Headway Science

Teacher's Manual

Class 7

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Lesson 1 : Nutrition in Plants

A. Multiple Choice Questions (MCQs) :

1. (a) Iodine
2. (b) Chemical Energy
3. (c) Symbiosis
4. (c) Chlorophyll and carbondioxide
5. (b) Nitrogen

B. Fill in the blanks :

1. Autotrophs
2. Saprophytes
3. Oxygen
4. Carbon dioxide
5. Chlorophyll

C. State True or False :

1. False
2. True
3. False
4. False
5. False

D. Answer the following questions in short :

1. Two organisms living in close association with each other for their mutual benefit nutrition are called as symbionts (syn=together, bio-life)and such a relationship is called as Symbiosis.

   Lichens is example of symbiotic relationship.

2. Some examples of heterotrophs are cuscutta, lichen, fungi etc.

3. Plants which grow in soil which is deficient in nitrogen nutrients, have to depend on outside sources for their nitrogen requirements. These plants are green and capable of forming glucose but for nitrogen they are modified to capture and digest the insects with the help of certain enzymes. Such plants are called insectivorous plants and the process is called as insectivorous nutrition. Some examples are Venus flytrap, Pitcher Plant.

4. The parasites usually have adventitious roots to suck the nutrients are called haustoria plants like Cuscuta Reflex an ('Amarbel') and Rafflesia etc. are totally dependent on their host, thus they are called as Total parasites.

5. Manures are required to be added from time to time to enrich the soil because these manures and fertilizers contain plant nutrients like nitrogen, potassium, etc. the fertilizers are selected on the basis of kind of crops grown and the type of soil. Usually fertilizers are rich in one type of nutrient only.

E. Answer the following questions in detail :

1. These are small pores mostly on the lower surface of the leaves. The pore is guarded by two kidney shaped guard cells which are full of chloroplast. They open and close in day and night respectively for gases to pass through them. (Diagram page no 7.)

2. a. Main role of food is to provide energy to the body to perform various functions for growth.

   b. It helps to replace worn out tissues with the newly made cells, the balance is maintained by the energy provided by food.

   c. The food is necessary for growth and reproduction.

   d. Food helps to keep us disease-free and resistant towards infection.

3. Objective : To demonstrate that sunlight is necessary for photosynthesis.

   Requirement : a potted plant, a strip of black paper, clips, all other materials as the in previous activity.

   Procedure : Take a potted plant. Destarch the leaves by keeping the plant in darkness for two days. Cover one of the leaves partially with black paper held with clip. Put the plant in sunlight for a few days. Pluck the leaf which was partly covered by black paper.

Now, perform the starch test with iodine solution.

Observation : It will be observed that the covered portion of the leaf will not turn blue-black while the exposed part with turn to blue-black colour.

Conclusion : The sunlight is necessary for the preparation of food in the leaves. (Diagram page 10)

4. Photosynthesis is a process by which green leaves prepares food. Green plants possess a pigment – Chlorophyll present abundantly in the leaves and sometimes in young stems also. The cell organelle containing chlorophyll are called chloroplasts which are more abundantly tightly packed under the upper surface of the leaf so that they can capture maximum sunlight for photosynthesis. They are loosely packed in the middle for diffusion of gases.

$$\text{Carbondioxide + Water} \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \text{Glucose + Oxygen}$$

5. Saprophytes are organisms which obtain their food from dead and decaying matter. eg. Mushrooms, other fungi and bacteria. They secrete digestive juices on the dead and organic matter which is digested and absorbed by the saprophytes in the soluble and digestive form. Saprophytes are also called as decomposers.

Lesson 2 : Nutrition in Animals

A. Multiple Choice Questions (MCQs) :

1. (c) Mouth
2. (b) Sugar
3. (b) 6m
4. (c) Milk teeth
5. (c) Anus

B. Fill in the blanks :

1. Villi
2. Soluble sugar

3. Digestive, hydrochloric acid, mucus
4. Premolars 5. 32

C. State True or False :

1. False 2. False
3. True 4. False
5. True

D. Answer the following questions in short :

1. Liver secretes green coloured liquid, the bile which is temporarily stored in a hollow pear shaped organ, the gall bladder.
2. Ingestion : The process of taking in food from outside.

   Digestion : It is the breakdown of complex organic food into simpler soluble form so that it can be easily absorbed by the cells.

   Absorption : After the food has been digested, is to be absorbed in the soluble form in the intestine in humans and higher animals.

   Assimilation : The absorbed food is utilized to form energy for the growth and development.

   Egestion : The undigested food after assimilation is to be removed out of the body, this process is called as egestion.
3. Incisors : They appear first are placed in front. They are four in each jaw, meant for cutting and biting.

   Canines : There are 2 canines in each jaw next to incisors. They are pointed at the base, meant for tearing.

   Premolars : Next to canines, there are broad, having flat surface, four in each jaw. They are meant for crushing and chewing the food.
4. Molars : They are six broad molars in each jaw, appear last for crushing and grinding the food.
4. The stomach is lined by glands that secrete protein digesting enzymes, hydrochloric acid and mucus. This

forms a juice called as the digestive juice. The protein digesting enzymes break down proteins into simpler form. Hydrochloric acid kills the germs and bacteria that may be there in food and makes the medium acidic to activate the enzymes. Mucus protects the wall of the stomach.

5. Pancreas is a leaf-shaped gland lying below the stomach and in u-shaped first part of intestine. It secrete pancreatic juice to act on carbohydrates and proteins to finally convert them into most soluble form.

E. Answer the following questions in detail :

1. In the first step they hurriedly eat the food, after half chewing it quickly swallow it. Ruminants have special stomach divided into four compartments. The food from the mouth goes to rumen, the largest of four compartments.

   Bacteria and protozoa breakdown cellulose of the grass.

   The half digested food then goes into another muscular chamber-the reticulum. From here it goes back to mouth as cud to be chewed again.

   By passing the first two chambers, it enters the third chamber- the omasum where food is broken down into smaller pieces. Excess of water is absorbed.

   Finally it enters the fourth chamber the abomasum where it is mixed with digestive juices.

   Digestion is completed in the intestine. The nutrients are absorbed by the intestinal wall and waste food is passed into the rectum.

2. a. Starch is converted into sugar
   b. Proteins are converted into amino acids.
   c. Fats break down into fatty acids and glycerol.
   d. Carbohydrates are converted to glucose

3. The wall of small intestine is very thin for easy

absorption and has thousands of finger like inward projections called the villi meant for increasing the surface area for absorption of nutrients. Each villus has fine network of blood capillaries. The food via the blood capillaries are carried to all the parts of the body for utilization and storage.

4. Undigested and unabsorbed food from the small intestine reaches the large intestine. Here excess of water and minerals from the food are absorbed by its walls and semisolid waste is passed into the rectum to be passed out through anus from time to time.
5. The muscular tongue has taste buds on its surface which are sensitive to different tastes – sweet, sour, salty and bitter. Tongue helps to move food in the mouth cavity for proper chewing and mixing. This also helps in speaking and swallowing the food.

Lesson 3 : Heat

A. Multiple Choice Questions (MCQs) :

1. (b) Mechanical Energy
2. (d) Copper
3. (b) Convection
4. (a) Land breeze
5. (d) 37^0C

B. Fill in the blanks :

1. Hot, Cold
2. Poor
3. Increasing
4. Sleep
5. Temperature

C. State True or False :

1. False
2. True
3. False
4. True
5. True

D. Answer the following questions in short :

1. A process of heat transfer in which the heat flows from

one part of the fluid to the other part by the movement of fluid particles itself.

