrophic nutrition in which organism nutrients from dead and decay matter. **2.** As dry leaf is not capable of doing photosynthesis, so iodine will not be able to react with it. As, no chlorophyll is present in it. **3.** The leaf stomata will not be able to open and then no carbon dioxide will pass in it and hence no photosynthesis.

CHAPTER:2 – NUTRITION IN ANIMALS AND HUMAN BEINGS

A. 1. b, 2. a, 3. a, 4. c, 5. d, 6. d. **B.** 1. holozoic, 2. digestive system, 3. amylase, **4.** 8, **5.** Oesophagus, 6. Ileum. **C.** 1. F, 2. T, 3. T, 4. F, 5. F, 6. T. **D.** 1. Digestion, 2. tongue, 3. villi, 4. bile, 5. omasum, 6. wisdom teeth. **E. 1. Digestion**: involves the breakdown of the food into simpler compounds. **2.** In humans, the alimentary canal is a long tube about nine metres long. It has the following parts : a. Mouth, e. Stomach, b. Oesophagus or food pipe, d. Small Intestine, e. Large Intestine. **3.** The tongue performs many functions such as tasting of food, helping in its mastication, and swallowing. **4.** The food that we eat is pushed down the oesophagus to the stomach by peristaltic movements. **5.** The inner surface of the small intestine has a number of finger- like projections called villi. The villi increase the surface area for absorption of digested food. **6.** Ruminant has one stomach with four compartments : Reticulum, rumen, omasum and abomasums. Such a stomach is called compound stomach. **7.** a. Ingestion : It is the taking in of food. It involves taking in the food through the mouth and eating it. Egestion: It involves the elimination of undigested solid parts of the food. b. Absorption : It involves the uptake of the soluble substance produced during digestion by the cells in the body. Assimilation: It involves absorption of food molecules for producing growth and energy. **F. 1.** The five steps of nutrition carried by amoeba are : a. **Ingestion :** The food particle is enclosed in a food vacuole corresponds to eating is known as Ingestion. b. **Digestion :** The food is digested in the food vacuole by digestive enzymes. This type of digestion is known as intracellular digestion because it occurs within the cell. c. **Absorption :** The digested food present in the food vacuole is absorbed directly into the cytoplasm of the amoeba by diffusion. The digested food just spreads out from the food vacuole into the whole amoeba cell. d. **Assimilation :** The food absorbed by amoeba is used to obtain energy for maintaining its life processes. e. **Egestion:** When a sufficient

amount of undigested food collects inside amoeba, then its cell membrane suddenly ruptures from any place. The undigested matter is thrown out of the body of the amoeba .This process is known as egestion. **2.** Teeth: We have two sets of teeth in our lifetime-the temporary set and the permanent set. The first set of the teeth are there when the babies are about six years. These fall out, permanent teeth take their place. There are thirty-two teeth in our mouth. A. The Temporary Set: The temporary set has twenty teeth, which are also called milk teeth. It starts appearing at the age of about three months and completes in about two years. Milk teeth fall off between the age of 6 to 8 years. The temporary set plays a very important role in the proper alignment and spacing of the permanent teeth. B. The Permanent Set : There are thirty-two teeth in all, sixteen in each jaw. There are four incisors, two canines, four premolars and six molars in each jaw. The permanent set is larger in number and size than the temporary set. Their enamel is thicker though less white in appearance when compared with the milk teeth. Based on the structure and functions, teeth are of four types. They are: incisors, canines, premolars and molars. i. Incisors : There are eight front teeth, four each on the upper and the lower jaws. They are also called biting teeth. They are flat in the shape and help in biting the food. ii. Canines : They are one on the either sides of the incisors on each jaws. They are also called tearing teeth. They are sharp, round and meant for tearing food. iii. Premolars : They are two on each side of each jaw. They have broader surfaces and, therefore, help to chew and grind the food. iv. Molars : These are the last three teeth on both the sides in both the jaws. They have a wide grinding surface and are used primarily to chew food. v. Wisdom Teeth : Wisdom teeth are the third molars which appear between age of 18 and 20. They are called wisdom teeth because they appear so late after the other teeth have already erupted in early childhood. **3.** a. Mouth : The mouth contains teeth, tongue and salivary glands. Food is taken in or ingested through the mouth. The tongue, jaws and teeth work together in grinding the food. Digestion of the food begins in the mouth. The teeth cut and chew the food. The floor of the mouth is a muscular tongue. The tongue performs many functions such as tasting of food, helping in its mastication, and swallowing. In the mouth, the ducts of salivary glands secrete saliva. Saliva contains an enzyme called amylase. It helps in digestion. It breaks down the starch into sugar. Saliva also lubricates the food and makes it easier to swallow. b. Tongue : Tongue is the organ used for taste. The tongue is a fleshy muscular organ present in the mouth. It is attached to the floor of the buccal cavity. It is a very important sense organ and has taste buds, which helps to sense four different tastes, salty, bitter, sour and sweet. It also helps in rolling and pushing the food into the pharynx. It helps to mix saliva with the food while chewing. c. Oesophagus (Food pipe) : The mouth cavity opens into a tube called oesophagus. It lies behind the wind-pipe. The

oesophagus is a 30 cm tube which connects the oral cavity and the stomach. It opens into the stomach the swallowed food passes from the mouth to the stomach through a passage. The food pipe runs along the neck and the chest. The food that we eat is pushed down the oesophagus to the stomach by peristaltic movements. d. Stomach : The stomach is a J-shaped bag-like structure made of muscles. The food travels from the mouth to the oesophagus and then reaches the stomach. It receives the food from the food pipe at one end and opens into the small intestine at the other end. The stomach secretes mucus, gastric, juice and hydrochloric acid. Mucus protects the lining of stomach. Hydrochloric acid kills micro organisms and provides an acidic medium for effective digestion. In the stomach, food is mixed with the gastric juice. The gastric juice contains an enzyme called pepsin which breaks down proteins into simpler substances. Food stays in the stomach for a few hours to get digested. Stomach turns all that you eat into a thick, scupy liquid which is passed on to the small intestine for further digestion and absorption. e. Small Intestine : The small intestine is the longest part of the digestive system. It is a long narrow, highly coiled tube about 7-5 metres long and 2.5 cm thick. It consists of three parts, namely duodenum, jejunum and ileum. In the small intestine, the food is mixed with bile juice and pancreatic juice. Bile is secreted by the liver and the pancreatic juice is secreted by the pancreas. These juices are important in the process of digestion. Bile juice breaks down fats into fatty acids and glycerol. The pancreatic juice breaks down starch into simple sugar and proteins into amino acids. Digestion of all components of food is carried out and completed here. The absorbed food is passed into the blood stream through which the nutrients reach all parts of the body. Absorption of food occurs through millions of small projections in the inner walls of the part of small intestine called ileum. The inner surface of the small intestine has a number of finger- like projections called villi. The villi increase the surface area for absorption of digested food. The absorbed nutrient are transported through the blood stream to other parts of the body, so that they can be assnilated where required. The incorporation of absorbed nutrients into the cell components is called assimilation. The food remains undigested and unabsorbed then enters the large intestine. f. Large Intestine : The last organ of the digestive system is the large intestine. It is shorter in length about 1.5 metres but wider than the small intestine. It consists of three parts, namely caecum, colon and rectum. The large intestine absorbs water and salts and also removes undigested solid wastes from the body in the form of faeces through the rectum. The faeces then leave the body through an opening called anus. The process of eliminating solid waste from the body is called egestion. This type of digestion is called extracellular digestion. The pancreas and the liver are the digestive glands out of the alimentary canal. **4.**

Digestive organ	Enzyme/Juice	Food acted upon	Substances produced
1. Mouth (salivary glands)	Amylase	Starch	Maltose (sugar)
2. Stomach	Gastric juice	Proteins (Pepsin)	Peptides.
3. Pancreas	Pancreatic juice	Starch	Maltose (Sugar)
	amylase trypsin	Proteins	Peptides and Peptide fragments
4. Small Intestine	Lipase	Lipids (fats)	Fatty acids and glycerol
	Maltase	Maltose	Glucose
	Sucrase	Sucrose	Glucose and fructose
	Peptidases	Peptides	Amino acids

5. After being chewed, the food passes down the oesophagus which further leads into the stomach. The stomach has four chambers: rumen, reticulum, omasum and abomasum. a. Rumen: Rumen is the largest chamber of the stomach used for storing food that has been quickly consumed. The food is partially digested here and is now called the cud. The cud is then brought back to the mouth, re-chewed and re-swallowed in a process called cud-chewing. Ruminants can digest cellulose because of the presence of cellulose digesting bacteria and protozoa in the rumen. b. Reticulum : The reticulum helps in moving the swallowed food back into the mouth for thorough chewing. When the food is completely chewed, it directly reaches the omasum. The reticulum opens into the omasum. c. Omasum: It is the smallest chamber of the stomach. It absorbs water, mineral and nitrogen. d. Abomasums: The abomasums is the true stomach and the only side on the digestive track that produces gastric juices (pepsin, enzymes, rennin and hydrochloric acid). The food enters the fourth chamber called the abomasums. In this chamber, gastric juices are secreted and digestion is further carried on. Digestion is completed in small intestine and undigested food is passed on to the large intestine and then eofested. **HOTS: 1.** Yes, because tongue helps in rolling and pushing the food into the pharynx. Then, food pipe pushes it to stomach by peristalsis. **2.** Because four chambered stomach helps in digesting cellulose very fast. In case of humans, cellulose take time to digest as rumen is not present.

CHAPTER : 3 – FIBRE TO FABRIC

A. 1. d, 2. a, 3. b, 4. a, 5. b, 6. c. **B.** 1. Synthetic, 2. winter, 3. wollen, worsted, 4. shearing, 5. bombyx mori, 6. cocoons, 7. Mulberry. **C.** 1. F, 2. F, 3. F, 4. F, 5. T, 6. T, 7. F. **D. 1.** The process of removal of the fleece from an animal is called shearing. **2.** The process of washing sheared wool with detergent to remove dust, dirt and grease is known as scouring. **3.** In grading, the wool is sorted on the basis of length, texture, colour and the ease with which it can be dyed (coloured). In grading small, fluffy fibres called burrs are picked out from the hair. **4.** The breeding and management of silkworms for the production of silk is known as sericulture. **5.** The silk fibre is obtained from the cocoons by a delicate process known as reeling or filature. **E. 1.** shearing, **2.** sericulture, **3.** Jammu & Kashmir, **4.** Scouring, **5.** second stage, **6.** Tassar silk. **F.** 1. In this season we wear loose, light coloured cotton clothes. Light coloured clothes reflect heat and keep the body cool. They absorb sweat and also prevent skin irritation. **2.** Fibre is soft-flexible hair-like filaments. Fibres are classified into— natural fibres and synthetic fibres. **3.** Cotton, hemp, jute, etc., are called plant fibres. Wool, silk and other fibres made from the hair, are called animal fibres. **4.** The type wool that a sheep produces varies by breed for example: merino sheep produces merino wool that is very fine.

