

COMPACT SCIENCE 7

(Book Solution)

1. Nutrition in Plants

Checkpoint 1

1. Green plants are called autotrophs because they make their food from simple inorganic substances.
2. The raw materials necessary for photosynthesis are chlorophyll, sunlight, carbon dioxide and water.
3. Chloroplast traps solar energy.
4. In plants, food is prepared in the form of glucose.

Checkpoint 2

1. (a) Obtaining food from dead and decaying matter is saprophytic nutrition.
(b) Plants called insectivorous plants grow in nitrogen-deficient soil. These plants trap and digest insects to obtain nitrogen compounds.
2. (a) alga; fungus
(b) symbiotic
(c) leaf

Let's Drill Our Skills

- A. 1. (c) 2. (a) 3. (c) 4. (b) 5. (d) 6. (b)
- B. 1. green; chloroplast
2. sunlight
3. water; minerals; roots
4. starch
5. insectivorous
6. *Rafflesia*
- C. 1. The mode of nutrition in which organisms make their food from simple inorganic substances is called autotrophic nutrition.
2. The mode of nutrition in which organisms obtain food from plants or other animals is called heterotrophic nutrition.
3. When two organisms live together and share shelter and nutrients, their association is called symbiotic relationship.
- D. 1. Plants use carbon dioxide gas during photosynthesis.
2. *Cuscuta* has parasitic mode of nutrition.
3. Chlorophyll is essential for photosynthesis because it traps light energy and converts it into chemical energy.
4. Fungi cannot synthesise their food because they do not contain chlorophyll.

5. Carbon dioxide + Water $\xrightarrow[\text{Chlorophyll}]{\text{Sunlight}}$ Glucose + Oxygen
 (from air) (from soil)
6. Insectivorous plants grow in nitrogen deficient soil. To supplement their nitrogen requirement, they feed on insects and obtain proteins from them.
- E. 1. Nutrition is essential for obtaining energy to perform various life processes. It is also essential for growth and development of the body and to repair worn out cells.
2. During photosynthesis, green plants take carbon dioxide from air and water from soil through roots. The chlorophyll present in leaves traps sunlight and converts it into chemical energy. Plants combine these inorganic compounds into complex organic substance called glucose.
3. Raw materials required for photosynthesis are chlorophyll which is present in chloroplast, sunlight, carbon dioxide and water.
4. When two organisms live together and benefit each other by nutrients, their association is called symbiotic relationship. For example, lichens are symbiotic organisms. In lichens, an alga and a fungus live together. Alga being green makes food for both by photosynthesis. The fungus provides shelter, water and minerals to the alga.
- F. 1. Epidermis 2. Palisade 3. Spongy mesophyll 4. Chloroplast
- (a) A leaf gets carbon dioxide from air through stomata.
 (b) Phloem in the veins of leaf carries synthesised food to other parts of the plant.
2. (a) An organism which can make food from raw materials is called autotroph. A green plant can make food, therefore, it is called an autotroph. On the other hand, the organism which cannot make food for it but, obtains food from plants or other animals is called heterotroph.
 (b) Partial parasites can synthesise their food but, they depend on the host for water and minerals. For example, *Mistletoe* plant. On the other hand, total parasites completely depend on the host plant for their food. For example, *Cuscuta*.
3. Heterotrophic nutrition is of following types:
- (a) **Parasitic nutrition:** In this type of nutrition, organisms obtain food from other organism. The organism which provides food is called host and the one who gets food is called parasite.
 (b) **Saprotrophic nutrition:** In this type, organisms obtain food from dead and decaying matter. For example, bacteria and fungi such as bread mould and mushrooms.
 (c) **Insectivorous nutrition:** In this type of nutrition, plants trap and digest insects to meet their nitrogen requirement.

- G. 1. Mushrooms obtain their food from dead and decaying matter of animals and plants. Therefore, they are called saprophytes.
2. *Cuscuta* completely depends on the host plant for its food. It has a yellow, wire-like stem which twines around the host stem and branches. It gives out special fine roots called haustoria which enter the host stem and absorb ready-made food from there.
3. Root nodules of leguminous plants have nitrogen-fixing bacteria, *Rhizobium*. These bacteria convert atmospheric nitrogen into nitrates which are utilised by leguminous plants.

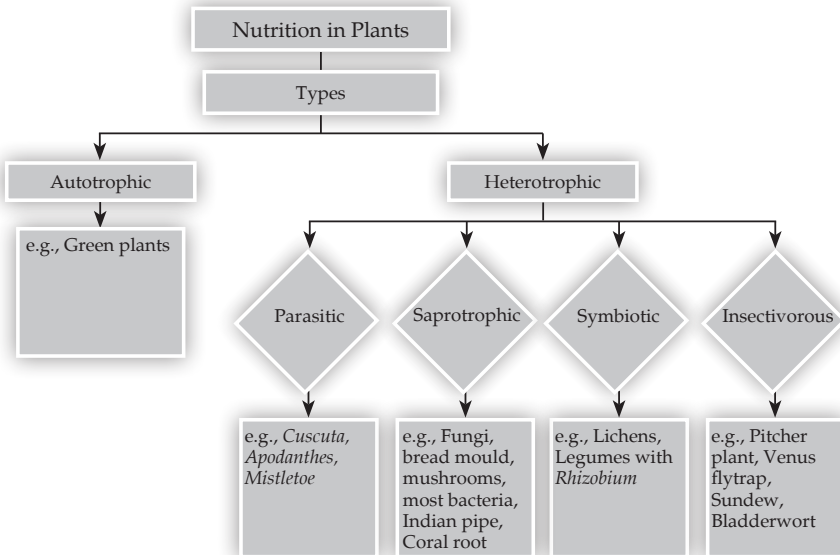
HOTS

1. Insectivorous plants are photoautotrophs. They synthesise their food but to fulfil their nitrogen requirement, they trap insects. So, they are called partial heterotrophs.
2. Roots of leguminous plants have root nodules which contain nitrogen-fixing bacteria *Rhizobium*. These bacteria convert atmospheric nitrogen into nitrates which are utilised by leguminous plants. So, the soil becomes rich in nitrates and no fertilisers are needed.
3. Chlorophyll gets degenerated in plants kept in the dark, so the green pigment is lost and leaves become yellow.