2. 1. It is shiny and silvery white, can be seen easily from outside the glass.
   2. Mercury has a wide range of temperature with its freezing point 39ºC and boiling point 357ºC.
   3. Its expansion is fairly uniform over a wide range of temperature.
   4. It does not stick to the wall of the glass.
   5. It can be easily obtained in pure form.
3. Woolen clothes keep us warm in winter because woolen fibres contain trapped air in the holes present. Air being bad conductor of heat does not allow the heat from the body to escape outwards.
4. In factories the roofs are painted shiny silver to reduce the loss of heat in winters and increase the radiation of heat in summers thus keeping the inside temperature moderate.
5. Applications of conduction : The handles of most utensils are made up of wood or plastic since they are bad conductors of heat.

   Application of Convection : Air conditioners are installed near the roof. The cool air moves down and the warm air near the surface of the room rises up there by setting up conventional currents which cool the whole room effectively.

   Application of radiations : Electric room heaters are made more effective by having a polished metallic surface behind the element. This way more heat is reflected.

E. Answer the following questions in detail :

1. The thermometer is used by doctors to measure the temperature of human body. It is made of a long and

narrow glass tube with a bulb at one end. This bulb is filled with mercury. The glass tube has a thin capillary tube. The capillary tube has a kink (bend) just little above the bulb. Both the Celsius and Fahrenheit scales are shown on the thermometer. The range of Celsius scale on the clinical thermometer is 35ºC to 42ºC and that of Fahrenheit scale is 94ºF to 108ºF.

2. The substances which allow the heat energy to pass through them easily are called good conductors of heat. eg. Aluminium, iron, copper The substances which do not allow the heat energy to pass through them easily are called poor or bad conductors of heat for example, plastic, wood, cotton clock. They are also called as Insulators.

3. Land and sea breeze are formed due to convection currents. The land near the sea is heated up more than the sea by conduction. The air expands, becoming dense than the surrounding cooler air. The heated air above the ground becomes lighter and rises up. Its place is taken up by the cooler air from the sea. This is called as sea breeze. At the time of sunset and night falls, the land loses heat faster than that of the sea, and becomes cooler. The warmer air from the sea rises up and cooler land air takes its place. This is called the land-breeze.

4. Precautions : 1. The laboratory thermometer should always be kept upright and not tilted.

   2. The bulb of the thermometer should be fully dipped in the substance whose temperature is to be measured.

   3. The bulb should not touch the base or the sides of container.

5. 1. Conduction : The process of transmission or transfer of heat in solids without actual movements of particles from their position is called conduction.

   2. Convection :In convection transfer of heat takes place

by actual movement of molecules from hotter regions to cooler regions. These moving molecules carry heat energy with them.

3. Radiation :It is a process of heat which does not require a medium between hot and cold bodies, called Radiation. The heat in this case can be transferred even in vaccum between two bodies.

In radiation, heat travels in a straight line in the form of waves from the hot objects.

Lesson 4 : Acids, Bases & Salts

A. Multiple Choice Questions (MCQs):

1. (c) Sodium carbonate
2. (a) Caustic soda
3. (c) Sodium hydrogen carbonate
4. (a) Indicator
5. (b) China rose

B. Fill in the blanks :

1. Red, blue
2. Salt, Water
3. Lichens
4. Phenolphthalein
5. Soapy

C. State True or False :

1. False
2. True
3. False
4. True
5. True

D. Answer the following questions in short :

1. Acids : the chemical substances that are sour in taste.

   Bases : the chemical substances that are bitter in taste and soapy to touch.

   Salt : a chemical substance that is formed as a result of neutralization reaction.

   Indicators : the substances that are used to test the

acidic or basic nature of substances.

2. General properties of acids :
   - They have sour taste.
   - They turn blue litmus red.
   - They are good conductors of electricity.
   - They are soluble in water.
3. The substances that are neither acidic nor basic in nature are called neutral substances. For eg. water.
4. Antacid tablet is taken when we suffer from acidity which contains magnesium hydroxide to neutralize extra acid.
5. The bases which dissolve in water are called alkalies. For example: Sodium hydroxide reacts with acids to neutralize them and it dissolves in water. Thus, it is a base and is called an alkali.

E. Answer the following questions in detail :

1. Litmus turns red when added to an acidic solution and blue when added to a basic solution.

   Two types of litmus papers are available blue and red, available in liquid form too. Acid turns blue litmus red and red litmus to blue.

   Some solutions do not change the colour either to blue or red. This shows they are neither acidic or basic in nature are called as neutral substances.
2. A) When an insect bites, it injects acidic fluid into the skin which contains formic acid. The effect of the sting can be neutralized by rubbing moist baking soda (sodium hydrogen carbonate)

   B) Alkaline based tooth paste should be used to neutralize the acids to prevent tooth decay.
3. The acidic waste are first treated with bases to neutralize them. This prevents river water from getting acidic which may harm the aquatic life.

4. Objective : To demonstrate neutralization reaction

Requirements : Acid solution, base solution, test tubes, phenolphthalein.

Procedure :

- Take a few ml of acid solution in a test tube and add phenolphthalein solution to it.
- Now to this test tube start adding a few drops of base solution.

Observation :

- In the first case 1, the colour remains a such.
- As the quality of base is increased, the colour of the solution starts turning pink/magenta.
- After a certain point when the colour turns to magenta, the effect of acid has been neutralized and acid is equal to the quantity of base in it.

Conclusion : This shows that when acid react with base in equal quantities, they neutralize each other to form salt and water evolution of heat.

5. Acids have other specific uses :

- Carbonic acid is used in aerated drinks.
- Acetic acid is used in making vinegar.
- Citric acid is used in soft drinks and also as preservative.
- Tartaric acid is used to make baking powder.

Uses of bases :

- Potassium hydroxide or caustic potash is used in making of soap.
- Sodium hydroxide or caustic soda is highly used in industries. It is used in the production of sodium metal, distillation of petroleum, manufacture of paper, soap etc.
- Calcium hydroxide or slaked lime is used for white washing, as a substitute for cement, also in the

manufacture of bleaching powder.

- It is also used to treat factory waste before waste water is disposed off.

Lesson 5 : Physical and Chemical Change

A. Multiple Choice Questions (MCQs) :

1. (b) A base
2. (c) Ultraviolet radiations
3. (d) Neutralization
4. (d) Digestion of food
5. (c) Milky

B. Fill in the blanks :

1. Galvanization
2. Change, chemical
3. Surface
4. Temperature
5. Crystallization

C. State True or False :

1. False
2. True
3. False
4. False
5. False

D. Answer the following questions in short :

1. Carbon (C) + Sulphur 2(S) $\xrightarrow{\text{Endothermic reaction}}$ Carbon di sulphide (CS_2)

   Quick lime + water $\xrightarrow{\text{Exothermic reaction}}$ Calcium hydroxide + Heat

2. $2MgO$ (Magnesium oxide) + $2H_2O$ (Water) $\longrightarrow$ $2Mg(OH)_2$ (Magnesium hydroxide)

   The resultant substance is basic.