Name of breed	State where found	Type of wool
Bhakarwal	Jammu and Kashmir	For woollen shawls
Lohi	Punjab and Rajasthan	Good quality wool
Marwari	Gujarat	For sweaters
Nali	Punjab, Haryana and Rajasthan	Coarse wool
Patanwadi	Gujarat	Carpet wool
Rampur bushair	Punjab, Haryana and Rajasthan	For hosiery Carpet wool

5. Uses of Wool: a. Wool is used for making blankets, carpets and other upholstery. b. It is used for making clothes, shawls, fabrics etc. c. It is used for sound proofing. **6.** The value of wool in the market depends primarily on fineness and length of fibre. Two kinds of yarns are made from wool for weaving and knitting: the woollen system and the worsted system. (a) Woollen system : In this woollen system, woollens are spun from fibres which vary in length and are mixed together. (b) Worsted system: Worsted are spun from combed wool. Combing removes the shorter fibres and leaves the longer ones lying parallel to make yarn. Uniform lengths of relatively

fine fibres are very important in the worsted system, because short fibres are difficult to spin. **7.** People working in the sorting department are at a risk because they may get infected by anthrax bacteria. The anthrax disease is a fatal blood disease. It is also called sorter's disease. **8.** States such as Madhya Pradesh, Assam and Odisha also produce silk. Karnataka, Tamil Nadu and Andhra Pradesh produces 90% of mulberry silk. **G. 1.** The different processes involved in the production of wool are shearing, scouring, grading, etc. The process of obtaining hair and turning it into wool fibres and fabric involves the following steps: a. **Shearing :** The process of removal of the fleece from an animal is called shearing. Machines similar to those used by barbers are used to shave off hairs. Usually, hairs are removed during hot season. Hand shearing does not remove wool completely from the body of sheep. b. **Scouring :** The process of washing sheared wool with detergent to remove dust, dirt and grease is known as scouring. The raw sheared wool is washed with detergent and alkali in tanks to remove grease, dust and dirty impurities account for between 30 and 70 per cent of the fleece's weight. Nowadays, scouring is done by machines. c. **Sorting and Grading:** The process of separating damaged wool from the fleece and separating the wool fibres obtained from different body parts is called sorting. In grading, the wool is sorted on the basis of length, texture, colour and the ease with which it can be dyed (coloured). In grading small, fluffy fibres called burrs are picked out from the hair. d. **Carding:** The clean selected wool fibres are passed through rollers. This straightens the fibres and removes the unwanted matter. The fibres are scoured again and dried. e. **Dyeing:** As the natural colour of fleece is brown, white or black, the fibres are dyed in different coloured wool. f. **Spinning:** The fibres are covered, straightened, washed, twisted and spun into yarn. g. **Weaving:** After spinning, the pieces of yarn get interlocked at right angles to one another. The shorter fibres are woven into woollen clothes. The longer fibres are knitted into wool for sweaters. **2.** The silkworms hatch from tiny eggs lay in the spring by the mulberry silk moth (bombyx mori). This is called the larval stage. The silkworm feeds on leaves and grows. The silkworm (caterpillar) starts off about 2mm in length and spends the first four to five weeks of life in eating. The silkworm secrets fine filaments from two glands on its head. The silkworm deposits filaments in layers around its body, through figure— of eight movements of the head, forming a structure called the cocoon. The silkworm takes three to seven days to prepare the cocoon. Inside the cocoon, the silkworm enters the second stage called pupa then the third and fourth stage to become adult moth. Silk threads are obtained from the cocoon of the silkworm. **3.** Tiny eggs of silkworm are incubated until they hatch and become worms. When the silkworms hatch, they are placed over mulberry leaves. They are fed chopped mulberry leaves for 20-35 days. At the end of this period, they are ready to spin their cocoons. Shrubs or branches of trees are placed in their rearing houses. They make their cocoon in around 6-8 days. After which the

cocoons are put in hot water, this kills the worms and loosens the filaments. The silk fibre is obtained from the cocoons by a delicate process known as reeling or filature. After this heating, the filaments from four to eight cocoons are joined and twisted, which is wound on a reel. The threads are then dyed and woven into silk fabric. The resulting thread is called raw silk. Some cocoons are not boiled and left for the silk moths to be born from them and the life cycle to be completed. **4.** Silk fabrics are light weight, soft, lustrous, elastic and highly strong in tensile strength. a. Silk is used for making clothes. b. It is used in parachutes, bicycle tyres, bullet proof vests, etc. c. It is used as non-absorbable sutures in surgery. Occupational Hazards of silk industry: a. Workers of sericulture industry are affected by respiratory diseases such as bronchitis due to inhalation of vapour rising from cocoons when steamed, boiled and reeled. b. Workers develop infectious skin diseases due to dipping of hands in boiling water while killing the pupa. c. Severe headache, fever and pain in neck and low back have also been observed in the workers of silk industry. d. Leg deformity and bow-leggedness are also found in some workers. **HOTS: 1.** These animals have thick coat of hair which traps a lot of air, thereby creating an insulating barrier. Air is a poor conductor of heat. This protect them in winter thats why shearing is done after winter. **2.** By the softness and rubbing it if you feel warm it is silk. **3.** To loose the filaments for obtaining silk.

CHAPTER - 4 : HEAT AND TEMPERATURE

A. 1. d, 2. c, 3. d, 4. d, 5. a, 6. a, 7. a. **B.** 1. energy, 2. metal, glass, 3. Daniel Gabriel Fahrenheit, 4. thermometer, 5. conductor, 6. –10°C, 110°C, 7. 212°F, 8. convection. **C.** 1. c, 2. e, 3. d, 4. a, 5. b, 6. g, 7. f. **D. 1.** Temperature. **2.** Thermometre. **3.** Kelvin Scale. **4.** Copper. **5.** Plastic. **6.** Sea breeze. **7.** Land breeze **E. 1.** Heat is a form of energy that can be transferred from one object to another or even created at the expense of the loss of forms of energy. **2.** The degree of hotness or coldness of a body or a place is called temperature.

3. Difference between Heat and Temperature

Heat	Temperature
1. Heat is the cause of temperature. It is the heat that cause a change in the temperature of a body.	It is the effect of heat.
2. Heat is a form of an energy.	It is degree of hotness or coldness of a body.
3. It does not determine the direction of flow of heat.	It determines the direction of flow of heat.

4. C/100 = K–273/100. **5.** The process of transfer of heat from the hotter end to the colder end of an object is called conduction. **6.** Good conductors allow heat energy to flow through them. Bad conductors do not allow heat energy to flow through them. **7.** Convection is the transfer of heat by the movement of molecules of liquids and gases. **8.** Bricks and mud which are bad conductors of heat are used in building houses especially in rural areas. **9.** Radiation is a process of heat transfer which does not require any material as medium of transfer. **F. 1.** We measure temperature with an instrument called the thermometer. A thermometer consists of a capillary tube with a small bulb at its end. The bulb and the part of the tube are filled with a liquid and the upper end of the tube is sealed so that the liquid does not evaporate. The unit for temperature that we commonly use is the degree Celsius (°C) or degree centigrade. There are many types of thermometer available today. Let us look at some of them. a. The laboratory thermometer, b. The clinical thermometer, c. The digital thermometer. a. The Laboratory thermometer : In the laboratory, we use the laboratory thermometer to take temperature reading. They are made of glass or metal. A laboratory thermometer measures the temperature, generally in the range of –10°C to 110°C. It cannot be used to measure body temperature because a laboratory thermometer does not have a kink near the bulb to prevent mercury level falling on its own. b. The Clinical thermometer: A clinical thermometer is used by a doctor or nurse to measure the temperature of our body. The clinical thermometer, also known as doctor's thermometer. It is specially designed thermometer used to measure the temperature of a human body easily and as accurately as possible. If you look carefully at a clinical thermometer, you will find that the scale on its stem shows temperature from 35°C, and it never drops to 35°C or rises to 43°C unless certain drastic conditions are reached. c. Digital Thermometer : Digital thermometers are widely used nowadays, as they do not contain mercury. They have a plastic body and provides accurate readings in the form of digital display. **2.** There are three different processes by which heat transfer can take place. They are: a. Conduction, b. Convection, c. Radiation. a. Conduction of heat : In solids, the heat gets transferred through the process of conduction. When an iron rod is placed on a flame, the end touching the flame starts heating slowly. This heat travels to the other end and to the other end becomes hot too. Conduction of heat is just like passing a book from a student in the first row to the student in the second row to the student sitting in the last row by student to student, each one handing it over to the next one. This process of transfer of heat from the hotter end to the colder end of an object is called conduction. b. Convection of heat : Convection is the transfer of heat by the movement of molecules of liquids and gases. On heating, liquids and gases become lighter and rise up. We know that except mercury and molten metals, liquids are bad conductors of heat. Heat transfer in which heat is

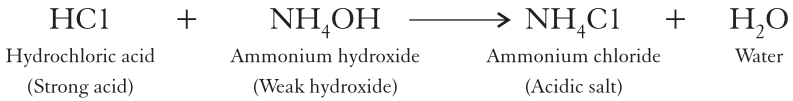
carried from the hotter part of a substance to its colder part by actual movement of hot particles in it is called convection. So in the convection process, the particles of the medium themselves move from one place to another, carrying heat energy with them. c. Radiation: If you stand in front of a fire, you feel hot. The air between you and the heat source is a poor conductor and does not get heated while transferring the heat from the fire to you. The heat you receive certainly does not come to you by conduction through the air or the ground, since both of these remain cold; neither you receive heat by convection, since hot air rises up. Heat energy can travel in the form of waves just like light. These waves the third method of transferring which does not require a medium between hot and cold bodies and is known as radiation. "Radiation is a process of heat transfer which does not require any material as medium of transfer." We receive the heat energy from the sun by radiation and the space between the earth and the sun is called vacuum. **3.** Application of Heat Radiations: a. Black and dark coloured clothes are more suitable in winter because they absorb most of the sun's heat that falls on them. b. Solar panels used in households for heating water, are designed to maximize the absorption of heat from the sun. A black metal sheet is used to increase heat absorption. c. White and light coloured clothes are more suitable in summer because they absorb very little amount of the sun's heat and this keep our bodies cool. **4.** Sea breeze and land breeze are actually convection currents. During the day, the land warms up more than the sea. The air over the land becomes hotter and rises upwards. To take its place, the cooler air from the sea moves towards the land. This convection current from the sea to the land is called sea breeze. After sunset, the land loses heat faster than the sea water. As a result, the air over the sea is warmer at night. The air over the sea being warmer rises up and takes its place, cooler air from the land starts moving towards the sea. The convection current from the land to the sea is called land breeze. **5.** A thermos flask is a very good example of how heat transfer, namely, conduction, convection and radiation is minimized. Let us see how this is done. It is a double walled glass bottle. The outer covering of the thermos flask made of insulating materials minimizes the heat loss by conduction. The inner jar is a double walled bottle made of glass or stainless steel. In the space between the two walls, both pieces of glass are coated with shiny bright silvering. The air is pumped out so that a vacuum forms between the two walls. This also reduces heat loss due to convection as there are no air molecules to carry the heat away. The outer surface of the flask is highly reflective and this minimizes heat loss due to radiation. The heat radiation is reflected back into the jar. **HOTS: 1.** Yes, as heat gets transferred from one object to another when in contact. There are three different processes by which heat transfer takes place. They are: a. Conduction, b. Convection, c. Radiation. Heat will be transferred from the body at higher temperature.

2. The one having spoon will get cool faster as steel is a good conductor of heat, so heat will transferred. **3.** Because a body temperature never raises up to 42°C, or below 35°C there is no use of increasing the range. For other use, we have fahrenheit scale and other.