Value-based Questions

1. The green-coloured patches on the bread are of bread mould fungi. They exhibit saprotrophic mode of nutrition.
2. Lakshi is an aware and a concerned person.

LET'S MEMORISE



2. Nutrition in Animals

Checkpoint 1

1. holozoic
2. plants
3. host
4. assimilation
5. microscopic

Checkpoint 2

1. Different types of teeth in our mouth are incisors, canines, premolars and molars.
2. Saliva contains an enzyme called salivary amylase. It converts starch of food into simple sugar.
3. (a) The muscular wall of stomach churns the food by rhythmic contractions.
(b) Stomach wall secretes hydrochloric acid which kills bacteria that enter stomach along with food.
(c) Enzymes of digestive juices secreted by stomach wall digest proteins.
4. Villi are finger-like projections in the inner wall of small intestine. They increase surface area of small intestine for the absorption of digested food.
5. Most of the food nutrients are absorbed in the small intestine.

Checkpoint 3

1. The partially digested food in ruminants is called cud.
2. Grass-eating animals like cows, horses, etc., are called ruminants.
3. In ruminants, cellulose is digested by cellulose-digesting bacteria found in the caecum.
4. Cellulose is not digested in man because caecum is small in size and cellulose-digesting bacteria are absent.

Let's Drill Our Skills

- A.** 1. (a) 2. (b) 3. (b) 4. (a) 5. (d) 6. (b)
- B.** 1. Pseudopodia are finger-like projections from the body surface of *Amoeba*.
2. Rumen is one of the four chambers in the stomach of ruminants. It is the largest chamber and is specialised to store half-chewed food.
3. Caecum is a sac-like structure in the digestive system of herbivores which harbours cellulose-digesting bacteria.
3. Canine is a round, sharp and pointed tooth which helps in tearing the food.
4. Canine is a round, sharp and pointed tooth which helps in tearing the food. There are 4 canines in humans.
- C.** 1. (c) 2. (a) 3. (b) 4. (e) 5. (d)
- D.** 1. Milk teeth are 20 in number.
2. Premolars and molars are the teeth with flat grinding surface.
3. The long tube with a large number of finger-like projections is small intestine.

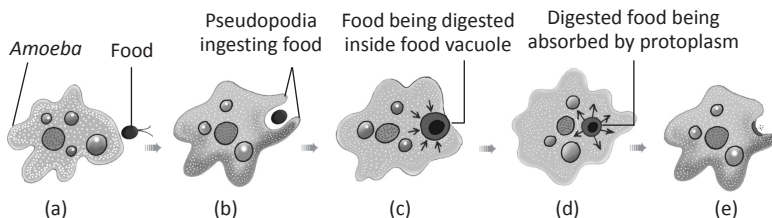
4. Rumen part of stomach stores partially chewed food temporarily in cows.
 5. The breaking down of food into simple soluble form is called digestion of food.
 6. Iodine becomes blue-black when added to starch.
- E.
1. Tongue has following functions:
 - (a) It helps in tasting and swallowing the food.
 - (b) It mixes saliva with food during chewing.
 - (c) It helps in turning food in buccal cavity for chewing.
 - (d) It helps in talking.
 2. *Amoeba* projects its pseudopodia around the food. These pseudopodia surround and engulf the food.
 3. Different types of teeth are incisor, canine, premolar and molar. There are 32 teeth in the permanent set of teeth in man.
 4. Villi are finger-like projections found in the inner wall of small intestine. They absorb the digested food.
 5. Gastric juice contains mucus, hydrochloric acid and digestive enzymes.
 6. During digestion:
 - (a) Fats change into glycerol and fatty acids.
 - (b) Proteins change into amino acids.
 - (c) Starch changes into simple sugars.
- F.
1. (a) The parasites which live inside the host body and derive nutrients from host's body fluid, blood or tissue are called endoparasites. For example, malarial parasites live in RBCs, flatworms and roundworms live in liver or intestine. On the other hand, the parasites which live on the body surface of their host are called ectoparasites. For example, ticks, mites, body louse and bedbugs cling on to the body surface of their host and suck their blood.
 - (b) Ingestion is the process of taking in food while egestion is the process of getting rid of undigested solid part of the food.
 2. Grass-eating animals like cows, buffaloes, etc. are called ruminants. A part of their stomach called rumen is specialised to store half-chewed food.
- Digestion of food in ruminants:** Digestion of food in ruminants takes place in following steps:
- (a) Ruminants swallow half-chewed food. It is mixed with saliva and is stored in the rumen part of stomach.
 - (b) In rumen, the half-chewed food is partially digested by the action of saliva. This partially digested food is called cud.
 - (c) When ruminants sit and relax, the cud comes back into their mouth cavity and is chewed again. This process is called chewing the cud or rumination.

- (d) The completely chewed food reaches to omasum where water from the food is absorbed.
- (e) The food is then pushed into abomasum where it is digested completely.

The cellulose of the food is digested in the caecum with the help of cellulose-digesting bacteria.

3. Nutrition in *Amoeba* takes place in following steps:

- (a) **Ingestion:** *Amoeba* ingests food by projecting pseudopodia around it. The food gets trapped in a food vacuole with in the body.
- (b) **Digestion:** The food in food vacuole is digested by the enzymes released from cytoplasm.
- (c) **Absorption:** The digested food diffuses into the cytoplasm from food vacuole.
- (d) **Assimilation:** The absorbed food is used for energy, growth and other life activities.
- (e) **Egestion:** The food vacuole with undigested food moves to body surface. It ruptures and expels the undigested food.



(a, b) Ingestion; (c) Digestion; (d) Absorption; (e) Egestion

4. 1. Salivary gland 2. Buccal cavity 3. Liver 4. Stomach
5. Pancreas 6. Colon 7. Small intestine 8. Large intestine
9. Rectum 10. Anus

- (a) The digestive juice of stomach has following functions:
- (i) Its mucus protects the lining of stomach from action of enzymes and acids.
- (ii) Hydrochloric acid in digestive juice kills the bacteria which enter the stomach with food. It also makes the food acidic for the action of enzymes.
- (iii) The enzymes of digestive juice digest proteins of the food.
- (b) Bile makes the food alkaline and helps in the digestion of fats. Bile is stored in gall bladder.