3. A change is brought about by adding a spoon full of curd in lukewarm milk. This converts whole of the milk into curd. The change is brought about by the curd-making bacteria. This involves bio-chemical reactions in protein, fats and organic acids making a new product. The curd cannot be reversed back to milk being irreversible. Thus, it is a chemical change.

4. Prevention of Rusting :
   - By avoiding direct contact with air and moisture. Applying grease or oil on the exposed parts of iron.
   - Galvanizing is also an important method to prevent rusting. In galvanization a layer of metals like chromium or zinc is deposited on the surface of iron articles
   - An alloy is a solid combination of two metals or a metal and a non- metal. For example, steel is an alloy of iron and carbon.
5. Process of obtaining large crystals of a pure substance from a concentrated solution is called crystallization.

E. Answer the following questions in detail :

1. The changes which involve changes in physical properties like shape, size, state of material, but no new substance is formed. Such changes do not involve gain or loss of energy.

$$\text{Reactants} \underset{\text{Reversible reaction}}{\overset{\text{Change}}{\rightleftharpoons}} \text{End products}$$

2. A change in which two or more substances react to form one or more new substances is called chemical change.

   Example : digestion of food, respiration, germination of seeds, bursting of crackers.

3. Objective: To observe a physical change with the help of a sugar solution.

   Requirement : A beaker, water, sugar, spoon, wire gauze, burner.

   Procedure : Dissolve a spoonful of sugar in 100ml of water in a beaker. You will get a solution of sugar and water. Now heat this solution over a burner as shown in figure.

Observation: It is observed that slowly the water evaporates and sugar is left at the bottom.

Conclusion : Since you get back the sugar from the solution. It is a physical change.

4. On adding baking soda to vinegar, carbon dioxide gas is evolved. This when passed through lime water, lime water turns milky due to the formation of another new substance.

These changes can be represented as

Vinegar	+	Baking soda	⟶	Carbon dioxide	+	Other substances
$(CH_3\ COOH)$	+	$(NaHCO_3)$	⟶	(CO_2)		
Carbondioxide	+	Lime water	⟶	Calcium carbonate	+	Water
(CO_2)	+	$[Ca\ (OH)_2]$	⟶	$(CaCO_3)$	+	(H_2O)

Thus, all these are chemical changes.

5. Ozone is formed when heat and sunlight cause chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds also known as hydrocarbons. This reaction can occur both near the earth and high in the atmosphere stratosphere that contains high concentration of ozone and protects the earth from the harmful ultraviolet radiations of the sun. Formation of ozone layer is a chemical change.

Lesson 6 : Respiration in Organisms

A. Multiple Choice Questions (MCQs) :

1. (c) Spiracles
2. (c) Respiration
3. (a) 15-18
4. (d) Lactic acid
5. (b) Respiration

B. Fill in the blanks :

1. Ethyl alcohol, carbon dioxide
2. Gills
3. Physical
4. Carbon dioxide

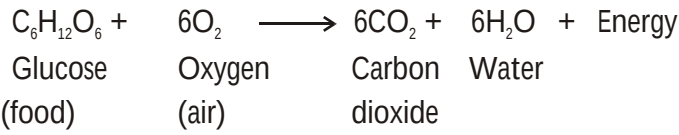
5. Fermentation

C. State True or False :

1. True
2. False
3. False
4. True
5. True

D. Answer the following questions in short :

1. Nostrils are a pair of openings which open into left and right nasal chambers. The chamber lining is also richly supplied with blood vessels that warm the incoming air. The air is also moistened and filtered by the mucus lining of the wall of nasal chambers.
2. Cellular respiration involves the breakdown of food using oxygen to release energy in cells . The whole process of respiration can be represented by an equation :



3. All living organisms need oxygen for breakdown of food to release energy to do various metabolic activities.
4. Plants exchange gases through holes on the lower surface of leaves called stomata which open during the day and close during night.
5. Number of times a person breathes in and breathes out in one minute is termed as breathing rate.

E. Answer the following questions in detail :

1. Fish use specialized organs called the gills to breathe in the oxygen dissolved in water. These are comblike soft feathery structures in the gill chamber behind the head. They are always moist and richly supplied with blood capillaries. The oxygen from the water moves through the thin walls of blood capillaries of the gills and enters the blood. The oxygenated blood is pumped into the

body tissues to be used by the fish for its metabolic activities;

2. A. Aerobic Respiration : It is as already explained having external and internal respiration to provide energy to the whole body for all the activities of the body.

Aerobic respiration takes place in most of the plants, animals and human beings.

It take place in the presence of oxygen.

Glucose + Oxygen $\longrightarrow$ Carbon dioxide + water + Energy

Anaerobic Respiration : Anaerobic repiration takes place in yeast and some bacteria in the absence of air. This kind of respiration is also called as fermentation. It takes place in the absence of oxygen.

$C_6H_{12}O_6$ (Glucose (In the cell)) $\xrightarrow{\text{absence of air}}$ $2C_2H_5OH$ (ethyl alcohol) + $2CO_2$ (carbon dioxide) + Energy

B Breathing

1. It is inhalation and exhalation of air.
2. It involves nose, trachea lungs, rib cage and diaphragam.
3. It is a physical process.
4. No enzymes are involved.
5. There is no energy change.
6. It is first step of respiration.

Respiration

1. It is bio-chemical breakdown of food with the help of oxygen of air, giving rise to carbon dioxide, water and energy.
2. It involves cells.
3. It is a biochemical process.
4. Enzymes are involved.

5. Energy is released step by step in the complete process of respiration.
6. It is the whole process

3. Combustion:
   1. It is a fast process.
   2. It occurs at high temperature.
   3. Energy given out as heat and light.
   4. It can occur anywhere.

   Cellular Respiration :
   1. It is a slow process.
   2. It occurs at body temperature.
   3. Energy is released in steps and stored as ATP.
   4. It occurs in living cells only.

4. Breathing is a physical process that involves inhalation and exhalation. During the process of inhalation, the ribs move upwards and outwards while diaphragm moves down. Due to these movements, the chest cavity increases in volume (space) and there by reduces the pressure inside the chest cavity. The air which is at higher pressure outside the nostrils, rushes into the lungs, there by lungs get filled up with air.

   Here, at this time exchange of gases (CO_2 and O_2) takes place. During exhalation, the ribs move downwards and inwards while the diaphragm move up to its former position.

   This results in reducing the volume (space) and thus increases the pressure inside, the chest cavity resulting in pushing out of the air from the lungs.

5. Breathing in earthworms : Earthworms live in soil. They breathe through their moist skin. Gaseous exchange or respiration takes place directly there. The body of the earthworm is always kept moist and slimy to allow oxygen to diffuse in and carbon dioxide to diffuse out

into the air. If the earthworm remains out, in the heat of the sun, the skin dries out and the animal suffocates.

Lesson 7 : Transportation in Animals and Plants

A. Multiple Choice Questions (MCQs) :

1. (b) Urethra
2. (b) WBCs
3. (b) Heart beat
4. (b) Kidneys
5. (d) Sugar

B. Fill in the blanks :

1. Capillaries
2. Plasma
3. Phloem
4. Diffusion
5. Lungs

C. State True or False :

1. True
2. True
3. False
4. True
5. True

D. Answer the following questions in short :

1. It is a medical procedure removing toxic materials from its blood when the kidneys fail to do so . The dialysis machine is also called as 'Artificial Kidney . It is done when kidney is damaged.
2. Bleeding stops after sometimes due to the collection of the platelets at the site of the cut.
3. A .Translocation : The process by which transport of food from the leaves takes place to the other parts of the plant is called translocation.