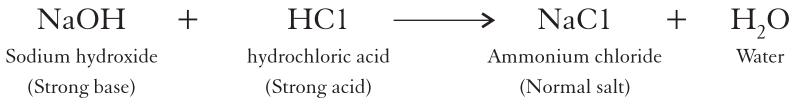
CHAPTER : 5 – ACIDS, BASES AND SALTS

A. 1. a, 2. a, 3. d, 4. c, 5. d. **B.** 1. soluble, 2. red, 3. fertilizers, 4. Bases, 5. Sulphuric. **C.** 1. Bases, 2. Indicators, 3. Salt, 4. Sodium Chloride (NaCl), 5. Milk of Magnesia. **D.** 1. c, 2. d, 3. a, 4. e, 5. b. **E. 1.** Sulphuric Acid (H_2SO_4) : a. It is used in manufacturing chemical fertilizers. b. It is used in car batteries. c. It is used as a dehydrating agent. Nitric Acid (HNO_3) : a. It is used in manufacturing chemical fertilizers. b. It is used in the manufacturing of some perfumes, plastics, dyes, medicines, artificial silk and purification of gold and silver. **2.** Collect some China rose(Godhal) petals and place them in a beaker and put some water in it. Keep the mixture for some time till you find that the water has become coloured. Filter this solution. The indicator is ready. **3.** Acids substances which are sour in taste, corrosive in nature. **4.** Bases substances which are bitter in taste soapy to touch. **5. Sodium Chloride (Nacl):** For preserving and seasoning food, essential for life purpose Calcium carbonate (CaCO3) : Flooring in the form of marble, to make lime (CaO) for extraction of iron. **6.** Universal indicators are mixture of indicators so chosen that it gives a different colour for different pH values. **7.** Acids are two types: mineral acids (inorganic acids) and natural acids (organic acids). **8.** Sodium hydroxide : a. It is used in soap, plastic, textile and paper industries. b. In homes, it is occasionally used to unlock drains. Calcium hydroxide : a. It is used in the preparation of dry mixes for painting and decorating. b. It is used as material for acid burns. **F. 1. Properties of Acids:** a. Acids have a sour taste. b. Most of the acids are soluble in water. c. Acids are colourless. d. Strong acids cause painful blisters on our skin. So, they are corrosive in action. e. They are corrosive in water. f. Acids turn methyl solution pink. g. Acids change the colour of blue litmus solution to red. h. They are good conductors of electricity. **Properties of Bases:** a. All bases have a bitter taste. b. They turn red litmus paper blue. c. Bases react with acids to give salt and water. d. They may or may not be soluble in water. e. Bases are compound that contain hydroxyl (OH) group. f. Solutions of bases are soapy or slippery to touch. g. They turn phenolphthalein solution pink. h. Bases in their aqueous solution are good conductors of electricity. i. They are corrosive in nature. **2.** Some salts have a fixed number of water molecules as an essential part of their crystal. These water molecules which form the part of the crystal are called water of crystallization and such salts are called hydrated salts. These water of crystallisation is responsible for crystal shape. It also gives colour of some crystals. In general they exist as dry in pure form. These salts on heating lose

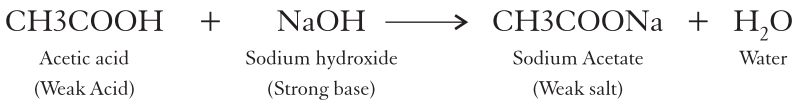
water of crystallisation and forms anhydrous salts. **3.** Salts can be defined as the substance formed by the neutralization of an acid with a base. Properties of Salts: a. Melting and boiling points : Most of the salts are solids. And they have high melting and boiling points. b. Solubility in water: Generally, salts are soluble in water. For examples, sodium chloride, potassium sulphate, ammonium carbonate and aluminium nitrate are soluble in water. Silver chloride, lead chloride, copper carbonate, etc., are the examples for water insoluble salts. **4.** a. Acidic Salts: Acidic salts are formed when a strong acid reacts with a weak base.



b. Normal Salts: When a strong acid reacts with a strong base, normal salts are formed.



c. Basic Salts :Basic salts are formed when a strong base reacts with a week acid,



5. Neutralization in Daily Life: a. Neutralization in Digestion : The stomach contains hydrochloric acid, which helps in the digestion of food. If this acid is produced in excess, it causes indigestion, which is painful. An antacid such as milk of magnesia neutralizes the excessive acid in the stomach, and provides relief from the pain due to indigestion. b. Neutralization- Ant Sting: Ant sting contains formic acid. When an ant bites, it injects this formic acid into the skin. This causes pain. It can be neutralized by rubbing the ant bite with moist baking soda, which contains sodium hydrogen bicarbonate ($NaHCO3$), or with a solution of calamine, which contains zinc carbonate ($ZnCO_3$). c. Neutralization - Acidic Soil : Excessive use of fertilizers makes soil acidic. As a result, plants cannot grow properly, and the yield decreases. Adding a base like quick lime (calcium oxide) or slaked lime (calcium hydroxide) neutralizes the soil and makes it suitable for plants. Similarly, when soil is basic in nature, organic matter is added to release acid and make it neutral, and thus, suitable for plants. d. Neutralization - Factory Wastes: Factory waste contains acids. This waste must be treated with bases for neutralization before it is released into a water source. Otherwise, it can cause damage to living organisms in the water source. **HOTS: 1.** There are some acidic gases (such as carbon dioxide)

which are present in the exposed air which dissolve in water forming carbonic acid. This is the reason, why colour changes to red. **2.** Toothpaste contains a weak base because it helps to neutralise and to remove acid in mouth. **3.** When we wash with soap the stain colour of turmeric changes to red, as soap is base in nature.

CHAPTER : 6 – PHYSICAL AND CHEMICAL CHANGES

A. 1. b, 2. d, 3. a, 4. c, 5. b. **B.** 1. Galvanizing, 2. Physical, 3. carbon dioxide, 4. brought, 5. Rusting. **C.** 1. b, 2. d, 3. a, 4. e, 5. c. **D.** 1. Physical change, 2. Physical change, 3. Displacement Reaction, 4. Chemical Change, 5. Galvanization. **E. 1.** In this method, metal surfaces are covered with another superior metal by using electric current and thus, corrosion is stopped. Gold plated or silver plated electrolytically. **2.** The process of deposition of crystals of a substance on cooling its saturated solution is called crystallization. **3.** There are two conditions that are necessary for the rusting of iron: a. Presence of water. b. Presence of air (Oxygen). **4.** This is a process depositing of a layer of zinc on iron. It is used to make roofing, buckets, boxes and other articles. **5.** To show that formation of curd is a chemical change. Take some milk in a container and add curd. Leave it as such for few hours. After few hours, milk changes into curd. The curd so formed cannot be changed back to milk. **F. 1.** When a substance undergoes a change in its physical properties, that change is said to be a physical change. During a physical change, no new substances are formed. Melting of a solid and freezing of a liquid are physical changes: When a solid substance is heated; it gets changed to its liquid form. When a liquid is cooled, it gets changed back to its solid form. **2.** When two or more substances react in such a way that there is a formation of one or more new substance, the change is called a chemical change. Some common examples are charring of coal, burning of a paper, curding of milk, burning of wood, ripening of fruits etc. **3.** Burning of a candle is a chemical change: Candles are made from wax and a cotton thread (called wick of the candle). During burning of a candle, the molten wax (melting of wax is a physical change) rises through the cotton thread, and undergoes combustion to produce carbon dioxide and water vapour. The cotton thread gets charred to a black mass. Heat and light are given in this process. Also, it is not possible to recover the burnt wax and to recover the thread in the original form from the charred thread. Therefore, the burning of candle is a chemical change. **4.** Burning of magnesium ribbon is a chemical change. Take a piece of magnesium ribbon and hold one end of it with a pair of tongs. Heat the other end over the burner or spirit lamp. It starts burning with a dazzling white flame, and produces dense white fumes. Let the magnesium ribbon burn completely. The white fumes on cooling form a white powder called magnesium oxide. Magnesium oxide is a new substance and its properties are different from that of magnesium. The change can be represented as follow :

Magnesium (Mg) + Oxygen (O_2) → Magnesium oxide (MgO)
Collect the ash and mix it with little water and shake well. With the help of a dropper put a drop of this solution on red and blue litmus paper. You will observe that red litmus paper turns blue and blue litmus paper remains as it is. This proves that the solution formed is basic in nature.
Magnesium oxide (MgO) + Water (H_2O)
→Magnesium hydroxide [$Mg(OH)_2$]
5. Methods to Prevent Rusting : Rusting of metals can be prevented if the contact between metals and air is cut off. This is done in the following ways: a. Coating with oil and grease : Iron and steel instrument, parts of various machines and agricultural tools are kept smeared with oils when not in use and this prevents rusting. b. Coating iron articles with paints : Applying a coat of paint on iron articles prevents them from coming in contact with air and moisture. c. Coating with other metals: Sometimes metals are coated with non-corrosive metals. (i) Electroplating : In this method, metal surfaces are covered with another superior metal by using electric current and thus, corrosion is stopped. Gold plated or silver plated electrolytically. (ii) Galvanization: This is a process depositing of a layer of zinc on iron. It is used to make roofing, buckets, boxes and other articles. (iii) Alloying: Alloy is a homogeneous mixture of two or more metallic solid solutions. Some metals when alloyed with other metals, become more resistant to corossion. For example, stainless steel which is made by mixing metals such as manganese, chromium and magnesium with iron. **HOTS: 1.** The paint stops air and moisture to come in contact with iron but due to weather conditions and because of its soft nature after a period of time it get faded. So, we need to paint every year to prevent rusting. **2.** Due to evaporation, the volume was found to reduced to half. Evaporation of water is endothermic as heat is absorbed to convert water into water vapour.

CHAPTER : 7 – SOIL

A. 1. b, 2. a, 3. c, 4. d, 5. a, 6. d, 7. d. **B.** 1. topsoil, 2. weathering, 3. Bedrock, 4. A, 5. loamy, 6. Acid Rain. **C.** 1. d, 2. c, 3. a, 4. e, 5. b. **D. 1.** Soil, **2.** Topsoil or A-horizon, **3.** Organic Matter, **4.** Weathering **5.** Deforestation, **E. 1.** Soil provides a foundation for a vast number of plants and serves as a store house of water and minerals needed for their growth. **2.** The vertical section of the soil showing its different layers or horizons is called soil profile. **3.** The types of soil based upon the size of particles present in it: (a) sandy soil, (b) clayey soil, (c) loamy soil. **4.** Soils contain the following components : a. Mineral particles, b. Inorganic substances, c. Organic substances, d. Water in the soil, e. Air. **5.** Breaking down of huge piece of rocks into smaller pieces by the action of natural forces is called weathering. **6.** The uppermost layer of soil is called the topsoil or A-horizon. The major content of this section is humus. The presence of humus gives it a dark colour. It is the layer

containing the most nutrients for plants. Many living microorganisms are also seen in this layer. The soil here is porous soft and has more water holding capacity than the other layers. **7.** Soil percolates rainwater which is collected above the bedrock. The level of ground water is called the water table. **8.** The topsoil can be carried away easily by wind or washed away by flowing water. This process of carrying away of topsoil by natural forces like water and wind is called soil erosion. **F. 1.**

S.No	Sandy Soil	Clayey Soil	Loamy Soil
1.	It is made up of large particles with large air spaces.	It is made up of fine particles with small air spaces.	It has high humus content.
2.	It is well suited for fruit and vegetable cultivation.	It is good for making pots.	It is good for cultivation of crop and gardening.
3.	More than two-third of sandy soil is sand and about one-tenth is clay.	More than two-third of clayey soil is clay.	Loamy soil has sand and silt in equal amount, about two-fifths each. One fifth of loamy soil is clay.