HOTS

1. A large amount of mucus is secreted by the mucous glands of the stomach wall. It forms a thick protective coat over mucous

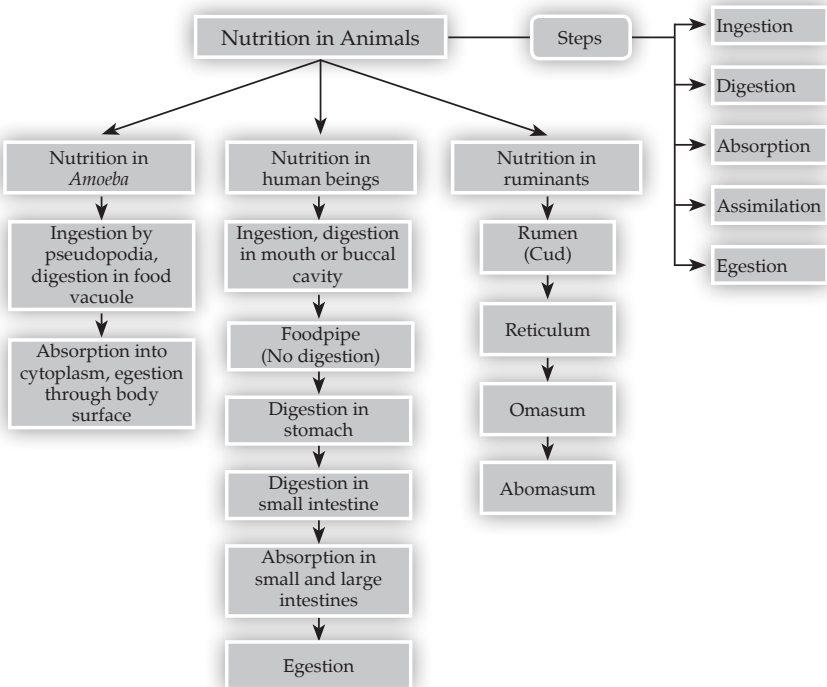
membrane of stomach wall and protects its cells from the action of hydrochloric acid.

- In stomach, the food is churned into fine paste and is mixed with the digestive juices by the rhythmic contractions of stomach wall. Therefore, stomach wall is thick and muscular.
- The digested food is absorbed in the small intestine. The wall of small intestine is provided with numerous villi to increase the surface area for the absorption of digested food. Therefore, to ensure maximum absorption of food, small intestine is long.
- We cannot digest cellulose because our caecum is small and nonfunctional. It does not have cellulose-digesting bacteria or enzyme.

Value-based Questions

- Tooth decay can be prevented by taking proper care of teeth. We should avoid sugary and sticky food, and add more raw food to our diet. We should keep the teeth clean and get regular check up by the dentist.
- Sameer and his mother are aware and health conscious persons.

LET'S MEMORISE



3. Cloth Materials – Fibre to Fabric

Checkpoint 1

1. The removal of hair from sheep is called shearing.
2. The small fluffy fibres are called burrs.
3. Anthrax is also called sorter's disease.
4. China tops in wool production.
5. International Wool Secretariat (IWS) confers woolmark logo.

Checkpoint 2

1. cocoon
2. sericulture
3. mulberry
4. salivary glands; caterpillar
5. fibroin

Let's Drill Our Skills

- A.** 1. (a) 2. (b) 3. (c) 4. (b) 5. (b)
- B.** 1. wool; silk 2. natural; man-made 3. South America 4. reeling
5. Cocoons
- C.** 1. The process of shaving a sheep's body to obtain fleece is called shearing.
2. The process of washing sheared hair of sheep in a series of tubs containing soapy water to remove grease, dust and dirt is called scouring.
3. The rearing of silk moth for obtaining silk is called sericulture.
- D.** 1. Synthetic fibres are made from petrochemicals in factories.
2. The process of washing fleece is called scouring.
3. The larva of silk moth is called caterpillar.
4. Polyester is a synthetic fibre.
5. Merino sheep gives the best quality of wool.
6. Xi-Chung-Shih, the bride of Chinese emperor Huang Di, discovered silk.
- E.** 1. The natural fibres are obtained from natural sources like plants and animals. For example, cotton and jute are obtained from plants while wool and silk are obtained from sheep, goat and silkworm respectively. On the other hand, artificial fibres are made in factories from petrochemicals. For example, rayon, nylon, polyester, etc.
2. **Spinning:** Spinning is the process by which wool fibres are straightened, combed and rolled into yarn.
Weaving: Weaving is the process by which the pieces of spun yarn are interlocked with one another to make cloth.

3. Sorter's disease is anthrax which is caused by anthrax bacteria mostly to the people working in the sorting department of wool factory.
 4. The sheep with thick coat provide good quality of wool fibres.
 5. Silk is obtained from various varieties of silk moth, *Bombyx mori*. Wild silk called tassar is obtained from silk moth feeding on oak leaves. Muga silk is obtained from a wild variety of silk moth found in Brahmaputra valley.
 6. The cocoon of silk moth is immersed into hot water to kill the pupa inside it, otherwise, the pupa would develop into young silk moth and cut the silk fibre of the cocoon to come out.
 7. **Softening of sericin:** It is the process which involves a series of hot and cold immersions of cocoons for softening of sericin protein which glues together the two strands of fibroin protein of silk fibre.
Reeling the filament of silk: It is the process of unwinding single long continuous silk filament from the cocoon.
- F. 1. Following steps are involved in the production of wool:
- (a) **Shearing:** It is the first step which involves shaving a sheep's body to obtain fleece.
 - (b) **Scouring:** It is the process of washing the fleece in tanks to remove dust, dirt and grease. The washed hair are dried by passing through a series of rollers and dryers.
 - (c) **Sorting:** The dried hair of different textures are sorted out in sorting department.
 - (d) **Carding:** The sorted hair are passed through rollers for straightening. They are scoured and dried again.
 - (e) **Dyeing:** The natural colour of fleece is black, brown or white. Therefore, they are dyed in various other colours.
 - (f) **Spinning:** The dyed fibres are straightened, combed and rolled into yarn. The longer fibres are made into wool for sweaters while shorter fibres are spun and woven into woollen cloth.
2. The life cycle of silk moth has following stages:
- (a) **Egg:** Hundreds of tiny eggs are laid by adult female silk moth on the mulberry leaves.
 - (b) **Larva:** The eggs hatch into larvae called caterpillars. They feed on mulberry leaves vigorously and grow in size. After some time, the larva stops feeding and secretes liquid silk from its salivary glands and changes into pupa.
 - (c) **Pupa:** It is a nonfeeding and resting stage. The liquid silk hardens on exposure to air and forms a cover around the pupa. The silk cover around the pupa is called cocoon.
 - (d) **Adult:** The pupa develops into moth inside the cocoon. At the end of pupal stage, the young silk moth cuts the silk fibre of cocoon and flies out.