   B .Transpiration: The loss of water from the plants in the form of water vapour through stomata is called transpiration.
4. The blood flows in one direction only through valves present between auricles and ventricles.

5. Xylem transport water and mineral salts from the root tip to tip of the stem and leaves. The food which is prepared by the green leaves during the process of photosynthesis is trans located downwards through phloem.

E. Answer the following questions in detail :

1. Red blood cells [RBC]:RBC contains red pigment Hemoglobin. RBC, carry oxygen since haeomoglobin easily combines with oxygen in lungs to form oxyhaemoglobin. When blood reaches the cells and tissues which need oxygen, oxyhaemoglobin breaks up into oxygen and haemoglobin to release oxygen to the cells to be used up for respiration.

   White Blood Cells [WBC]: WBC's helps them to destroy the germs by passing through walls of blood vessels to reach the infected parts of the body . Therefore the function of the white blood cells to fight against the diseases by destroying bacteria.

   Platelets : These are small, much smaller than the red blood cells. They are colourless and without a nucleus. They play important role in clotting of blood.

2. Structure of heart : Human heart is internally divided into four chambers, two upper right and left auricles, two lower right and left ventricles.

   Right auricle receives the de-oxygenated blood from the whole body and sends it to right ventricle.

   Left auricle receives-oxygenated blood from the left and right lungs and send to left ventricle.

   Right ventricle receives blood from the right auricle and sends to the lungs.

   Left ventricle receives blood from left auricle and sends it to the whole body.

   The blood flows in one direction only through valves

present between auricles and ventricles.

3. 1. A pair of Kidneys : Kidneys are two reddish brown bean-shaped structures located on either side of the backbone. They are placed against the back wall of the abdominal cavity just below the diaphragm. They are protected by the last two ribs. They are placed slightly asymmetrical, the left kidney being placed a little higher than the right. Kidney is composed of numerous microscopic coiled tubules called the nephrons which are functional units of excretion to form the urine.

   2. Ureters : Two tube-like structures arise from the inner side of the kidneys which go down to connect to the urinary bladder.

   3. Urinary bladder : It is an elastic muscular sac-like structure where urine is stored temporarily.

   4. Urethra : It relaxes from time to time to release urine. Nephrons, the units of excretory system filter out excess of salts, urea and water there by keeping the blood clean.

4. Factors affecting transpiration :
   1. Temperature : Higher temperature promotes transpiration.
   2. Humidity : Humid air is already saturated with water, thus reduces the rate of transpiration.
   3. Light : Light promotes the rate of transpiration because of opening of stomata.

5. 1. Arteries : These are vessels which carry oxygenated blood (oxygen-rich) from the heart to distribute to all the parts of body. Pulmonary artery is an exception since it carries de-oxygenated blood from the heart to the lungs.

   2. Veins : Veins are the blood vessels which carry de-oxygenated (carbon dioxiderich) blood from different

parts of the body to the heart. Pulmonary vein is an exception carrying the oxygenated blood from the lungs to the heart.

3. Capillaries : Arteries finally branch into very fine and smaller blood vessels called the capillaries. The exchange of gases andsubstances between blood and the bodycells occurs in capillaries.

Lesson 8 : Reproduction in Plants

A. Multiple Choice Questions (MCQs) :

1. (b) Flower
2. (c) Bread mould
3. (c) Vegetative reproduction
4. (a) Unisexual flower
5. (d) Zygote

B. Fill in the blanks :

1. By spore formation
2. Ovary
3. Anther, filament
4. Budding
5. Stem

C. State True or False :

1. True
2. False
3. False
4. True
5. False

D. Answer the following questions in short :

1. Different methods of asexual reproduction are :
   Spore formation, Example : Mushrooms
   Budding, Example : Yeast
   Fragmentation, Example : Spirogyra
   Binary Fission, Example : Amoeba
2. A plant produces large number of seeds. If all these fall below the plant and start growing, they will not get sufficient space, water, minerals and sunlight and they

will not develop into healthy plants as there will be overcrowding and struggle for existence. Many of them may even die. Therefore, there is a need for dispersal of seeds and fruits to long distances.

3. Pollination is the transfer of pollen from a flower to stigma of the same or another flower. Common agents of pollination are wind, insect , water etc.
4. Grafting is done when the good qualities of two different plants of the same species are to be mixed. A cutting of the desired plant is placed on or inserted into a cut in the stem of a rooted plant (stock) of the same species and tied together. In a few days, tissues of both(scion and stalk) get fused with each other. New varities of roses etc. are produced by the method.
5. The wind pollinated flowers are small, light having no nectar. They are produced in large numbers as many of the pollen may get lost or destroyed.

E. Answer the following questions in detail :

1. Artificial methods of vegetative propagation are as following :
   - A. Cutting : example- Rose , bougainvillea, cactus and sugar cane.
   - B. Layering: example- Jasmine and strawberry.
   - C. Grafting: example – Mango, Apple, Roses etc.
   - D. Tissue culture: example- Orchids and Asparagus.

   Advantages :
   1. The advantageous traits are preserved because the offsprings are genetically identical.
   2. This type of propogation helps the organisms to increase in number at a rapid rate which balances the loss in number due to various causes.
   3. Virus- free plants can be grown due to modern techniques of tissue culture.

2. 1. Spore formation: Spore are the asexually reproducing structures which are motile called the zoo spores. They are formed in rounded structures called the sporangia. Under favourable conditions, the thick wall breaks and the spores are released and dispersed. On falling on a suitable substratum, they germinate to form new organism.

   2. Budding : Budding is a kind asexual reproduction seen is microscopic organism like yeast. In this method, a bulb like projections called the 'bud' is produced which may separate from the parent body to form new organisms or stay singly or form a chain of buds. The bud grows to its full size and gets-detached from the parent body finally growing into a new individual.

   3. Self-Pollination : Pollination is the transference of pollen grains from the anther to the stigma of the same flower or between the flowers of the same plant (self pollination).

      Cross Pollination : Transference of the pollens from the flower of one plant to that of the other plant of the same species is called the cross pollination.

4. A typical flower has four whorls. They are arranged from outside to inside :

   1. Calyx : Outermost green coloured whorl of leafy structures. They protect the flower at bud stage.

   2. Corolla : Second whorl from outside is formed of colourful leafy structures. These are meant to attract insects for pollination.

   3. Androecium : Inner to corolla, there is a whorl of filaments bearing swollen structures anthers at the top. These are called the stamens. Anthers produce powdery substance consisting of very minute pollen grains. They have a thick coat but

are light and can be carried away by wind or water. Pollen grains produce male gametes.

4. Gynoecium : A gynoecium or the pistil has a broader basal part the ovary which continues into a tubular structure called the style ending up into stigma. Ovary contains one or more rounded tiny balls called the ovules which produce the female gametes. Ovules after fertilization convert into seeds.

5. 1. The part of the flower-sepals, petals, carpels and stamen shed off after drying.
   2. Ovary persists and ripens. Ripen end ovary converts into the fruit.
   3. Ovules get converted into seeds which store food.
   4. The zygote forms the embryo as it starts dividing and growing.
   5. As a result, the seed containing a young plant in the form of an embryo is formed .It is protected by a hard covering which is the seed coat and has stored food.
   6. As the seeds are formed, the ovary swells and becomes the fruit.