2. The vertical section of the soil showing its different layers or horizons is called soil profile. The layers differ in feel(texture), colour, depth and chemical composition of soil particles. The main layers of soil are topsoil, sub-soil, parent rock and bed rock. a. **Topsoil (A-horizon):** The uppermost layer of soil is called the topsoil or A-horizon. The major content of this section is humus. The presence of humus gives it a dark colour. It is the layer containing the most nutrients for plants. Many living microorganisms are also seen in this layer. The soil here is porous soft and has more water holding capacity than the other layers. It is a habitat of many tiny creatures. b. **Subsoil (B-horizon) :** Being the second layer from the top, it is relatively harder and compact. This is also called the subsoil. It is lighter in colour and is often grey or red. It is rich in minerals that seep down along with water. It also contains compactly packed fine particles of soil. The organic matter is less that makes it less fertile. Subsoil is not suitable for plants growth as it contains very little organic matter. c. **Parent Rock (C-horizon) :** Below the subsoil is the parent rock or a C-horizon, which consist of small pieces of rocks with cracks and crevices. There is no organic matter in this layer. It contains parent material through which the soil is formed by the weathering process. This layer stores water over it and makes the water table. This layer is also called substratum. Soil that

is formed from it is called residual soil. This layer of the soil is infertile. **d. Bedrock (R-horizon) :** It contains the parent rock. Below C- horizon is a layer of hard rock called bedrock Or R-horizon. Water cannot penetrate through the bedrock. The properties of this rock greatly determine the composition of the soil. **3.** Different places have different types of soil. The type of soil and the climatic factors of a place determine the plants that can grow well there, and hence the kinds of crops that can be best grown in the region. a. Clayey and loamy soils are both suitable for growing wheat and gram. b. Paddy requires soil rich in clay and organic matter, with a good capacity to retain water. c. For pulses (dals), loamy soils that drain water easily are best. d. For cotton, sandy-loam(loam having more sand) is best. It can hold air, but water can drain through it easily. **4.** Some of the agents of weathering act as mentioned below : a. Water plays an important role in breaking large piece of rock into smaller pieces. Rain water enters the small crevices of rocks. In the winter, this water freezes to form ice. When the ice in the crevices of these rocks expands, it causes the crevices to open up further. This leads to the breakdown of rocks. It also results in the formation of smaller rock pieces. b. The broken pieces of rock travel down due to the forces exerted by flowing water and wind. These forces further break these rocks, thus converting them into very fine particles and mix with humus to form soil. c. The Sun heats up the rocks during the daytime, causing them to expand. The heated rocks cool by the night and they contract. The repeated heating and cooling make the rocks expand. These rapid changes cause cracks and, ultimately, the rocks split into pieces. d. Roots of trees growing through rocks exert great pressure on the rocks. This causes craks in the rocks leading to weathering. e. Mosses and lichens produce certain acids which are capable of dissolving the minerals in rocks. The acid they produce seep into rocks and dissolve some of the minerals. Gradually, the rocks break down into smaller pieces. Burrowing animals like earthworms, rabbits, moles and bandicoots loosen the soil. When they burrow, they break the bigger particles into smaller particles. f. The minerals present in certain rocks may oxidize and hence, result in weathering. **5. Uses of soil are:** a. Soil gives us everything: food, clothing and even shelter. Food, as we know, is derived from plants. Even the food for animals originates from plants which in turn needs soil to make food. Fibres such as silk, wool, cotton can all be traced down to the soil. b. Industries use the materials dug out from the earth to extract metals such as iron, silver, gold etc. c. Water that seeps into the soil is stored underground as subsoil water. We use this water for drinking and other purposes. d. Fossil fuels like petroleum, coal and natural gas are also present in the soil. These fuels are basically formed due to the pressure exerted by soil on dead and decaying plant and animals matter for thousands of years. e. Soil makes a very good natural habitat for various microorganisms. These microorganisms form humus and make the soil fertile. f. Soil is used for various purposes. It is used for the construction of roads,

industries, buildings, bridges, dams etc. It is also used for cultivation of crops. All these activities give employment to thousands of people. **6.** Causes of Soil Pollution: a. Dumping of garbage and sewage wastes in soil. b. Excessive use of chemical fertilizers and pesticides. c. Waste material such as plastic and metals which do not decay easily. d. Spilling or leakage of chemicals. e. Acid rain. Preventing Soil Pollution a. Recycle waste. b. Animal and domestic wastes should be used to produce biogas. c. Use organic manure or vermicompost. d. Instead of chemical pesticides and fertilizers, natural pesticides and fertilizers should be used. **HOTS: 1.** Organic substances are added to the soil by the activities of plants and animals. These substances are excreta of human and animals, dead and decaying plant matter, etc. The substance formed is called humus. It makes the soil fertile and is more suited to agriculture. It also encourages the growth of useful microbes in the soil and these activities go on in the topsoil only. **2.** Clayey soil is suitable for making toys and pots. Clay has the smallest size of particles less than 0.002 mm in diameter. They have very less air spaces between them. Their capacity to retain water is commendable. In fact, you can not see a single clay particle. Clay feels smooth because of its small particle size. **3.** The topsoil can be carried away easily by wind or washed away by flowing water. This process of carrying away of topsoil by natural forces like water and wind is called soil erosion. This damages and removes the fertility of the soil. The delicate balance between topsoil and subsoil is also disturbed.

CHAPTER : 8 – RESPIRATION IN PLANTS AND ANIMALS

A. 1. None , 2. a, 3. c, 4. b, 5. b. **B.** 1. energy, 2. plural membrane or plura, 3. exhalation, 4. $2C_3H_6O_3$, 5. stomata. **C.** 1. Lungs, 2. Exhaling, 3. Inhalation, 4. Trachea, 5. Aerobic, respirations 6. Anaerobic respiration **D.** 1. c, 2. d, 3. a, 4. e, 5. b. **E. 1.** The process of respiration that takes place in the absence of oxygen is called anaerobic respiration. **2.**

S.No.	External Respiration	Internal Respiration
1.	It is a physical process in which exchanges of gases takes place.	It is a chemical process in which molecules are oxidized to form carbon dioxide and water.
2.	No enzymes or other catalysts are involved.	Enzymes and other catalysts are involved.
3.	The process takes place outside the cell.	The process takes place inside the cell.
4.	No energy is released during this process.	Energy is released during this process.

3.

S.No.	Respiration	Combustion
1.	It is a slow process	It is a fast process.
2.	Takes place at Ordinary temperature (37°C)	Needs high temperature
3.	Many steps are involved in the breakdown of food	Converts fuel directly to carbon dioxide and water
4.	It can occurs only in living cells.	It can occur anywhere.
5.	The energy is obtained in the form of a chemical molecule.	Energy is obtained in different forms such as heat and light.

4. Respiration is the process of taking in oxygen, using it for release of energy by oxidation of food, and eliminating the waste products carbon dioxide and water. **5.** Plants also respire for their survival. Oxygen is used and carbon dioxide is given out. Energy is also produced during the process. However, no specific organs for breathing are present. The exchange of gases takes place by the process of diffusion. Leaves have tiny pores called stomata on their lower surface. Stomata traps air and the exchange of gases takes place inside the plant cells. **6.** Respiration is some common animals is described below: a. Through Skin : Multicellular organism such as earthworms, frog and leeches exchange oxygen and carbon dioxide through their moist skin. In amphibians such as frogs and salamanders, the rich exchange of gases take place through the skin and through the lungs. b. Through Air holes : In animals such as insects, there are several holes called spiracles in the body. Air enters the insects body through the spiracle and is carried through tracheal tubes. Oxygen is absorbed inside the body and carbon dioxide rich air is sent out through these spiracles. c. Through cell Membrane : Unicellular organisms like amoeba and paramecium take in oxygen and give out carbon dioxide though their cell membrane or general body surface. **F. 1.** Stomata traps air and the exchange of gases takes place inside the plant cell. A stomata opening surrounded with two guard cells and several subsidiary cells is called stomatal apparatus. The opening and closing of stomata is brought about by the expansion and contraction of the guard cells. Guard cells expand and contract due to the flow of water in and out of the cell and the exchange of gases takes place in cell. Stomata are minute pores on the surface of leaves. Exchanges of oxygen and carbon dioxide takes place though these pores. Young stems also have stomata as in

leaves. In old woody stems, lenticles develop below the bark for gaseous exchange. Roots take in oxygen from the air spaces present between the soil particles, and the oxygen diffuses through the general surface of the roots. **2.** The respiratory system in human beings consists of the following organs : a. Nasal Cavity, b. Larynx, c. Trachea, d. Bronchi, e. Lungs. a. Nasal Cavity: It is first part of the human respiration system. The air that we breathe in enters the nasal cavity through external mares. It is divided into two parts by a septum. In this cavity, the air is cleaned of dust particles, bacteria and other foreign bodies. b. Larynx : The pharynx follows the nasal cavity. Air pauses into a rectangular chamber called larynx. The opening of the pharynx to the larynx is guarded by the epiglottis. This opening closes when we swallow food. It is open while breathing. c. Trachea : The trachea or wind pipe is a delicate muscular tube situated in the front of the neck. The trachea is around 12 cm in length and around 2.5 cm in diameter. It is supported by half-rings of cartilage which prevent it from collapsing. The trachea divides into two bronchi. d. Bronchi : Each bronchus leads to the lungs of its own side . Each bronchus then branches into smaller tubes known as bronchioles. e. Lungs : Lungs are two in number and are present in the chest cavity of the body. Lungs are the organs where oxygen is taken from the air and carbon dioxide is taken from the blood. Each lung is covered with a membrane called plural membrane or pleura. The bronchi in each lung divided repeatedly into smaller branches in the lungs. It is advisable to inhale air through the nose because the nose has hair and mucus. Air sacs are richly supplied with blood capillaries. Breathing is the air, which is pumped in and out of the lungs, so the exchange of gas takes place. The lungs are found inside the chest, protected by a cage of rib bones.

3. Difference Aerobic respiration & Anaerobic respiration

S.No	Aerobic respiration	Anaerobic respiration
1.	It takes place in presence of oxygen.	It takes place in absence of oxygen.
2.	Glucose is completely oxidized to release carbon dioxide, water and energy $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$ + Energy	Glucose is incompletely oxidized to release ethyl alcohol, carbon dioxide and energy. $C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$ + Energy
3.	It occurs in most of the plants and animals.	It occurs in few organisms like yeast and bacteria.

	More of energy is released, 36 Molecules of ATP are produced.	Less of energy is released, only 2 molecules of ATP are produced.
4.	It occurs both in the cytoplasm and mitochondria of the living cell.	It occurs in the cytoplasm of the living cell.
5.	Water is also formed in the process.	Water is not formed.

4. The process of taking in oxygen rich air into the lungs and giving out carbon dioxide rich air is known as breathing. This process is of two types : a. Inhaling : The process of taking in air rich in oxygen is inhaling. During inhaling the rib muscles contract, the front ends of the ribs move upward and outward. At the same time, the floor of the chest cavity, the diaphragm contracts making it somewhat straight. b. Exhaling : The process of giving out air rich in carbon dioxide is exhalation . Inhaling is followed by exhaling. In this process, the ribs return to their normal position , the diaphragm relaxes becomes convex and the abdominal organs take their original position. **HOTS : 1.** When we exercise we require more energy. This requires more oxygen which can only be provided by increase intake of air by increasing the breathing rate. **2.** Fish can use the dissolved oxygen in water which flows over the gills if the fish is taken out of the water the fish cannot absorb atmospheric oxygen and it dies. **3.** When we feel sleepy the respiratory rate comes down. The brain deprived of oxygen sets in a reflex of yawning so that more air can be drawn in to replenish the deficit

CHAPTER : 9 – TRANSPORTATION

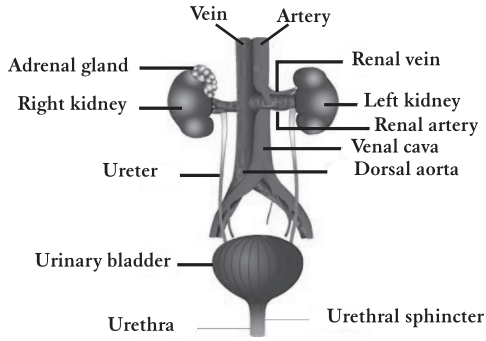
A. 1. b, 2. a, 3. a, 4. d, 5. b, 6. b. **B.** 1. Platelets, 2. veins, 3. valves, 4. pulse, 5. water, minerals, food. **C.** 1. a, 2. d, 3. b, 4. e, 5. c. **D. 1.** Red Blood Cells (RBC). **2.** Artery. **3.** Heartbeat. **4.** Translocation. **5.** Transpiration. **E. 1.** Blood has red blood cells, white blood cells and platelets. **2.** These are red in colour and responsible for transporting oxygen to different parts of the body. They contain a red-coloured protein called haemoglobin. It is a pigment that absorbs oxygen and transports it to the cells all over the body. **3.** Blood is a fluid tissue. It forms a medium through which nutrients, important gases, water and waste products are transported inside the organisms. **4.** Blood is circulated in human body through blood vessels. They are of three kinds namely arteries, veins and capillaries. **5.** Valves prevent the backflow of blood in the heart and the blood vessels. They open and close about 1,00,000 times a day. **6.** The useful substances are utilized by the body of organisms and the harmful substances are eliminated at

regular intervals from the body. The process of getting rid of metabolic waste from the body is called excretion. **7.** Importance of transpiration : a. It produces cooling effect. Thereby saving the delicate cells from the heat of the sunlight. b. Transpiration helps in the movement of water from roots upwards. **8.** The xylem conducts water and mineral salts from the root to the stem, branches and leaves. This process is called ascent of sap. **F. 1.**

S.No	Arteries	Veins
1.	They have thick walls.	They have thin walls.
2.	They carry blood away from the heart.	They carry blood to the heart.
3.	They carry oxygenated blood.	They carry deoxygenated blood.
4.	Pulmonary artery is an exception to this.	Pulmonary vein is an exception to this.
5.	They are deeply placed under the skin	They are superficially placed and blood does not move under pressure.
6.	There are no valves present inside and blood moves under high pressure.	They have a series of valve inside them.