3. Following steps are involved in the production of silk:
 - (a) The eggs of silk moth are stored on strips of cloth or paper and are sold to silkworm farmers.
 - (b) The eggs are reared in hygienic conditions at suitable temperature and humidity till the larvae come out.
 - (c) The silk moth larvae are then fed on mulberry leaves under controlled conditions.
 - (d) Fully grown cocoons are sorted out according to their colour, size, shape and texture.
 - (e) The sorted cocoons are immersed in boiled water or exposed to steam. This kills the pupae inside the cocoons.
 - (f) The cocoons are then passed through a series of hot and cold immersions for softening the silk fibre.
 - (g) The silk fibres are unwound from the cocoons to get long continuous fibres. The process is called reeling the filament.
 - (h) The silk fibres are spun into silk threads.
 - (i) The silk threads are woven into silk fabric in looms. The silk fabric is finished by crease-proofing, water-proofing, fire-proofing, etc.
4. Following are the occupational hazards of silk industry:
 - (a) Workers of silk industry are affected by respiratory diseases such as asthma and bronchitis because of inhalation of vapours arising from cocoons being steamed, boiled and reeled.
 - (b) Workers develop infectious skin diseases due to dipping of hands in boiling water during killing of pupae.
 - (c) Severe headache, fever and pain in neck and lower back are also observed in the workers of silk industry.
 - (d) Leg deformity and bow-leggedness are also found in some workers.

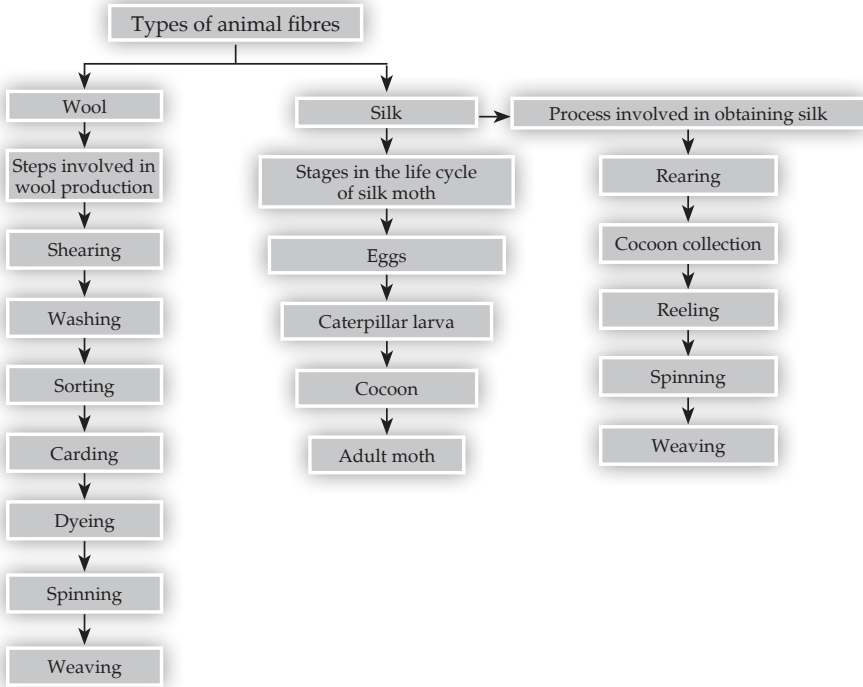
HOTS

1. The workers of sericulture industry often develop asthma, chronic bronchitis and difficulty in breathing because of inhalation of vapour arising from cocoons being steamed, boiled and reeled.
2. If the boiling of cocoon is delayed, the young moth cuts the silk fibre of cocoon to come out. Thus, a single thread of silk is cut into small pieces which cannot be spun into silk thread.
3. The shorn sheep is dipped into an antiseptic solution to protect it from skin infection.

Value-based Questions

1. No, it is not good to kill the insect for obtaining silk because it is inhumane to kill someone for own benefits.
2. Rajat is a curious, aware, kind and sensitive person.

LET'S MEMORISE



4. Temperature and Heat Flow

Checkpoint 1

- (a) comparative; absolute (b) temperature (c) Celsius (d) 37°C (e) 0°C (f) -10°C; 110°C
- (a) The boiling point of water is 100°C.
(b) Sir Thomas Clifford Albutt invented clinical thermometer.
(c) The range of clinical thermometer is 35°C to 42°C.
(d) A laboratory thermometer consists of a capillary tube of glass surrounded by a very thick, supportive glass wall. Its lower end is drawn into a delicate bulb-like shape which is filled with mercury. Its stem has calibrations from -10°C to 110°C.