Lesson 9 : Motion

A. Multiple Choice Questions (MCQs) :

1. (b) Quartz watch
2. (b) Odometer
3. (c) 86400
4. (a) Speed
5. (b) 60km/hr

B. Fill in the blanks :

1. Seconds, metre
2. Time period
3. Bob
4. Jaipur
5. Romans

C. State True or False :

1. False
2. True
3. False
4. False
5. True

D. Answer the following questions in short :

1. Uniform motion : the motion of a body moving in a straight line that covers equal distances in equals intervals of time.

   Non- uniform motion : the motion of the body in which a body moving in a straight line covers equal distance in unequal intervals of time and vice-versa.

2. Simple pendulum consists of a weight (a small metallic ball) called the bob tied to a string. The other end of the string is attached to a rigid support. The principle of the simple pendulum is used to make a pendulum clock. The pendulum in a pendulum clock swings continuously under the influences of a wound up spring and controls the action of its hands.

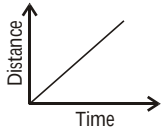
3. Distance between two station = 240 km

   Time taken by train = 4 hours

   Speed = Distance / Time

   = 240 / 4

   = 60km/hr

4. 

5. Standard units are used in measurements for more accuracy. The measurement should be same for all.

E. Answer the following questions in detail :

1. Speed : the distance covered by a body in unit time.

   Speedometer : A device that shows the speed of the vehicle directly in km/h.

Odometer : A device that shows the distance travelled in kilometers.

2. Distance travelled by santro car = 120km

Time taken = 3hrs

Speed = Distance / Time

= 120 / 3

= 40km/hr

Distance travelled by maruti car = 180km

Time taken = 4hr

Speed = Distance / Time

= 180 / 4

= 45km/hr

Hence maruti car moves faster.

3. If you are sitting in a bus looking outside, the window, the trees and other things will appear to be moving backwards, but to a person on the road, the trees will appear stationary. In the same manner, the person sitting next to you will appear at rest to you while to the person standing outside will appear to be in motion. Thus, motion and rest are relative terms.

4. For measuring 'short time' intervals accurately 'stop watches' have been devised for measuring time for sporting events upto 1/100th of a second. They can be started or stopped at will which can be controlled by pressing a button. Now a days stopwatches are also provided on mobile phones.

5. Units of speed:

Speed can be expressed in different units as given below

The SI unit of speed is metre per second m/s or ms-1

The speed of slow moving bodies are expressed in the units of centimeter per second(cm/s) or metre per minute (m/min.)

The speed of fast moving bodies ie. Automobiles like-

cars, scooters, aeroplanes etc. are expressed in kilometers per hour (km/hr.)

Lesson 10 : Electric Current and Its Effects

A. Multiple Choice Questions (MCQs) :

1. (c) 220V
2. (c) Increase its strength
3. (d) Ampere
4. (a) Electromagnet
5. (a) Door bell

B. Fill in the blanks :

1. Switch
2. Cables
3. Overloading
4. Vertical lines
5. Electromagnets

C. State True or False :

1. True
2. False
3. True
4. False
5. True

D. Answer the following questions in short :

1. 1. Electrical Cell
   2. Battery
   3. Electric bulb
   4. Connecting wire
   5. Wire connections
   6. Switch Off
   7. Switch ON.
2. On passing electric current through a conductor some of it gets converted into heat energy. The heat effect of current is utilized in a large number of domestic and industrial appliances.

   For example, electric kettle, room heater.
3. The factors on which the amount of heat produced depends on are :
   1. Material of the coil.
   2. The length and the thickness of wire.
   3. The amount of current passing through the wire.
4. MCB stands for Miniature Circuit Beaker. MCB is a

switch that automatically stops the current in the circuit if the current in it exceeds the specific maximum limit. MCB protects the circuit in case of a short circuit and overloading of current and thus prevents damage.

5. Diagram Page No. 115.

5. E. Answer the following questions in detail :

1. Construction of an electric bell : It consists of a horse shoe magnet. Facing the poles of the magnet is a soft iron piece with a hammer H, at its one end and an armature of the elastic steel strip S attached to it. This steel strip acts like a spring. An adjustable screen P makes contact with another strip Q attached to the spring or the armature S, the hammer is placed near the bell gong.

   Working of the electric bell :

   1. On connecting a cell or battery to the terminals A and V, the circuit gets completed through the coils of the electromagnet and spring S, Q and the adjustable screw P.
   2. The electromagnet is magnetized.
   3. It attracts the soft iron piece, pulling the hammer to the gong. This produces a sound.
   4. As soon as the metal strip S is attracted by the electromagnet, the circuit isbroken between points P and Q, the flow of the current stops.
   5. This way the circuit is made and broken a member of times automatically and the hammer strikes the gong repeatedly by to produce sound.

2. Factors which affect the strength of the electromagnet :

   1. Increasing the number of turns in the coil.
   2. Increasing the flow of current.
   3. Using aluminum or plastic nail in place of iron nail.

   It is observed that the strength of the electro-

magnet increases due to (1) and (2)and decreases due to factor. (3)

3. Electromagnets are based on the magnetic effect of current. An electromagnet shows magnetic properties only as long as the electric current flows through it coil.

Uses of electromagnets :

1. Electromagnets are used in different electrical appliances like electric fans, speakers, electrical door bells, microphones, electric motors, electric generators, electric locks etc.

2. They are used in the receivers of telephones.

3. Very strong electromagnets are used in factories and cranes for lifting heavy iron pieces and separate iron scrap from the junk in the industries.

4. They are used in picture tubes of television and computer science.

5. Doctors use very small but strong electromagnets to remove particles of metals (magnetic) from the patients' eyes.

4. 1. A source of electric current.
   2. A conducting material such as a metal wire.
   3. An uninterrupted path for the flow of charge.

5. To demonstrate that a wire behaves like a magnet when current is passed through it.

Procedure : Make an electric circuit as shown in the figure below with A B in north-south direction. Place a magnetic needle (compass needle) near AB and let it be in North-South direction. It is observed that when the current passes the needle shows deflection whereas there is no deflection in the needle when the key is released and the current does not pass.

Lesson 11 : Light

A. Multiple Choice Questions (MCQs) :

1. (a) Bounces back
2. (c) Convex lens
3. (c) Plane Mirror
4. (a) Concave Mirror
5. (b) Rectilinear propagation

B. Fill in the blanks :

1. Virtual image
2. Concave
3. Concave mirror
4. Convex
5. Concave

C. State True or False :

1. False
2. False
3. True
4. True
5. False

D. Answer the following questions in short :

1. The property of light to travel in straight lines is called rectilinear propagation of light.
2. When we bring our face closer to bulging side, erect image is formed.

   When we bring our face closer to inner side of spoon, inverted image is formed .
3. Newton colour disc had all the colours of VIBGYOR. Seven colours of spectrum of white light if put together can again give rise to white light again. Newton used in colour disc to show this phenomenon.
4. It is a phenomenon of light in which the light rays bounce back from the reflecting surface into our eyes.
5. Convex lens is used on microscopes. Convex lens is used in cameras. Concave lens in used in flashlights. Concave lens is used in peepholes.