2. Functions of Blood: a. Transportation of digested food to various parts of the body for absorption. b. It carries oxygen to various parts of the body and brings carbon dioxide to lungs to exhale out. c. The platelets present in blood, clot the blood to stop excessive bleeding. d. It transports hormones and a number of other substances. e. It helps in maintaining a constant body temperature. f. Transportation of waste materials to the excretory organs for excretion. g. It protects our body against invading germs. **3.** Working of the Heart and Circulation of Blood: a. When both auricles and ventricles are relaxed, Right auricle receives deoxygenated blood from various parts of the body and the left auricle receives oxygenated blood from lungs by pulmonary veins. b. Now both auricle contract simultaneously and their cuspid walls open up. Blood from left auricle comes in the left ventricle and from right auricle into right ventricle. c. Both the auricles relax and ventricles contract. The cuspid valves between the auricle and ventricles are slam shut and semilunar valves between left ventricle and aorta opens up. d. Oxygentated blood from left ventricle is pumped into aorta and is distributed to all the body parts by arteries. Deoxygenated blood from right ventricle is pumped into the pulmonary aorta and is transported to lungs by

the pulmonary arteries for oxygenation. **4.** One heartbeat includes: a. A phase of relaxation of heart muscles and general pause – Diastole. b. A phase of contraction of heart muscles- Systole. During diastole, heart receives blood and during systole, first auricles contract to push the blood into ventricles and then ventricles contract to pump blood into blood vessels. **5.** The excretory system in human beings consist of kidneys, ureters, urinary bladders and urethra. Kidneys : The human body has a pair of kidneys located in the abdomen on either side of the backbone. Each kidney is brick red in colour and bean shaped. Each kidney weights about 150g and is about 12 cm in length, 6 cm in width and 3cm in thickness. The kidney is made up of a large number of coiled tubes called nephrons, which are the functional units of the kidney and help in forming urine.



Excretory system of human

Nephrons are the filtering units of the urinary system which filters out excess salts, urea and water. It filters the blood of these impurities and helps to keep the blood clean. Glucose, amino acids, salts, etc. are reabsorbed in the kidneys. Ureter : It is the narrow tube that runs from the inner side of each kidney. The ureters are two thin-walled, urine-carrying ducts. A ureter originates from each kidney and is about 30cm in length. Urinary bladder : It is a bag-like structure in which urine is stored. The urine traveling from the kidneys and through the ureters is collected and stored in the urinary bladder. Urethra: Urine from the bladder passes through a tube called urethra. The urethra is the duct which finally discharges urine from the body. **6.** Transpiration is the process by which plants lose water in the form of water vapour from the aerial parts of the plant (mainly leaves) due to the heat of the sun. When plants lose water from the aerial parts, suction is created-similar to you sipping a juice through a straw. Importance of transpiration : a. It produces cooling effect. Thereby saving the delicate cells from the heat of the sunlight. b. Transpiration helps in the movement of water from roots upwards. **HOTS : 1.** Veins have valves so that blood should flow only towards the heart and arteries carry blood from heart to other parts of the body. So, there is no need of valves in it. **2.** Transpiration.

CHAPTER - 10 : PLANT REPRODUCTION

A. 1. c, 2. a, 3. b, 4. d, 5. b, 6. c, 7. d. **B.** 1. asexual, 2. equal, 3. Green algae, 4. zygote, 5. stigma, 6. water. **C.** 1. c, 2. a, 3. b, 4. d, 5. f, 6. e. **D. 1.** Budding. **2.** Binary fission. **3.** Spores. **4.** Pollination. **5.** Gamets. **E. 1.** The process of producing one of the same kind so that the species may continue on earth is called reproduction. **2.** a. The formation of new plants through the fusion of male and female gametes is called sexual reproduction. Sexual reproduction is the most common method of reproduction in flowering plants. For sexual reproduction to occur, two parent-one male and the other female are required. The formation of new plants from the cells of a single parent is called asexual reproduction. There are many ways in which asexual reproduction occurs in nature. The common forms are : budding, fragmentation, spore formation, etc. **3.** Some lower plants such as ferns, mosses, lichens and fungi reproduce through spore formation under unfavourable conditions. **4.** The filament of the algae breaks into two or more pieces called fragments and the process is known as fragmentation. **5.** When a new plant is produced from the vegetative parts of a plant such as leaves, stems and roots, it is called as vegetative reproduction or propagation. **6.** The seed enclosed in the fruit need to be separated from its parent plant before it can develop into a new plant. Seed dispersal helps the plants to avoid competition for sunlight, water and minerals. Seeds and fruits may be carried away by wind, water and animals. Some seeds also get dispersed by special means. **7.** Pollination taking place in the same flowers is said to be self-pollination, but if it takes place between different flowers, it is said to be cross pollination. Cross pollination is more common than self-pollination. **8.** Dandelion have tiny hairs surrounding them. Wind blows away the seeds to distant places. There are many ways in which asexual reproduction occurs in nature. The common forms are : budding, fragmentation, spore formation, etc. **F. 1.** Fertilization: The stigma of each flower secretes a liquid containing sugar. A pollen grain on reaching the stigma develops a long tube called the pollen tube. It is this tube, that carries the male gamete through the style. It grows until it reaches the ovule and enters inside it. The pollen tube contains two male gametes at its tip. The male and female gamete fuses in the ovary to form the egg or the zygote. This process of formation of zygote is called fertilization. The zygote develops into an embryo. **2.** a. Cutting : In this method a healthy young branch of a plant having leaf buds is cut off and planted in moist soil. The cutting develops roots and grows into a new plant. This method is generally used for multiplying sugar cane, rose, bougainvillea and hibiscus. b. Grafting : In horticulture, this method is used to grow fruit plants in order to develop new varities of fruits. To get the combined features of two plants, the stem of a healthy plant is cut (scion) and inserted over the cut stem of

another plant (stock) which is rooted in the soil and then both of them are tied together at the joint. After a few days, the plant starts giving out new branches and shows combined features of both the plants. c. Layering : In this method, a young branch is bent towards the ground and covered with moist soil. After some time, roots develop from the covered part. This is called a layer and the process is called layering. The branch is then separated from the parent plant and allowed to grow into a new independent plant. This method is commonly used by gardeners to develop plants, such as jasmine, rose and bougainvillea. **3.** Vegetative reproduction has several advantages. Therefore, several artificial methods have been developed for vegetative reproduction. These are used to grow many plants from one parent plant. The process of growing new plants using man-made techniques is known as artificial propagation. It is a simple faster and less expensive method for multiplying plants. Some of these methods are : cutting, grafting, layering. **4.** Tissue culture is a method, in which a piece of tissue is cut from the plant and kept in a nutrient medium under controlled conditions. The cell of the tissue divide rapidly to form an organized mass of cells called callus. The nutrient medium contains hormones that make the cells divide and form groups of cells. Roots are also developed. These are then kept in a different nutrient medium containing hormones that enable shoots to develop. It makes them develop into new plantlets. These plantlets are them transferred to moist soil for further growth. Chrysanthemums, Orchids, Asparagus and many other plants are grown by this method. Tissue culture can be carried out throughout the year irrespective of the season. **5.** Pollination : For fertilization to occur the pollen grains must first be transferred from the stamens to the stigma of the pistil. Pollen grains are present in the pollen sac which is called the anther. The transfer of pollen grains to the stigma of a flower is called pollination. This transfer can take place with the help of wind, water or insects. These are called the agents of pollination. **Types of Pollution:** There are two types of pollination which are described below : Pollination taking place in the same flowers is said to be self-pollination, but if it takes place between different flowers, it is said to be cross pollution. Cross pollination is more common than self-pollination. **HOTS: 1.** Spores are very small spherical and single-celled organism. They are protective by a protective wall. Spores develop in a structure called sporangium. When the spores are released, they keep floating in the air. The spores being very small and light are carried away to distant places by air. They give rise to new plants under favourable conditions. A fruit can have one or more seeds inside it. The fruit is the seed bearing ovary of the ripened ovary of the flowering plant. The seed is seed is ripened over which contains an embryo and is covered by a protective coat. The seed enclosed in the fruit need to be separated from its parent plant before it can develop into a new plant. Seed dispersal helps the plants to avoid competition for sunlight,

water and minerals. Seeds and fruits may be carried away by wind, water and animals. Some seeds also get dispersed by special means. **2.** Yes, cross pollination will occur. The stigma of each flower secretes a liquid containing sugar. A pollen grain on reaching the stigma develops a long tube called the pollen tube. It is this tube, that carries the male gamete through the style. It grows until it reaches the ovule and enters inside it. The pollen tube contains two male gametes at its tip. The male and female gamete fuses in the ovary to form the egg or the zygote. This process of formation of zygote is called fertilization. The zygote develops into an embryo. **3.** Yes, because wind means no attraction, without nector help they can transfer the pollen grains from stigma of one flower to another.

CHAPTER : 11 – MOTION AND TIME

A. 1. c, 2. b, 3. d, 4. a, 5. d. **B.** 1. second, 2. hour glass, 3. oscillation, 4. increases, 5. quartz, 6. speed, 7. Speedometer, 8. uniform. **C.** 1. c, 2. d, 3. e, 4. a, 5. b. **D. 1.** The speed of an object is defined as the distance travelled by it in unit time. The standard unit of distance is **metre** and that of time is **second**. Therefore, the SI unit of speed is metre/second or ms. **2.** Jaipur, Delhi, Mathura, **3.** A small mass suspended from a fixed point and allowed to swing freely under the influence of gravity is called a **pendulum**. A simple pendulum has a small metallic ball called **bob** suspended from a rigid stand by a thread.

4.

Total distance covered by the man = 70 m + 70 m + 60 m = 200 m

Total time taken by man = 20 s + 20 s + 10 s = 50 s

$$\text{Average speed} = \frac{\text{Total distance covered (d)}}{\text{Total time taken (t)}}$$

$$= \frac{200\ \text{m}}{50\ \text{s}}$$

$$= 4\ \text{m/s}$$

5. Motion of an object can be slow or fast. If an object covers a given distance in a short interval of time, it is said to be fast, if on the other hand the time taken is more. The motion is said to be slow. For example, we may observe that an aeroplane travels very fast while a bicycle is slow. **6.** The physical property which gives us both the speed and direction of motion of a body is called **velocity**. **7.** The distance time graph shows the speed of a body. It shows two motions: Uniform-When a body covers equal distance in equal interval of time. Non-uniform-When a body covers unequal distance in unequal interval of time. **E. 1.** One complete to and fro movement of a simple pendulum is called an **oscillation**. The time taken by a pendulum for one oscillation is known

as its **time period**. The maximum displacement of the bob from its mean position is called its **amplitude**. The time period of the simple pendulum can be changed by changing the length of the string. **2.** People used instruments such as sundials and hour glass to keep track of time. The movement of shadow of a rod stuck upright in the ground, whose shadows changed direction with the movement of the sun across the sky, was used to make crude sundials. An hourglass consisted of two rounded glass bulbs, connected by a narrow neck of glass. It is also known as **sand clock**. It was based on the principal that all the sand from the upper chamber falls into the lower chamber through tiny openings, in one hour. Once the upper chamber is empty, it is turned upside down to record the time again. **3.** Nowadays most clocks or watches have an electric circuit with one or more cells. These clocks are called **quartz clocks**. The time measured by quartz clocks is much more accurate then by the clocks available earlier.