Checkpoint 2

- True
- False
- True
- True
- False

Checkpoint 3

- (b)
- (d)
- (a)
- (c)

Checkpoint 4

- Vacuum
- Hot objects
- Black colour
- White/Silver colour
- Summer

Let's Drill Our Skills

- A. 1. (b) 2. (a) 3. (d) 4. (c) 5. (a) 6. (d) 7. (d)
- B. 1. False 2. True 3. True 4. True 5. False 6. False
- C. 1. Temperature is the degree of hotness or coldness of a body.
2. Conduction is a mode of transfer of heat from one particle to another in solids.
3. Convection is the mode of heat transfer by the actual movement of the heated particles, especially in liquids and gases.
4. Clinical thermometer is a device used to measure human body temperature.
5. Sea breeze is the convection currents from the sea or ocean to the land.
- D. 1. Thermometer is used to measure the temperature of an object.
2. Laboratory thermometer ranges from -10°C to 110°C .
3. Clinical thermometer ranges from 35°C to 42°C .
4. Conduction is the mode of transfer of heat from one particle to another in solids.
5. Convection is the transfer of heat due to actual movement of the heated particles within the medium.
6. Radiation is heat transfer from the source to cold object without contact.
- E. 1. Touching and feeling the hotness of a body do not give the accurate degree of hotness. Therefore, they are not sufficient to measure temperature.
2. Following precautions should be taken while using a clinical thermometer:
(a) Thermometer should be washed with antiseptic lotion or clean water and dried with clean cloth before every use.
(b) The thermometer should be given two or three soft jerks carefully to bring the mercury below 35°C .
(c) While the thermometer is inside in mouth, one should not laugh, talk or yawn to prevent its breakage and release of mercury in the body.
(d) Thermometer should never be hold by the bulb while reading it.
3. A lab thermometer cannot be used to measure the body temperature of a human being because it has a straight capillary, whereas the capillary of a clinical thermometer has a kink just above the bulb to prevent the falling of mercury level on its own when the thermometer is taken out of mouth.
4. The materials which conduct heat easily through them are known as good conductors of heat. For example, all metals like copper, gold, silver, etc. On the other hand, the materials which do not conduct heat through them are known as poor conductors of heat. For example, wood, brick, plastic, paper, glass, glass wool, cotton, wool, air, ice, snow, etc.

5. We feel hot when we sit under the sun directly because we receive thermal radiation from the sun.
6. Freezers are placed at the top of refrigerators so as to easily circulate the cold air downwards as cold air is heavier than warm air. This keeps the refrigerators cool.
7. Handles of cooking utensils are made of wood, plastics or bakelite because they are bad conductors of heat and do not pass heat from hot utensil to the user while holding it.
8. Radiation is a mode of transfer of heat from a hot body to a cold body directly without any contact or medium between them. For example, we receive heat from the sun by radiation.
Metals and water are good radiators.

$$\begin{aligned}
 9. F &= \left(C + \frac{9}{5} \right) + 32 \\
 &= \left(25 + \frac{9}{5} \right) + 32 \\
 &= (5 \times 9) + 32 \\
 &= 45 + 32 = 77^\circ\text{F}
 \end{aligned}$$

- F. 1. Following steps are followed for using a clinical thermometer:
- (a) The thermometer is washed with antiseptic lotion or with clean water and dried with a clean cloth.
 - (b) One or two jerks are given carefully to the thermometer to make sure that the mercury in the capillary tube has fallen well below 35°C .
 - (c) The bulb of thermometer is put under the tongue or in underarm for one minute.
 - (d) After one minute, the thermometer is taken out and temperature is read by observing the level of mercury in the capillary tube.
2. Differences between laboratory and clinical thermometers

Laboratory thermometer	Clinical thermometer
1. A laboratory thermometer is much longer than a clinical thermometer.	1. A clinical thermometer is shorter than a laboratory thermometer.
2. The range for a laboratory thermometer is -10°C to 110°C .	2. The range for a clinical thermometer is 35°C to 42°C .
3. The laboratory thermometer is read while its bulb is in close contact with the object whose temperature is to be measured.	3. The clinical thermometer is removed from the body to note down the temperature.
4. The laboratory thermometer has a straight capillary.	4. The capillary of a clinical thermometer has a kink, just above its bulb.

- Sea and land breezes are caused by the formation of convection currents as follows:

Sea breeze: Sea breeze is formed when convection current flows from sea to the land. During daytime, the air above land becomes hotter than that over water. The hot air rises up and colder air from the sea rushes towards the land to occupy the space left by hot air. This movement of air creates sea breeze.

Land breeze: Land breeze is formed when convection current flows from land to sea. During night, the air over water is warmer than that of land. The warm air rises up and colder air from the land rushes towards the sea to occupy the space left by hot air. This movement of air creates land breeze.

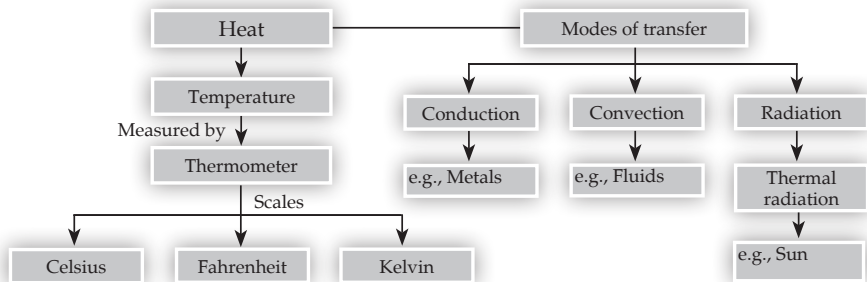
HOTS

- The stem of thermometer is made up of glass so that we can see the mercury thread inside it.
- The outer body of the inner bottle of a thermos flask is made silver in colour to prevent the loss of heat by radiation. It is because shiny surfaces are poor radiators.
- In extreme winters, the surface of lakes and oceans freezes but the water under it remains liquid and warm. So, aquatic animals survive in water.

Value-based Questions

- Saksham advised Rahim to wear light-coloured clothes in summer and dark coloured clothes in winter because light-coloured clothes absorb minimum heat from the sun, whereas dark-coloured clothes absorb maximum heat from the surroundings.
- Saksham is an aware and a concerned person.

LET'S MEMORISE



5. Acids, Bases and Salts

Checkpoint 1

- (a) Acetic acid (b) Tannic acid (c) Lactic acid (d) Citric acid
- (a) An indicator is a substance that changes colour in acids and bases.

- (b) Litmus and turmeric are two natural indicators.
- (i) Blue litmus paper turns red in acids and remains blue in bases.
 - (ii) Phenolphthalein remains colourless in acids and changes to pink colour in bases.