E. Answer the following questions in detail :

1. To demonstrate that light travels in a straight line, take three card boards of the same size. Make holes in the

centre of each one of them. Fix all of them on a flat surface or a table. Please burning candle on one side of the table in such a manner that the flame of the candle is in a straight line with the holes of the boards. Now, see through the other side of the setup, the flame will be visible. On disturbing any one of the boards, the flame will not be seen. This demonstrates the rectilinear propogation of light.

2. When the rays of light are reflected from a smooth surface in such a way that they actually meet at some other point on the screen, the image formed is a real image. The characteristics of a real image are:-
   1. It can be taken on a screen.
   2. It is always inverted.
   3. Its size can be same/smaller/bigger than the size of the object. eg. image formed by a projector in a cinema hall.
3. Newton showed that a triangular piece of glass called the prism can produce a spectrum. He allowed a thin beam of light to fall on the prism in a dark room. After passing through the prism, the beam of light splits into different colours. A spectrum can be seen on a screen kept behind the prism.
4. Objective : To demonstrate the recombination of seven colours of spectrum into white light.

   Requirement : White cardboard, compass, protractor, seven colours of VIBGYOR sequence and a pencil.

   Procedure : Take a piece of white cardboard and a set of compass of 5cm radius to draw a 10cm diameter circle on the cardboard. Cut out a circle. Divide the cardboard circle using the protractor into 7 equal sections with each section being 51 degree. Colour the sections in the order of VIBGYOR. Now insert the pencil through the centre of the circle with the point at the bottom. Spin

the disk.

Observation : You will observe that as the disk is spinning at high speed, our eyes are unable to see the colours separately and the disc almost seems white. This is due to the fast rotation of the disc, all the seven colours which you have used seem to be mixed together resulting in whitish colour.

Conclusion : When the seven colours of the spectrum combine white light is produced.

5. An image formed in the mirror can be defined as the appearance or picture of a real object, formed by the light that is reflected by the mirror or any other reflecting surface.

The nature of the image formed depends on-

- The nature of mirror/reflecting surface.
- The distance of the object from the mirror.

Lesson 12 : Forest Our Life Line

A. Multiple Choice Questions (MCQs) :

1. (b) Plastic
2. (b) Consumers
3. (d) All of these
4. (c) Humus
5. (d) Crown

B. Fill in the blanks :

1. Herbs
2. Neem
3. Food web
4. Afforestation
5. Emergent layer

C. State True or False :

1. False
2. True
3. True
4. False
5. True

D. Answer the following questions in short :

1. Insects and birds act as agent for pollination thereby

they help in fruit formation. Flowering plants in forest depend on animals for formation of fruits.

2. Forest maintains the water table, since forests are natural absorbers, rain water does not stagnate, thus controls floods. Also prevent soil erosion.
3. Food chain : a chain in which one organism eats another one.

   Example : Trees Õ Deer Õ Lion

   Food web : a web formed due to inter-linked food chains.
4. Plants, animals together with the environment make an ecosystem in a forest. Plants and animals constitute the wild life in the forest. They depend on each other and support each other.
5. 1. Large scale, cutting of trees (deforestation) should be stopped.
   2. Forests should be protected while planning construction of dams, roads, mining etc.
   4. Methods of controlling plant diseases should be employed.
   5. Air, water, soil pollution should be controlled.
   6. Overgrazing should be prevented.

E. Answer the following questions in detail :

1. Balance in nature is brought about by the interdependence of plants and animals in food chain.

   Now, suppose all the eagles are removed from the earth. The population of snakes will increase and more and more snakes will eat frogs. As a result, the number of frogs will decrease in number. Due to this number of grasshoppers will increase. These grasshoppers will eat more plants and crops resulting in shortage of food. Ultimately humans are affected. But nature does not tallow this to happen as it maintains the population of

each species in balance by maintaining the number. Thus, the balance in nature is maintained due to-'to kill and to be killed' law of nature.

2. - To create more residential areas for increasing population.
   - For production of more food, forest land has been converted into agricultural land.
   - Industrial development, to create transport facilities, construction of roads.
   - Felling of trees has increased due to wood requirement for paper industry.
   - Overgrazing by animals has increased.

3. 1. The Emergent Layer : Only the tallest trees reach this level. This layer is very sunny. This is also called as Over storey.
   2. This is the thickest layer and much of the rain in stopped by the thick foliage. The branches of tall trees make a roof like cover over the other plants. This is known as the Canopy.
3. The Under story : The vegetation is a forest that grows under the shade of canopy is known as under story. In the under story, there are different horizontal layers of vegetation.
4. The Forest Floor : This layer is very dark, damp and covered with many dead leaves, twigs and dead plants. Sunlight is not able to penetrate and reach the floor.

4. Trees help to regulate the climate of a place.

   Trees help in taking in carbon dioxide for photosynthesis which is a green house gas, and thus help in checking the global warming.

   Trees help to control soil erosion.

   Forests are source of fruits and most of the dry fruits.

   Forest are source of many oils, resins, paints, wax etc.

5. Afforestation : This is a practice of renewing and regenerating a forest by planting seedlings or small trees on a large scale. Selective and judicious cutting of trees inthese plantation practices keeps the forest cover intact while providing wood for industrial purposes. These days in our country afforestation is officially done by the government and by private organizations for commercial purposes.

Lesson 13 : Waste Water Story

A. Multiple Choice Questions (MCQs) :

1. (c) Polio
2. (d) All of them
3. (b) waste water treatment plant
4. (a) Sewage
5. (a) Bacteria

B. Fill in the blanks :

1. Fertilizers
2. Chlorine
3. Biological
4. Industrial effluent
5. Biogas

C. State True or False :

1. False
2. False
3. True
4. True
5. False

D. Answer the following questions in short :

1. It is necessary to treat sewage before discharge into the water bodies as sewage gets collected in pools, which become the perfect places for flies, mosquitoes to breed. These might produce serious diseases malaria, dengue, jaundice, elephantiasis etc.
2. To improve sanitation in public places following rules must be followed :
   - There should be sufficient toilet facilities.
   - There must be a wash basin with clean water.

- There must be dustbin for garbage disposal.

3. Formation of stagnant pools which acts as breeding places for mosquitoes.
   - Flooding
   - Water logging in fields.
   - Loss of agriculture crops.
   - Spreading of diseases.
4. Waste water is spent or used water with dissolved and suspended impurities.
5. Eucalyptus trees should be planted all along the sewage ponds. These trees absorb surplus water and release pure water vapour into the atmosphere through transpiration.

E. Answer the following questions in detail :

1. Various steps involved in the treatment are as follows :

   Primary Treatment : Screening large solid materials like plastic packets, rags, cloth pieces, napkins, cans, sticks etc. by passing sewage water through large bars.

   The waste water is then passed through settling tanks called Grit Chambers where sand, silt and gravel settle down.

   Secondary Treatment : This is a biological process. Sludge organic matter obtained is decomposed with the help of anaerobic bacteria to release biogas which can be used as fuel or to produce electricity.

   Tertiary Treatment : Finally the water then undergoes chemical treatment which depends upon the composition of the water at this stage. Chemicals are used to remove phosphorus and nitrogen from water. Addition of chlorine and exposure to ultraviolet light kill any remaining bacteria This treated water can also be used for agricultural activities, aquaculture etc.