4. Total distance covered (d) = 80km

Total time taken (t) = 2 h

$$\text{Average speed (s)} = \frac{\text{Total distance covered (d)}}{\text{Total time taken (t)}}$$

$$= \frac{80\text{km}}{2\text{h}} = 40\text{km/h}$$

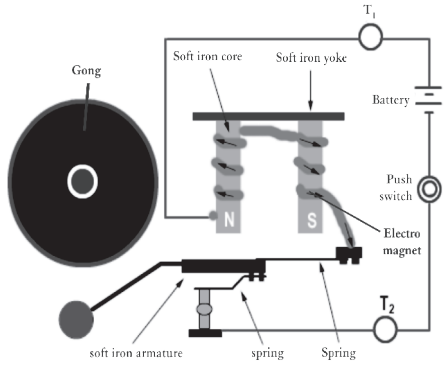
5. Do yourself, **HOTS: 1.** The time period of the simple pendulum can be changed by changing the length of the string. **2.** 1 Day = 24 hours. 1 Year = 8760 hours. **3.** Do yourself

CHAPTER : 12 – ELECTRIC CURRENT AND ITS EFFECTS

A. 1. c, 2. c, 3. d, 4. b, **B.** 1. core, 2. Audio, Video, 3. heating a wire, 4. Battery, 5. connecting, disconnecting. **C.** 1. b, 2. e, 3. c, 4. a, 5. d, **D.** 1. Switch, 2. Electric Circuit, 3. Filament, 4. Electric fuse, 5. Solenoid, **E. 1.** The positive and negative wires in an electric circuit at home or anywhere else come directly into contact with each other. This is commonly called short circuit. Due to short circuit the wires will get overheated and may catch fire. **2.** A coil wound around an iron core that acts as a magnet as long as an electric current flows through the coil is known as an electromagnet. **3.** A solenoid is a device which can be used as an electromagnet. A solenoid is a cylindrical coil of wire. The solenoid behaves like a bar magnet, with opposite poles at the ends. **4.** A device which is used to join parts of a circuit. If you disconnect one of the wires from the cell or break, bulb does not glow. This is because, the path of the current is now obstructed. **5.** It is a safety device used to prevent electric appliances from getting damaged from an excessive flow of current.

F. 1. **Components of electrical circuit**

The following are the essential components of an electrical circuit: (a) The cell or battery: It Consists of one or more cells connected to each other – the positive of one cell is the negative of the other and so on. (b) The switch: It is a device to join parts of a circuit. (c) Appliance, e.g. bulb: This is is like appliance that uses the electric current in the circuit for some useful purposes **2. Uses of Electromagnet** • Games with strong electromagnets are used to lift up large iron objects. When they have to be placed some where the switch is put off. • Audio and video tapes use the principal of magnetism. • They are used in motors that drive fans, mixers washing machines, etc., they are also used in generators. • Electromagnet are use in hospitals by surgeons to remove steel splinters from eyes or wounds. **3.** In an electric bulb also it is the filament that gets so hot , due to the electric current flowing through it. That it glows and produces light. This change of electrical energy into light energy is called Lighting effect of current. All the appliances have a heating element or filament made of a material such as nichrome or tungsten. **4.** An electric bell is a simple device which uses an electric magnet. It is the direct application of electromagnets. It consists of the parts which are fitted on a float wooden or plastic board. Such as electromagnet, an armature ,a contact adjusting screw, a gong and a hammer. The armature consists of a soft iron rod moving on a spring. The terminals T1 and T2 of the bell are connected to a battery through a push button switch. When the push button switch is pressed, electric flows from the dry cell to the electromagnet and then to the contact screw an and finally to terminal T2 and again to the dry cell. Thus the electric circuit is completed. When we push the switch of the bell, an electric current flows to the electromagnet. The electromagnet attracts the soft iron strip. The electric current flowing in the circuit breaks at the contact points but the armature and the electromagnet due to inertia of motion. The case of electro magnetism and the armature springs back to its original position to close the circuit one again. Current flows again and the cycle repeats itself till the current switched off. **5.** An electric fuse makes use of the heating effect of current. It breaks the electric circuit of there is an excessive flow of current in the circuit. It is a safety device used to prevent electric appliances from getting damaged from an excessive flow of



An Electric Bell

current, A fuse is a safety device used in an electric circuit. The electric fuse works on the principal of heating effect of current. A fuse contains two pins through which a wire passes. This wire is made of a material that melts easily when heated. In case of flow of an excess current, the wire melts there by breaking the circuit. If the current exceeds this amount , the heating in the wire causes it to melt. We say that the fuse 'blows'. **HOTS: 1.** Copper wire can't be used as a fuse wire because it has a high melting point can't be melt easily when a high electric current passes though it. It may damage the electrical appliances. **2.** As we know cells produce electricity as they are made of chemical reactions. Batteries are made up of two or more cells which means more chemical reactions. These reactions involve toxic which are harmful, so when we charge the battery more reaction occurs and more the toxid come in environment.

CHAPTER : 13 – LIGHT

A. 1. d, 2. a, 3. b, 4. b, 5. c, 6. a, 7. b, **B.** 1. irregular, 2. smooth surface, 3. behind, 4. convex mirror, 5. convex, 6. Virtual, 7. dispersion. **C.** 1. e, 2. a, 3. b, 4. d, 5. c, **D.** 1. Plane Mirror, 2. Converxlens, 3. Virtual, 4. Pegular Reflection, 5. Spectrum, **E. 1.** When light falls on an object, some of it is absorbed and the rest is bounced back. Reflection is the bouncing back of light from the surface of an object. **2.** There are two laws of reflection for the light incident on a plane polished surface. There are as given below: (a) The angle of incidence is equal to the angle of reflection. $\angle i = \angle r$ (b) The incident ray, the reflected ray and the normal all lie in the same plane. **3.** Real image: An image that is formed on the screen is said to be real image. An image formed by a projector in the cinema hall on the screen is an example of real image. Virtual image: An image that appears to be formed behind the screen and cannot be formed on screen is said to be virtual image. Such an image moves towards or away from the screen, if the position of the object is changed. **4.** The phenomenon of left appearing in right and right appearing left on reflection in a plane mirror is called the lateral inversion. **5.** Uses of plane mirror: (a) Mirror are used as looking glass. (b) These are also used in showcases as a double to see the reflecting images. (c) They are used as reflectors in solar cookers. **6.** A lens is a curved and polished piece of glass or any other transparent material. Lenses are of various shapes and sizes. **7.** A circular band of seven colours that can be seen in the sky after rains formed by the dispersion of sunlight is called rainbow. **8.** Isaac Newton, a great scientist who lived in the seventeenth century, was the first to show that ordinary white light is made up of seven colours- violet, indigo, blue, green, yellow, orange and red (VIBGYOR). The pattern formed by these colours is called a spectrum. **F. 1.** Property of light travelling in a straight line is known as rectilinear propagation of light. To show that light travels in a straight line. Take lighted candle and place it on a table. Now look at the

lighted candle first through a straight pipe. You can very clearly see the candle flame. Now look at the candle flame through a bent pipe. Now you cannot see the flame This is because the light travels in straight line. In other words, it cannot bent along the corners. **2.** In short, the image characteristics of a plane mirror are: • A plane mirror produces an upright and virtual image • The image is of the same size as that of the object. • The distance of the image formed on the mirror equals the distance of the object in front of the mirror. • The image is laterally inverted.

3. Difference among Plane, Concave and Convex Mirror

S.No.	Plane Mirror	Concave Mirror	Convex Mirror
1.	Always virtual	(a) Virtual when the object is between F and P (b) Real for all other positions.	Always virtual
2.	Reflecting surface is flat	Reflecting surface is curved inwards	Reflecting surface is curved outward
3.	Image formed is virtual and upright	Image formed is real inverted except when the object is closer to the mirror	Image formed is virtual and upright
4.	Always erect	(a) Erect when object is between F and P (b) Inverted for all position of object	Always erect
5.	Image is of the same size as the object	Image is either enlarged or diminished	Image formed is diminished
6.	laterally inverted	(a) Magnified when object is between F and P (b) Magnified when the object between F and C (c) Diminished when object beyond C.	Always diminished

4. Uses of Concave Mirror (a) As doctors head mirror to focus a parallel beam of light on the internal boy parts, such as throat, ear, nose, teeth, etc. (b) To collect heat radiation in solar cooker. (c) It is used in flood light when the source of light is placed between pole and focus, a divergent beam is produced after beam is produced after reflection. (d) A narrow parallel beam of light is obtained if a point source of light is placed at the principal focus of a concave mirror. This property is utilized in the headlight of vehicles, torch lights, search lights and projectors where a concave mirror is used to get a strong parallel beam of light. Uses of Convex Mirror (a) Convex mirror are used as vigilance mirrors in departmental stores and big shops as anti-shoplifting devices. (b) Convex mirrors are used as rear view mirrors in vehicles. (c) It is used as a reflector in street lamps as it diverges the light rays over a wide area. Position of object

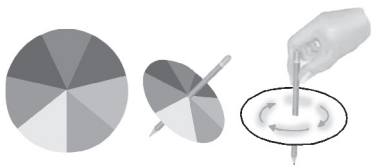
5.

Position of object	Position of Image	Nature
(a) Between O & F	Same side of lens	Virtual & erect
(b) Between F & 2F	Beyond 2F	Real & inverted
(c) At F	At infinity	Real & inverted
(d) Beyond 2F	Between F & 2F	Real & inverted

6.

Position of object	Position of Image	Nature
(a) Between O & F	Behind the object	Virtual & upright
(b) Between F & 2F	Beyond 2F	Real & inverted
(c) At F	At infinity	Real & inverted
(d) Beyond 2F	Between F & 2F	Real & inverted

7. Take a circular piece of white cardboard and paint seven sectors on it with seven colours. Paint bands of the seven colour on the white paper . Insert a pencil through the centre of the disc formed, Now it looks like a top. When the top is moving rapidly you cannot see the different colours separately. Instead, you will see that the card appears grayish-white.