Checkpoint 2

1. Neutralisation reaction is formed when an acid reacts with a base.
2. Salt like sodium chloride is used in our food and as a preservative in pickles, meat, fish, etc.
3. Wasp sting contains allergens which are basic in nature.
4. Milk of magnesia contains magnesium hydroxide $[\text{Mg}(\text{OH})_2]$.
5. Baking soda or sodium bicarbonate (NaHCO_3) solution is used to neutralise the ant sting.

Let's Drill Our Skills

- A. 1. (d) 2. (c) 3. (c) 4. (a) 5. (b)
- B. 1. (b) 2. (d) 3. (a) 4. (e) 5. (c)
- C. 1. Indicator is a substance which is used to test the acidic or basic nature of a substance.
2. The reaction between an acid and a base in which they neutralise each other and form salt and water is called neutralisation reaction.
3. Indigestion is the formation of excess of acid in the stomach due to overeating.
- D. 1. Sulphuric acid is also called battery acid.
2. The molecular formula of limewater is $\text{Ca}(\text{OH})_2$.
3. An indicator changes colour in acidic and basic solutions.
4. A salt is formed when an acid reacts with a base.
5. Washing soda is the common name of sodium carbonate (Na_2CO_3).
- E. 1. (a) Curd, spinach and tea.
(b) Indigestion tablets, soaps and window cleaners.
2. Mineral acids which are formed from the minerals are corrosive in nature, whereas the organic acids which are found in living beings, are noncorrosive.
3. The reaction between an acid and a base in which they neutralise each other and form salt and water is called neutralisation reaction. Tooth decay is caused due to acid produced by mouth bacteria. Tooth pastes used for cleaning teeth are basic in nature. They neutralise the acid formed by mouth bacteria and, thus, help to prevent tooth decay.
4. Salts are used for following purposes:
- (a) Sodium chloride is the common salt which we add to our food. It is also used as a preservative in pickles, meats, fish, etc.
 - (b) Sodium bicarbonate is used in bakery for making breads and cakes.
 - (c) Potassium nitrate is used as a fertiliser.
 - (d) Copper sulphate is used in textile industries, electroplating and cleaning.

5. The factory wastes should be neutralised before disposing them into rivers or lakes because they contain harmful acids. If they are allowed to flow directly into rivers or lakes, they will harm the aquatic life.
 6. The indigestion tablet contains a base called magnesium hydroxide which neutralises the excess of acid formed by eating too many unripe mangoes and thus, helps in getting relief from uneasiness.
- F. 1. Acids and bases have following differences:

Acids	Bases
1. Acids are sour in taste.	1. Bases are bitter in taste.
2. Acids turn blue litmus red.	2. Bases turn red litmus blue.
3. Acids do not give any soapy feeling.	3. When rubbed on fingers, they give a soapy feeling.
4. Acids change the colour of china rose indicator to magenta (dark-pink).	4. Bases change the colour of china rose indicator to green.
5. Acids change the purple colour of red cabbage indicator to red.	5. Bases change the purple colour of red cabbage indicator to green.
6. Acids do not change the yellow colour of turmeric paper.	6. Bases change the yellow colour of turmeric paper to red.
7. Acids change methyl orange to red.	7. Bases change methyl orange to yellow.
8. Acids do not change phenolphthalein, thus, it remains colourless.	8. Bases change phenolphthalein to pink.

2. Neutralisation reaction can be explained with the help of following activity:

Take a test tube and add 10 mL of dilute hydrochloric acid to it. It is colourless. Add two drops of phenolphthalein indicator and shake gently. It remains colourless.

Now, add a drop of sodium hydroxide base to it with the help of a dropper. Shake gently. There is no change in colour. Keep adding sodium hydroxide solution dropwise and keep shaking till the colour of the solution becomes pink. Now, add one drop of dilute hydrochloric acid to this solution. The solution again becomes colourless. Now, if a drop of sodium hydroxide solution is added to it, the solution becomes pink again.

Thus, we see when dilute hydrochloric acid and sodium hydroxide are mixed in just right amounts, the acid and the base neutralise each other and the resulting liquid is neutral.

3. Indicators are the substances which indicate the acidic or the basic nature of a substance.

Natural and synthetic indicators change their colour in acids and bases as shown in the following table:

Indicators	Original colour	Colour in acids	Colour in bases
Natural indicators			
Red litmus	Red	No change	Turns blue
Blue litmus	Blue	Turns red	No change
Turmeric	Yellow	No change	Turns reddish-brown
China rose	Dark-pink	Magenta	Green
Synthetic indicators			
Methyl orange	Orange	Turns red	Turns yellow
Phenolphthalein	Colourless	Colourless	Turns pink

4. Neutralisation reaction is applied in everyday life as follows:
- In the treatment of soil:** The excess of acidic feature of soil is neutralised by adding slaked lime, a base, to it and that of basic feature is neutralised by adding organic matter to the soil.
 - In preventing tooth decay:** The toothpastes used to clean the teeth are basic in nature. They neutralise the acid formed by mouth bacteria and prevent tooth decay.
 - In treating indigestion:** The antacids contain magnesium hydroxide base which neutralises the excess of acid formed in the stomach and relieves the indigestion.
 - In treating ant and bee stings:** The ant and bee stings contain formic acid. The pain caused due to sting can be relieved by neutralising formic acid by using base like baking soda solution.
 - In treating wasp sting:** The wasp contains allergens of basic nature. The pain caused due to wasp sting can be relieved by neutralising it with vinegar which contains acetic acid.
 - In treating factory waste:** The factory waste which is of acidic nature is neutralised by treating it with a suitable base. By doing so, it becomes safe to discharge waste into the waterbodies, otherwise, it would harm the aquatic life.