2. 1. Non-degradable products like disposable plates,

glass, plastic etc. should not be thrown into the drain as they can clog the drains.

2. Excessive use of fertilizers and pesticides should be avoided .
3. Chemicals like paints, solvents, medicines, insecticides should not be thrown down the sink.
4. Leakage in taps and pipes should be repaired.
5. Sewage should not be discharged directly into the water bodies without being properly treated.

3. Open drains are the cause of many water borne epidemics as :
   - Sewage gets collected in pools, which become the perfect places for flies, mosquitoes to breed.
   - These might produce serious diseases malaria, dengue, jaundice, elephantiasis etc.
   - The germs of diseases like cholera can also grow and multiply in stagnant waste water and may become endemic or epidemic.
   - The organic matter in these open drains producesfoul-smell a big cause of air pollution.
   - During heavy rains, rain water directly enters the drains and sewage spills on the roads during monsoon.
4. Sludge can be used in the following ways :
   1. Sewage sludge and waste water effluents provide essential plant nutrients and water. It can improve the physical condition of the soil since sludge is rich in inorganic mater.
   2. It can be dried and is used as an excellent organic fertilizer.
   3. Biogas can be produced from it which is used as a fuel and also to generate electricity.
5. Vermi composting : In this red worms and earth worms

are used to treat excreta and convert it to vermi-compost. Vermicompost contains water-soluble nutrients and can be used as an organic fertilizer.
Landfill: It is a process in which the waste is buried in unused mining voids or pits where the organic waste breaks down in the absence of oxygen by bacteria producing a gas(carbon dioxide and methane-biogas).
Planting Eucalyptus trees : Eucalyptus trees should be planted all along the sewage ponds. These trees absorb surplus water and release pure water vapour into the atmosphere through transpiration.

13

Wastewater Story

Water is a basic necessity for our day to day life. It is essential for the existence of not only the humans but also plants and animals. Even the microbes, smallest to the largest plants and animals will perish in the scarcity of water.

Our country is rich in natural water resources, however, with the extraordinary increase in human population, the demand for water for them and their activities has increased many fold.

There is a huge network of rivers and vast river basins to hold plenty of ground water, yet the available water resources in many parts of the country are getting depleted. There is a lot of deterioration in the quality of water too. There are certain regions of the country where clean water is not available at all. It has been reported that more than one billion of people have no access to safe drinking water which leads to many water-borne diseases and even deaths. People, women and even children have to walk many kilometers to get clean water. It is a serious matter for human dignity and welfare.

Scarcity of water is mainly due to over population, industrial development, mismanagement and many other factors. The situation is grave, therefore, the general assembly of the United Nations declayered the period 2005-2015 as the International Decade for action on 'Water for life' on March 22nd, 2005.

Waste water and Pollution :

On using water at home to wash clothes and utensils, bathe and flush toilets, we produce a lot of wastewater. It contains urine, faece, detergent dirt, food waste. Discharging all these undesirable substances into the water leads to water pollution. The substances causing the pollution are the pollutants.

Sources of water pollution :

1. Industrial waste : Industries release their untreated affluents into water bodies which may contain harmful chemical like mercury, lead, copper, cadmium which may be the cause of serious skin diseases and affect the nervous system.
2. Domestic waste : Domestic water waste includes soap, detergents, toilets water, washing machines greese, food, decomposed waste etc. can be dangerous if left untreated.
3. Agricultural waste : Pesticides are used to kill the living organisms which are harmful to the crops. Pesticides are harmful for consumption by other organisms and human beings. They get washed by rain water and collect in the rivers, streams and ground water and thus harm the living organisms consuming it.

Industrial waste

Domestic waste

Agricultural waste

What is Sewage?

Waste water from houses is collected into a drainage system through large holes, at the bottom of the pipes. These drains open into sewer outside the houses. Sewage is the water along with the waste. This is contaminated water.

These sewages are connected to bigger sewer drains to be carried out of the area or locality is known as the Sewer System.

In many places, like slums, there is a lack of drainage system. Waste water is carried in uncovered puddles, ditches or channels gives rise to open drainage system, but this system is not favourable at all for the public at large.

Reasons are as follows :

- Sewage gets collected in pools, which become the perfect places for flies, mosquitoes to breed.

  These might produce serious diseases malaria, dengue, jaundice, elephantias is etc.

- The germs of diseases like cholera can also grow and multiply in stagnant waste water and may become endemic or epidemic.

- The organic matter in these open drains produces foul-smell a big cause of air pollution.
- During heavy rains, rain water directly enters the drains and sewage spills on the roads during monsoon.
- Plastic waste mixed with sewage enters these drains, choking them which lead to overflow of sewage on the roads. The sewage discharge into the water bodies disturbs the ecological balance of rivers and lakes. Untreated or ill treated sewage is the major source of water pollution. It is therefore, necessary to have a covered drainage system for sewage disposal. The sewage should be well treated before being discharged into the water bodies. The treated water can then be utilized for agricultural activities.

SEWAGE TREATMENT :

Sewage treatment involves removal of solid materials from the sewage in addition to making liquid part of the sewage less harmful to humans and aquatic life when it flows into the water bodies.

It involves physical, chemical and biological process that remove physical, chemical and biological contaminations in waste water. The sewage system consists of network of underground pipes that transfer or carry sewage. The transference is from the point it is generated to the treatment plant before it is disposed off.

Waste Water Treatment Plant (WWTP) Primary, Secondary and Tertiary Treatment :

Various steps involved in the treatment are as follows :

1. Primary Treatment : Screening large solid materials like plastic packets, rags, cloth pieces, napkins, cans, sticks etc. by passing sewage water through large bars.
2. The waste water is then passed through settling tanks called Grit Chambers where sand, silt and gravel settle down.
3. Waste water is then made to pass through sedimentation tanks called 'clarifies'. Here the organic matter settles down and removed with scrappers. This is sludge.
4. Air is forced into the water through shimmer. The bubbles thus formed bring up suspended floating matter like greese and oil.

   This is called the scum and removed with a skimmer. The water that comes out of the settling tank is called clarified water.

Secondary Treatment :

This is a biological process. Sludge organic matter obtained is decomposed with the help of anaerobic bacteria to release biogas which can be used as fuel or to produce electricity.

This process is called digestion. The whole treatment is called as sludge system.

Now air is pumped through the clarified water in an aeration tank. This allows aerobic bacteria to grow so that organic material like faces, food wastes which tend to form clumps to humus like materials which settle at the bottom. Water is removed from the top. The dried clumps are used as manures.

Tertiary Treatment :

Finally the water then undergoes chemical treatment which depends upon the composition of the water at this stage. Chemicals are used to remove phosphorus and nitrogen from water. Addition of chlorine and exposure to ultraviolet

light kill any remaining bacteria and thereby disinfect water. The treated water can be discharged into the water bodies. This treated water can also be used for agricultural activities, aqua-culture etc.

Uses of treated water or sludge :

The treated water is safe to be drained into the water bodies. This can be used for various purposes. Sludge is the residue of the chemical biological and physical treatment of municipal and industrial waste. It is rich in organic matter, nitrogen, phosphorus, inorganic salts and heavy metals.

It can be used in the following ways :

1. Sewage sludge and waste water effluents provide essential plant nutrients and water. It can improve the physical condition of the soil since sludge is rich in inorganic mater.
2. It can be dried and is used as an excellent organic fertilizer.
3. Biogas can be produced from it which is used as a fuel and also to generate electricity.