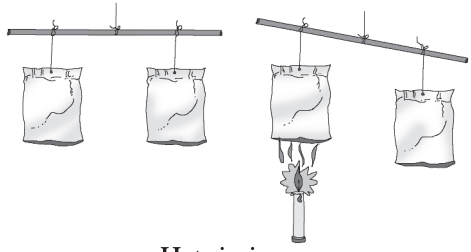


Experiment to show that white light is made up of several colours

HOTS: 1. The moon is visible because it reflects light of the sun. It doesn't produce light. It seems to be shiny by reflection. **2.** The warning reminds driver that the adjacent vehicle is a bit closer than it is seeing in the mirror. Because these mirrors give a useful field of view it makes objects to appear small. **3.** Convex lens

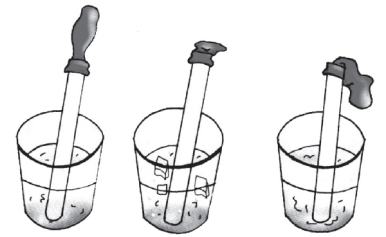
CHAPTER : 14 – WINDS, STORMS AND CYCLONES

A. 1. d, 2. b, 3. b, 4. a, 5. c, 6. a, **B.** 1. lighter, rises, 2. difference. 3. expands, 4. low, 5. hurricane or typhoon, 6. thunder, lighting, 7. storm center or eye, 8. barometer, **C.** 1. d, 2. a, 3. e, 4. c, 5. b, **D.** 1. Atmosphere, 2. Wind, 3. Air pressure, 4. Windvane, 5. Eye, 6. Tornado, **E. 1.** Moving air is called wind. **2.** The pressure exerted by air is called air pressure. The air in the atmosphere exerts pressure on every object and in all direction. **3.** It is thunderous sound. Thunder and lightning occur together in the clouds. It fades away when the rising column of hot air cuts off due to decreased precipitation. **4.** If the earth's surface in a region is heated up by the strong sun, the air over it becomes lighter and rises up. This produces a region of low pressure on the earth's surface winds are caused by the movement of air from a region of high pressure to a region of low pressure. **5.** The poles are regions of high pressure. The air in equatorial regions get heated and rises and the cooler air from the surrounding regions moves in. Thus, winds blow from the North and South towards the equator. At the poles, the air is cooler than that at latitudes about 60 degrees. **6.** Direction and speed are two main characteristics of wind. The direction of wind is judged by an instrument called a **windvane** or also known as **weathervane**. The head of the rooster points in the direction from where the wind is blowing. The speed of the wind is measured by an instrument called **anemometer**. 7. Swirling around a low pressure centre called the **eye** of the storm. This low pressure area is called the **storm centre**. Cyclones are huge and are very powerful storms. **8.** It is a whirling and twisting funnel of wind. It is formed when a funnel like column of cold air sinks down from a storm cloud. **F. 1. Hot air rises up.** Tie a ruler with a piece of string at its centre. Tie two large paper bags to the ends of the ruler so that the ruler stays balanced on both the sides. Now put a burning candle below one of the bags. The balance of the bags is distributed because the air in this bag heats up and so becomes lighter. The bag with the burning candle beneath it goes up. This is because air above the candle gets heated and rises up and pushes the bag from below. This proves that hot air rises up. **2.** If the earth's surface in a region is heated up by the strong sun, the air over it becomes lighter and rises up. This produces a region of low pressure on the earth's surface winds are caused by the movement of air from a region of high pressure to a region of low pressure. Wind currents are generated due to uneven heating of the earth. The speed of winds



Hot air rises up

depends on the difference in pressure. **3.** It develops when warm humid air near the ground receives an initial upward push from converging surface winds and rises rapidly in an unstable atmosphere. The water droplets and ice crystals collide with each other. Due to the swift rising air, the lightning heats up the surrounding and make the air expand very fast. In turn, it produces a thunderous sound. Thunder and lightning occurs together in the clouds. **4.** Air expands on heating and contracts on cooling. Take a balloon, press it so that it is flat and there is no air inside it. Stretch a balloon tightly over the mouth of a test tube. Keep the test tube in a glass containing hot water. What happens to the balloon? It gets filled with air. Keep the test tube in a water trough filled with ice cubes. It gets deflated. This proves that air expands on heating and contracts on cooling. This activity shows that the air in the test tube expands on heating and fills the balloon. The greater the heating, the greater will be the expansion. Similarly, air in the test tube contracts on cooling. **5.** Cyclones are also called hurricanes or typhoons. It is a storm which develops in the sea and has high speed winds. Swirling around a low pressure centre called the eye of the storm. This low pressure area is called the storm centre. Cyclones are huge and are very powerful storms. They can be hundreds of kilometres wide. The result of this mixture of heat and moisture is often a collection of thunderstorms, from which a tropical storm can develop due to the heat of the sun, the warm air rises up causing the cold air to rush and take its place. Thus a current of air is developed when water from the sea evaporates; taking up heat from the atmosphere to change into water vapour. **6.** Precautions for cyclone prone regions • Avoid driving on roads through sandy water. • Listen to the TV and radio weather bulletins regularly. • In case of a cyclonic forecast, enough provision for medicine and food should be maintained. • Prepare an emergency kit containing a portable transistor/ radio set, battery torch, extra batteries, hurricane lamp, first aid box, dry food, drinking water and other minimum essentials. • As soon as warning is sounded, secure your home well or move to safer places. • Do not venture into the sea. • Do not touch wet switches or electric lines. • Bolt glass windows and put shutters in place. • Keep an emergency kit ready at home. • During and after a cyclone, check for gas leaks. Do not use electric appliances if wet. • Beware of fallen power lines, loose wires hanging from poles to avoid electrocution, damaged bridges, buildings and trees. • Co-operate and help your friends


(a) Hot water (b) Ice cold water (c) Water at normal temperature

and neighbours. **HOTS: 1.** The main cause behind the formation of wind is the heat of the sun. When the sun rays fall on different parts of the Earth and the heat is unevenly distributed, wind is caused. The air absorbs different amounts of heat, making it warmer in some places and cooler in other places. In other words, air expands on heating. This makes the air lighter, or less dense, so it rises. The cool, heavy air rushes to take its position. This moving air is what we call wind. The heating and cooling on earth happens very regularly with the change in seasons. This sets up seasonal winds such as the monsoon winds. When the speed of moving air is slow, it is called **breeze** and if it is high, it is called storm. Wind is closely related to the pressure of the air at a place. **2.** Once formed a cyclone may remain in one place for many hours or it may move with a great speed. A large area of low pressure often brings rain and unsettled weather for days as it moves across the land.

CHAPTER : 15 – WATER : A PRECIOUS RESOURCE

A. 1. b, 2. d, 3. d, 4. c, 5. b, **B.** 1. 0°C, 2. solid, liquid, gas, 3. watertable, 4. cycle, 5. harvesting, 6. drip, **C.** 1. e, 2. a, 3. c, 4. b, 5. d, **D.** 1. 97.4%, 2. Ice, 3. Wells, 4. Vapour, 5. Replenished by Rain water, 6. Water table, **E. 1.** The top level of the ground water is called water table. The water table varies from place to place, regions to regions area to area and even from time to time. **2.** When rain falls, all of it does not run off into water bodies. Some of it evaporates, and the rest seeps through the soil. The layer of water trapped between the rocks form the ground water. It is an important source of freshwater for us because it is constantly recharged by rain water. **3.** • The blood in our body is mostly water. Water in the blood carries the nutrients obtained from the food to all the parts of the body. • It helps in the digestion of food. • Water helps in keeping the muscles and joints in our body running smoothly. **4.** Water is the only substance that occurs in all the three forms— solid, liquid and gas at any given time on the earth. **5.** Water is a natural resources so long as man does not disrupt the water cycle. Water is essential for life. A person can live without food for several weeks, but he cannot live without water. **6.** Groundwater is clean & safe to drink as it is recharged by rain water & replenished in the soil. **7.** Cutting down the forests adversely effects the water cycle. Less rainfall, soil erosion, depletion of ground water, etc., are some of the consequences of deforestation. **8.** Water conservation refers to wise, judicious and economic use of available water. The purpose of water conservation is to increase the amount of clean water available. **F. 1.** Around 97.4% of all the water on Earth is stored in the oceans. This cannot be used as it is salty. Of the balance 2.6%, almost 2% of the water is frozen in glaciers and the polar ice caps. This is pure water but it is not available for human consumption. Thus, only about 0.6% is freshwater in liquid form. Of this, 0.59% is present as groundwater. The balance, that is,

only 0.01% is available as freshwater on the surface of the Earth. It is this tiny fraction of the total water which is repeatedly recycled in nature and used by humans and other living organisms. **2.** Water useful to plants : Plants take water through the roots that go deep inside the earth. • Water is essential for the germination of seeds. • Water dissolves the nutrients in the soil; these are absorbed by plants through their roots along with water. • Water further acts as a medium for transporting nutrients to different parts of a plant. • Green leaves use water and carbon dioxide to prepare food in presence of sunlight through photosynthesis. • The oxygen released by green plants during photosynthesis which is used for breathing comes from water. **3.** Causes of water scarcity • Overpopulation • Over irrigation for agriculture • Climatic change and various ability • Water pollution • Increase in demand for water. • Indiscriminate cutting of forest. Destruction of natural water reservoirs. • Disputes between the states for sharing water. **4.** Methods to prevent water scarcity: • Encourage water recycling in industries and use it for irrigation. • Better management of water by the civic authorities by preventing leakage from pipes. • Grow more trees. Trees help in increasing rainfall and also help in replenishment of ground water reserves. • Soil conservation methods, such as planting tress also increase the supply of ground water. • Use treated water from sewage and effluent treatment plants for irrigation. **5.** Water is a natural resources so long as man does not disrupt the water cycle. Water is essential for life. A person can live without food for several weeks, but he cannot live without water. Growing urbanization and industrialization are playing a major role in the pollution of water. Water being supplied in cities is not cline for drinking. That day is not far away, when potable water will be difficult to obtain. We must take special precautions to preserve water. It should be conserved and used wisely. **6.** Effect of water scarcity on the life of the people • Long walk to fetch water. • Have to pay price for buying water. • Area will remain backward and neglected. • Low scope for generating employment. • More incidence of diseases due to poor sanitary. • Poverty alleviation program will suffer. • Increase incidents of crime. **HOTS: 1.** The human activities should be stopped during severe water scarcities are as follow : • Overirrigation for agriculture • Water pollution • Increase in demand for water. • Indiscriminate cutting of forest. Destruction of natural water reservoirs. • Disputes between the states for sharing water. **2.** Same as HOTS-1**.** Water can be back or recharge by rain water. As rain is the main source of water. **3.** Same as F5.

CHAPTER : 16 – THE FORESTS

A. 1. c, 2. c, 3. d, 4. a, 5. b, 6. d, **B.** 1. 22, 2. quinine, 3. saprotrophs or saprophytes, 4. deforestation, 5. sal, 6. Afforestation, 7. Van Mahotsava, 8. Tehri, **C.** 1. d, 2. e, 3. b, 4. a, 5. c, **D.** 1. Carnivores, 2. Deforestation, 3. Afforestation, 4. Industries, 5. Understory, **E. 1.** The branchy part of the tree above the stem is known as the **crown** of the tree. Different trees have crowns of different types and sizes. The branches of the tall tree look like a roof over the other plants in the forest. This is known as canopy. It is quite dark inside a thick forest, for example, in a tropical rain forest. These create different horizontal layers in the forest. These are known as understory. Below the giant and tall trees are smaller trees, below which are the shrubs and tall grasses. The herbs form the lowest layer. **2.** A forest is home to many types of plants, animals and microorganisms. The various organisms are interconnected and together form a biotic community or biota. **3.** Plants such as neem, eucalyptus and amla are used for making several ayurvedic medicines. **4.** Plants are called producers as they can produce their own food. They are also called autotrophs (auto-self, trop-food). Some organisms depend directly or indirectly on the food prepared by plants. They are called consumers or heterotrophs. **5.** We have several food chains in nature that are connected to each other. All food chains are interlinked. This interconnected network of food chains is called food web. **6.** Large scale cutting of forests is called deforestation. The effects of deforestation include soil erosion, landslides, floods.