HOTS

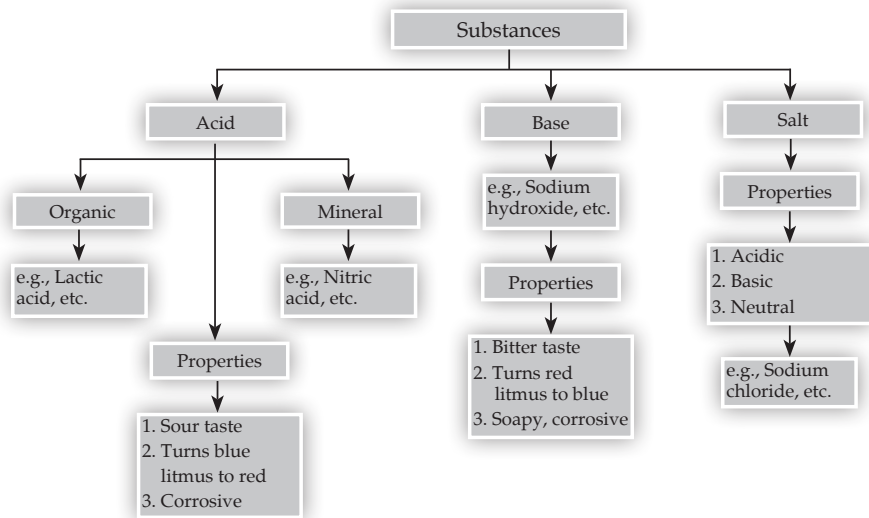
- Soap is basic in nature. When a turmeric stain on a white shirt is washed with soap, it turns red as turmeric turns red in basic solutions.
- (a) ● Solution C is a base.
● Solution D is neutral.
● Three acids – A, B and E have been tested.

- (b) Red
(c) (ii) C and B

Value-based Questions

1. Mukul suggested to apply baking soda because it will help in relieving pain by neutralising the acidic action of the sting.
2. Formic acid is present in bee sting.
3. Mukul is an aware and a concerned person.

LET'S MEMORISE



6. Physical and Chemical Changes

Checkpoint 1

1. A change in which no new substance is formed is called a physical change.
2. Breaking of glass and tearing of paper are irreversible physical changes.
3. A change in which a new substance is formed is called a chemical change.
4. Formation of ammonia is a reversible chemical change.

Checkpoint 2

1. Chemical
2. Rust
3. moisture/water
4. Galvanisation
5. evaporating

Let's Drill Our Skills

- A. 1. (c) 2. (c) 3. (c) 4. (d) 5. (d)
B. 1. False 2. False 3. True 4. True 5. True

- C. 1. irreversible; reversible 2. physical; chemical 3. magnesium hydroxide 4. chemical; physical 5. milky; chemical
- D. 1. A change in which a substance undergoes a change in shape, size or state without the formation of a new substance and is usually reversible is called a physical change.
 2. A change in which a new substance is formed and is usually irreversible is called a chemical change.
 3. Galvanisation is the process of depositing a layer of zinc metal on iron to prevent it from rusting.
 4. Rusting is the destroying of iron by the chemical action of air and moisture on it.
- E. 1. Burning of a substance is a chemical change.
 2. Dissolving salt in water is a physical change.
 3. Magnesium burns with a dazzling white flame.
 4. Galvanisation can prevent rusting.
 5. Carbon dioxide turns limewater milky.
- F. 1. Physical and chemical changes have following differences:

Physical change	Chemical change
1. No new substance is formed in a physical change.	1. A new substance is formed in a chemical change.
2. It is usually accompanied by a change in shape, size or state.	2. It is usually accompanied by a change in colour, release or absorption of heat or light, evolution of a gas, production of sound or change in smell.

2. Alloying is done to prevent rusting. Articles like scissors, blades and utensils are made by alloying.
3. Rust is a reddish-brown substance that appears on the surface of iron articles when they are left exposed to moist air. Presence of air and moisture is essential for rusting to take place.
4. Paint on iron articles prevents them from coming in contact with air and moisture and thus, saves from rusting.
5. (a) **Physical changes:** Melting of butter, dissolving sugar in water, breaking of a glass bottle, clothes being ironed, wool being knitted into a sweater, drying of wet hair.
 (b) **Chemical changes:** Burning of a magnesium ribbon, burning sugar, souring of milk.
- G. 1. A chemical change is usually accompanied by following factors:
 (a) **Change in colour:** Many chemical reactions occur with change in colour. For example, when iron nail is placed in copper sulphate solution, the blue solution becomes green.
 (b) **Release or absorption of heat or light:** Some chemical reactions

release or absorb heat or light. For example, burning of magnesium ribbon releases heat and light.

- (c) **Evolution of gas:** Some chemical reactions are accompanied with evolution of gas. For example, when zinc reacts with dilute hydrochloric acid, hydrogen gas is evolved.
 - (d) **Production of a sound:** Chemical reaction such as bursting of crackers is accompanied with production of sound besides heat and light.
 - (e) **Change in smell:** Some chemical changes occur with production of smell. For example, spoiling of food, rotting of egg, etc.
2. **Activity to show that burning of magnesium is a chemical change:**
Take a magnesium ribbon and clean it with a sandpaper. Hold it with a pair of tongs and heat it on a burner or a candle. The magnesium ribbon burns with a dazzling white flame.
Let the magnesium ribbon burn completely. It leaves a powdery ash after it has burnt completely. Collect the ash and observe its colour. The powdery ash formed is magnesium oxide. Thus, a new substance has been formed on burning magnesium ribbon.
3. Following methods are used to prevent rusting:
- (a) **Coating with paint:** Paint on iron articles prevents them from coming in contact with air and moisture and thus, saves from rusting.
 - (b) **Coating with grease:** Applying a coat of grease on an iron article cuts off its contact with air and moisture and hence, prevents it from rusting.
 - (c) **Galvanisation:** It is the process of depositing a layer of zinc on iron articles. The zinc coating does not allow the iron article to come in contact with air and moisture and hence, prevents it from rusting.
 - (d) **Alloying:** Alloying is mixing of metals or metals with nonmetals to obtain a durable substance called alloy. Alloy does not get rusted.
4. Air and moisture are necessary conditions for rusting to occur. This can be shown by following activity:
Take three test tubes. Label them as A, B and C respectively. Now, place three clean and shiny iron nails in each test tube.
In test tube A, put some anhydrous calcium chloride and cork it. Anhydrous calcium chloride absorbs all the water (moisture) present in air. This means, no moisture is left in test tube A.
In test tube B, add boiled water. Boiled water is free from air. Add some oil to this test tube and cork it. You will find that a layer of oil is formed over boiled water in test tube B. This layer does not allow air to come in contact with the iron nail.
In test tube C, add ordinary tap water and cork it.