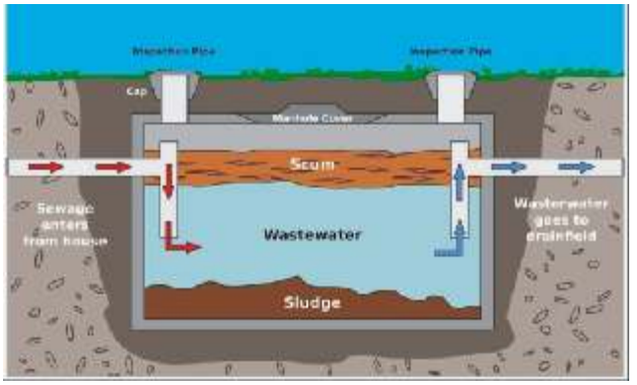
Alternative Methods of Sewage Disposal :

In villages where a sewage system does not exist, alternative methods of sewage disposal are used. Constructing a sewage system is an expensive process as it involves the laying down of several sewers and their maintenance. Therefore, another economical alternative sewage disposal method is employed. This is onsight sewage disposal system. In this waste water systems are designed in such a way that effluents are treated on the property that produces the waste water.

Septic Tanks :

In semi urban areas low cost of septic tanks also known as Onsight disposal system are used to manage the waste. In this method the sewage is allowed to flow into a

tank in which anaerobic bacteria are added. They can be used to treat domestic sewage of individual houses, hospitals or apartments. A septic tank is a water tight concrete tank with an outlet. Due to the action of anaerobic bacteria, the solid waste settles down at the bottom and floatable materials rise. A liquid stream flows though the outlet and percolates down the soil.



Vermicomposting :

This is a recently used method tested in India in which red worms and earthworms are used to treat excreta and convert it to vermicompost. Vermicast, also known as worm humus or worm manure is the resultant product of the breakdown of organic matter by worms. The vermicompost is an excellent manure for plants. This method uses very less water and is simple, hygienic way to process human excreta. Vermicompost contains water-soluble nutrients and can be used as an organic fertilizer.

Landfill :

It is a process in which the waste is buried in unused mining voids or pits where the organic waste breaks down in the absence of oxygen by bacteria producing a gas (carbon dioxide and methane-biogas) which is pumped out of the landfill and flared off or burnt in gas engines to generate electricity.

Planting Eucalyptus trees : Eucalyptus trees should be planted all along the sewage ponds. These trees absorb surplus water and release pure water vapour into the atmosphere through transpiration.

Become an active citizen : With rapidly increasing population, urbanization and industrialization, sewage is getting more and more contaminated. Sewage treatment depends on the quantity and quality of contaniminations present in it. The Government should make sure that adequate treatment plants are installed. But there are many things we can do invidually to reduce the water pollution. We produce a lot

of waste at home that is thrown into the sink or flushed down the toilet. This adds to the sewage which is treated and finally disposed off in the water body. This leads to contamination of water. We, being responsible citizens can limit the type of waste and quantity of waste produced.

Finally are few steps to prevent water pollution :

1. Non-degradable products like disposable plates, glass, plastic etc. should not be thrown into the drain as they can clog the drains. Try to make use of reusable articles.
2. Excessive use of fertilizers and pesticides should be avoided and possibly replaced by bio-fertilizers and bio-pesticides.
3. The materials like tissue paper, sanitary towels, diapers, solid food waste, tea-leaves etc. should not be thrown down the drain. They should be thrown into the dustbins.
4. Chemicals like paints, solvents, medicines, insecticides should not be thrown down the sink.
5. Leakage in taps and pipes should be repaired.
6. Sewage should not be discharged directly into the water bodies without being properly treated.

Large amount of waste is generated everywhere. If this is not disposed off properly, epidemic could break. The Government lays down some standards of sanitation, but unfortunately people do not follow strictly.

It is the civic duty of each one of us to contribute to maintenance of sanitation at public places. There has to be a collective action, influence others especially children the need for hygiene and sanitation.

Keywords :

Wastewater	:	spent or used water with dissolved and suspended impurities.
Sewage	:	wastewater from different sources.
Contaminants	:	the suspended impurities in the sewage.
Sewage system	:	the network of pipes that carry sewage from the place where it is generated, to the sewage treatment plant.
Sludge	:	the residue of the chemical biological and physical treatment of waste
Vermicompost	:	manure for plants.

Summary :

- Water is a basic necessity for our day to day life.
- Scarcity of water is due to over population industrial development, mismanagement etc.
- Wastewater from different sources like houses, industries etc. and rainwater that run over land altogether form sewage.
- Improper drainage system leads to spread of various diseases and pollution of surface water and ground water.
- Sewage treatment involves physical, chemical and biological process that removes waste from water.
- Waste water treatment plant remove contaminates and make the water suitable for use.
- We all should use methods to prevent contamination of water and manage waste water.
- Septic tanks, vermicomposting and landfill are alternative method of sewage disposal.

Exercise

A. Multiple choice questions (MCQs) :

1. _____is not a water borne disease.

   (a) Cholera ☐ (b) Typhoid ☐

   (c) Polio ☐ (d) Dysentery ☐

2. Sewage is a kind of _____ .

   (a) Industrial waste ☐ (b) Agricultural waste ☐

   (c) Domestic waste ☐ (d) All of them ☐

3. WWTP stands for-

   (a) Waste water therapy plant ☐ (b) Waste water treatment plant ☐

   (c) Waste water transport plant ☐ (d) Waste water temporary plant ☐

4. Liquid waste consisting of suspended impurities is _____ .

   (a) Sewage ☐ (b) Aeration ☐

   (c) Sludge ☐ (d) Contaminants ☐

5. The decomposition of sewage is carried out by-

   (a) Bacteria ☐ (b) Chlorine ☐

   (c) Ozone ☐ (d) Fungi ☐

B. Fill in the blanks :

1. Excessive use of _____ in farm lands and gardens can have adverse effect.

2. The water is disinfected by using _____ .
3. Secondary treatment is a _____ process involving decomposition.
4. Waste water generated from industrial activity is known as _____ .
5. _____ is used for cooking and electricity production in rural areas.

C. State True or False :

1. To reduce the use of water means drinking less water.
2. Cooking oil and fats should be thrown down the sink.
3. A septic tank is a water tight concrete tank with an outlet.
4. Sludge is dried and is used as an excellent organic fertilizer.
5. We should scatter litter everywhere.

D. Answer the following questions in short :

1. Why is it necessary to treat sewage before discharge into the water bodies?
2. What can be done to improve sanitation in public places?
3. What problems can arise due to improper drainage system?
4. What do you understand by waste water?
5. Why should the Eucalyptus trees be planted along the sewage ponds?

E. Answer the following questions in detail :

1. Explain the various steps of treatment of waste water before it is released in the water bodies.
2. How can all of us help in keeping our city clean?
3. Open drains are the cause of many water borne epidemics. Explain.
4. How is sludge useful after its treatment?
5. Explain the alternative methods of sewage disposal.

Activity :

Talk to your grandparents and other elderly people in the neighbourhood. Find out the sewage disposal systems available to them. You can also write letters to people living in far off places to get more information. Prepare a brief report on the information you collected.