7. Fires are controlled by spraying fire extinguishing solutions from aircraft or by changing the directly of wind by using strong blowers. **8.** Afforestation is the large-scale planting of trees on lands where there were no forests previously. **F. 1. Uses of forest :** • We get timber from more than a thousand species of trees such as sal, mahogany, teak and rosewood. Timber is used for making furniture, sleepers, carts, railway, boats, ships, sports good, ploughs, etc. Several timber based industries such as those of plywood, paper, sawmills and pulp, and cardboards are all dependent on these trees. • Forests provide a large number of important products such as gum, spices, bamboo, honey, oils, fooder, resins, lac, silk, etc. Horns , ivory, musk, etc. are provided by forests. • Trees allow water to seep into the soil through their root system. Forest acts as a natural absorber of rainwater and helps to maintain the water table. Forests prevent soil erosion and floods. Roots of tree bind the soil particles together and prevent the soil from being washed or blown away. (d) Wood is one of the most important fuels used for cooking in several rural areas even today. Charcoal is also used during winters to keep ourselves warm. (e) We get several nuts and spices from plants growing

in forest. **2.** Bacteria and fungi are very small organisms they cannot be seen with the naked eyes. These are known as microorganisms. The microorganisms which convert the dead plants and animals to humus are known as decomposers. These play an important role in the forest. Consumers dies, bacteria and fungi act to break down or decompose the material of its bodies into the nutrient substance it was made up of. The presence of humus ensures that the nutrients of dead animals are released into the soil from there, these nutrients are again absorbed by the roots of the living plants. The nutrients that producers absorb from the soil are passed on to all the consumers. In this way, nature recycles the nutrients that have been taken from the soil. **3.** "Such a chain in which one organism eats another one is called a food chain". This is a process of eating and being eaten. In simple words, a food chain indicates " who eats whom". For example, grass is eaten by a grasshopper which in turn is eaten by the frog. The frog is further eaten by a snake and the snake by an eagle. This food chain can be represented as under :

plants grasshopper frog snake eagle

4. Plants are also dependent on animals in various ways : • **For carbon dioxide:** Animals produce carbon dioxide during respiration which is released in the atmosphere. Plants utilize this carbon dioxide for preparing their food. In this way plants play an important role in maintaining carbon dioxide and oxygen balance in nature. • For pollen and seed disposal : A number of insects and birds help in pollination. Some animals help in dispersal of fruits and seeds. • For supplying nutrients : Animal excreta and their dead bodies add nutrients to the soil. They act as manure and provide mineral for plant growth. **5.** The following steps to conserve forest, in order to maintain balance in nature. • **Afforestation:** People should be made aware of the damages caused by feeling of trees. This is the practice of renewing of forest by planting seedlings or small trees. These days in our country, planned afforestation is being done not only by the government but also by private organization for commercial purposes. Afforestation is the large-scale planting of trees on lands where there were no forests previously. • **Planned cultivation:** An effective way to get wood from forests for our requirements is to cut only some of the trees in an area. The uncut trees prevent erosion. Fruits of these trees produce seeds so that new trees can grow. This way the forest cover is maintained. • **Prevent illegal logging:** Illegal logging (activity of cutting down trees for timber) has lead to the decrease of a lot of trees over the years. The Indian government has laid out rules to prevent illegal logging by making it punishable under law. • **Protection from forest fires:** Forest fires are considered beneficial for plants but they might have devastating effects on animals life and people nearby. Fire may be caused by the people or by natural methods Forest fires are

controlled by spraying fire extinguishing solutions from aircraft or by changing the directly of wind by using strong blowers. • **Prevent overgrazing :** Provisions of sufficient pastures should be made, especially in areas adjoining forests, to prevent overgrazing and trampling of growing plants by cattle. Stall-feeding of cattle should be encouraged. • **Control pollution :** Pollution of air, land and water must be controlled so that the trees and other vegetation could survive. • **Control soil erosion :** All activities leading to soil erosion should be controlled.

• **Van Mahotsava :** It is celebrated every year in the beginning of rainy season should be made more popular, meaningful and effective. **6.** The popular movement launched by the village people of the Terai forest in the Himalayan foothills to hug trees to prevent them from cutting was named Chipko Andolon. The chipko movement was started in December 1972 by illiterate tribal people of the Tehri district of Uttarakhand under the leadership Sunder Lal Bahugana. The movement played an important role in educating people about the role played by forest in making soil fertile providing water, pure air and proper climate, which are the very basic of life. It was perhaps the first well known development program initiated by the common people to protect forests. **HOTS: 1.** Forest have no wastes since all the waste materials like dead trees & animals, animal excreta, etc., are acted upon by microorganisms and concreted to humans which is as moved by like plants. Also, car omitted by respiration of plants & animals are used up by the plants to make food. Thus there are no wastes in the forest. **2.** Removal of vegetation cover brings many changes in the local climate of the area. Thus deforestation, overgrazing, etc., bring about changes in rainfall, temperature, wind, velocity, etc., and also lead to soil erosion. Such changes then lead to desertification of the area. Due to lowering of water table a large number of trees die. Also, due to soil erosion the topsoil which is rich in humus gets washed away causing to become barren. **3.** If forests disappear • The global climate and local weather may change drastically. This will result in the loss of many species of animals and plants, and biological diversity. • Large amounts of greenhouse gases such as carbon dioxide, methane, etc. are released into the atmosphere due to deforestation. • Natural resources such as timber, medicinal plants, fruits, and nuts are depleted due to deforestation. • Deforestation can cause severe flooding, soil erosion, landslides, etc. affecting our daily lives. • The wild animals will not get food and shelter. • The tribal people living in that area will loose the source of their livelihood. Our forests, thus need to be protected from further depletion.

CHAPTER : 17-WASTE WATER MANAGEMENT

A. 1. b, 2. d, 3. a, 4. c, 5. a, **B.** 1. c, 2. a, 3. e, 4. b, 5. d, **C.** 1. Water for life, 2. Domestic waste water, 3. contaminants, 4. cholera, typhoid 5. sewer system, 6. ozone, **D.** 1. Sewage Treatment, 2. Sewage, 3. Contaminants, 4. Waste Water Treatment, 5. Plastic Bags, **E. 1.** Oil spill is caused due to release of oil into rivers and oceans. **2.** Diseases such as gastroenteritis, dysentery, typhoid, meningitis, cholera and hepatitis **3.** Sewage is waste water that flows down the drains of houses, industries, hospitals, offices, fields, etc. Sewage is a complex mixture. **4.** A channel of pipelines used to carry sewage is called the sewer system. These seweres form the sewerage. **5.** A facility that treats waste water, domestic as well as industrial source is called a waste water treatment plant. There are three steps in the process which are involved in treating waste water before it is discharged into the water reservoirs. These processes are primary treatment, secondary treatment and tertiary treatment. Waste water treatment is the process of removing contaminants from waste water. It includes removel of physical, chemical and biological contaminants using physical, chemical and biological processes. **6.** It is first stage and is called primary treatment. This is a mechanical process which involves screening and settling of large particles. **7.** Addition of chlorine and exposure to ultraviolet light kills any remaining bacteria and disinfects the water. The water is disinfected with chemicals like chlorine or may be exposed to ultraviolet rays to kill disease causing organisms. It can also be treated with ozone gas. **8.** Do not dispose off cooking oils and fats in the kitchen sink. They can block pipes when they harden. Throw them in dustbins. **F. 1.** Primary treatment : It is first stage and is called primary treatment. This is a mechanical process which involves screening and settling of large particles. First the sewage is passed through screens of vertical bars to remove larger impurities such as metal can, plastic bags, cloth pieces, etc. The water is then passed through a grit and sand tank to remove small stones and pebbles. The liquid material is then passed through huge sedi mentation tanks. Here large solids rags and plastics are removed by strainers or screens. From here it passes on to the settlement tank where most of the suspended solid sink to the bottom. The solid that settles down is called sludge. The sludge can be used for production of biogas. Large materials float on top and are called scum. The scum is removed by slimmer. The water thus obtained is called clarified water **2.** Sewage is a complex mixture. It contains: • Organic impurities: It includes human excreta, animals' waste, urine, oil, fruit and vegetables waste, pesticides, herbicides, etc. • Inorganic impurities: It includes inorganic impurities in the form of nitrates, phosphates and heavy metals. • Nutrients: Sewage includes nutrients like nitrogen, phosphorus and potassium. • Bacteria : It

includes bacteria causing water related diseases such as cholera (vibrio cholerae) and typhoid (salmonella typhi). • Other microbes: Various other microbes causing diseases like dysentery (amoeba) are also present. **3. Steps carried out at waste water treatment plant:** Primary treatment: It is first stage and is called primary treatment. This is a mechanical process which involves screening and settling of large particles. First the sewage is passed through screens of vertical bars to remove larger impurities such as metal can, plastic bags, cloth pieces, etc. The water is then passed through a grit and sand tank to remove small stones and pebbles. The liquid material is then passed through huge sedi mentation tanks. Here large solids rags and plastics are removed by strainers or screens. From here it passes on to the settlement tank where most of the suspended solid sink to the bottom. The solid that settles down is called sludge. The sludge can be used for production of biogas. Large materials float on top and are called scum. The scum is removed by slimmer. The water thus obtained is called clarified water. Secondary Treatment: It is the second stage and is called secondary treatment. This is a biological process in which the organic matter in the sludge is broken down with the help of bacteria. This process is called digestion and as a result of it, biogas is produced. Air is blown into aeration tanks to speed up the process. At times anaerobic bacteria are also used for the process. This is done in closed tanks which settle down at the bottom of the tanks as activated sludge. The water at the top is removed. The activated sludge is mostly water. It is passed through sand beds to separate the solid material out of it. The solid waste can be used as manure. Tertiary treatment: It is the third stage and is called tertiary treatment. Sometimes the water has to be treated more before they are passed into water bodies. Water may be passed through sand filters or man-made ponds with reeds and other organisms like water hyacinth, which can clean out dissolved chemicals. This is basically a chemical process in which chemicals are used to remove phosphorus and nitrogen from the water. Addition of chlorine and exposure to ultraviolet light kills any remaining bacteria and disinfects the water. The water is disinfected with chemicals like chlorine or may be exposed to ultraviolet rays to kill disease causing organisms. It can also be treated with ozone gas. The water is then discharged into the distribution system. The treated water which is obtained from sewage treatment plant is used for irrigating fields. A schematic representation of a waste water treatment plant is shown in this figure. **4.** Vermicomposting toilets : A new method recently tested in India is to use redworms to treat human excreta and convert it into vermicompost. Vermicompost is an excellent manure for plants. It has been found to be a low water use toilet for safe processing of human waste. The cooperation of such a toilet is hygienic and very simple. It is based on an innovative design in which earthworms are used to convert human excreta into compost. **5.** A few

steps for housekeeping: (a) Never throw paints, solvents, insecticides, automobiles, and medicines down the drain as they may kill microbes that helps to purify water. (b) Solid wastes such as used tea leaves food remains plastic bags, soft toys cotton and sanitary towels should not be thrown down the drains in the kitchen sink or in the toilet. They clog drains and prevent free flow of oxygen that interferes with the decomposition process. Throw them in dustbins. (c) Do not dispose off cooking oils and fats in the kitchen sink. They can block pipes when they harden. Throw them in dustbins. **6.** We can reduce sewage generation • Ask civic authorities to cover the open drains of your area. • All solid items should be thrown in the dustbin.• Do not defecate, spit or scatter litter at public places. • Waste water from basins, sinks and washing machines can be used again for watering plants. • Use flushes with low capacity to reduce flushed water. • Leakage in sewer lines should be checked and repaired regularly. **7.** In our country fairs are organized periodically. A large number of people participate in them. In the same way railway stations, bus depots, busy places are crowded places. As a large number of people gather at these places, the waste generated is subsequently large too. The government has laid down certain standards of sanitation, but unfortunately, they are not strictly enforced. Public conveniences and dustbins have been built by the government that help in maintaining sanitation in public places. However, all of us can contribute in maintaining cleanliness at public places. Plastic bags, metal cans, and other wastes should be thrown in the bins meant for them. This becomes necessary because this water can, otherwise, find their way to the underground drainage system and clog them up. This would result in blockage of sewage pipes and the sewage would flow back onto the streets and colonies. During the monsoon season, it will lead to flooding of streets and traffic jams. **HOTS: 1.** If the city does not have a proper storm water drainage system, this water starts over flowing on the streets and can even enter houses. This is very dangerous for public health and property. Sanitation system can overflow during floods. There is also the risk of flood water contaminating drinking water supplies, bursting pipelines and cause sewers to backflow or even break. These situations present a major health risk, as excreta will flow onto the surface. That is why cholera epidemics are common after floods. **2.** The processes done in WTP can be done naturally by a river or lake. As, when water is left same the sand will settle down at the bottom, large particles will be collected at the side of the river. The water can be used after removing them. Also the bacteria help in detoxifying the organic agents and UV rays of the sun act by detoxifying the water.