Leave the set-up undisturbed for 2–3 days and then observe it carefully.

You will find that only the iron nail placed in test tube C has rusted.

This is because:

- (a) Test tube A has no moisture for iron nail. Dry air alone has no effect on iron nail.
- (a) Test tube B has no air for iron nail. Water (moisture) alone has no effect on iron nail.
- (a) Test tube C has both air and moisture. So, the iron nail gets rusted. Thus, it is concluded that both air and moisture are essential for rusting to take place.

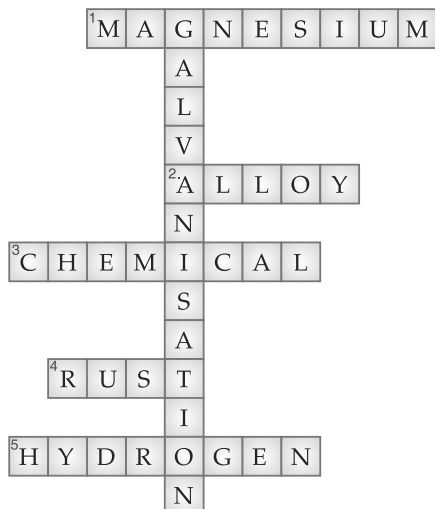
HOTS

1. Evaporation of perfume is a physical change.
2. (a) Carbon dioxide gas is released in test tube A.
(b) Hydrogen gas is released in test tube B.
3. (a) We pass the gas evolved in test tube A through a test tube containing limewater. We observe that limewater turns milky.
(b) We bring a burning matchstick or a candle near the mouth of test tube B and observe that the gas evolved burns with a 'pop' sound.

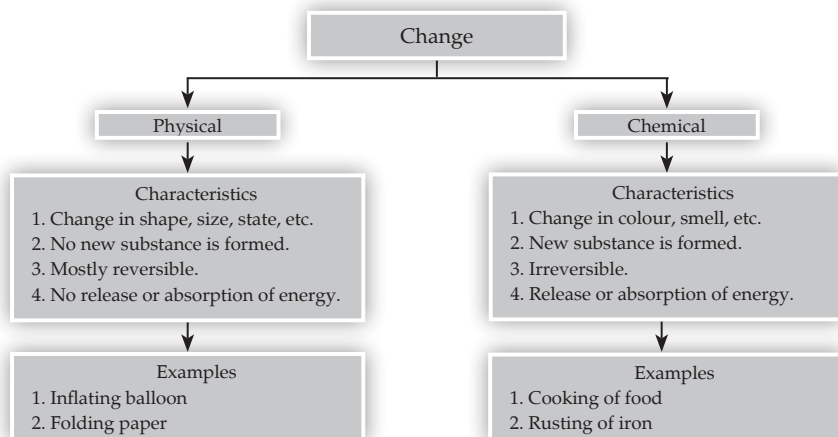
Value-based Questions

1. Melting of candle wax is a physical change, whereas bursting of crackers is a chemical change.
2. We should not burst crackers as they cause air and noise pollution.
3. Neeraj is an aware and a responsible citizen.

Learning by Doing



LET'S MEMORISE



7. Weather, Climate and Adaptations in Animals

Checkpoint 1

1. The amount of water vapour present in air is called humidity.
2. People who study and record weather are called meteorologists.
3. The study of weather is called meteorology.
4. The prediction or estimation of weather conditions likely to occur in the near future is called weather forecasting.
5. Weather forecasting allows people to prepare to fight against bad weather.
6. Afternoon.

Checkpoint 2

1. Climate
2. carbon dioxide
3. less
4. temperature

Checkpoint 3

1. Adaptations are modifications in living organisms that enable them to survive in changed environment.
2. The large padded limbs of camel help it to walk easily on hot and slippery sand.
3. Penguins have short and thick feathers which make their body waterproof.
4. The thick fur on the body of polar bear retains the body heat and saves it from extreme cold.

Checkpoint 4

1. Tropical rainforests
2. arboreal
3. camouflage
4. body temperature

Let's Drill Our Skills

- A. 1. (c) 2. (a) 3. (c) 4. (d) 5. (c) 6. (c) 7. (a) 8. (b) 9. (a) 10. (b)
- B. 1. Weather is defined as the state (or condition) of the atmosphere of a particular place at a particular time in terms of humidity, cloudiness, temperature, wind, etc.
2. Climate of a place is defined as the average weather conditions at a particular place over a long period of time, say 25–30 years or more.
3. Meteorologists are the people who study and record the weather.
4. The modifications in the body of living organisms which enable them to survive in the changed environment are called adaptation.
5. Migration is the mass movement of birds or animals in groups from one place to another according to the season for food or reproduction.
- C. 1. False 2. True 3. True 4. False 5. False
- D. 1. The study of weather is called meteorology.
2. Weather forecasting is helpful to us because it helps to plan activities and events. It is helpful in protecting life and property.
3. Rain gauge is used to measure rainfall.
4. Coastal areas have moderate climate.
5. The animals that become active and feed at night are called nocturnal animals.
6. The animal that preys on some other animals is called predator.
7. Tropical rainforests have large variety of plants and animals with rain throughout the year.
8. The hands and feet adapted for holding tree twigs are called grasping-type of hands and feet.
- E. 1. Weather effects our life in many ways. We wear clothes and eat food according to the weather. In hot weather, we feel comfort in wearing light-coloured cotton clothes and eat ice-cream, etc., whereas in cold weather, we wear warm clothes and like to eat fried food, etc. Weather also controls our life activities. We plan our day according to weather. During rain, cold or hot weather, we prefer to stay indoor while in pleasant weather, we are more energetic and go outdoor to play or for doing everyday life activities.
2. Weather is the state (or condition) of the atmosphere of a particular place at a particular time in terms of humidity, cloudiness, temperature, wind, etc. On the other hand, climate of a place is the average weather conditions at a particular place over a long period of time, say 25–30 years or more.
3. Greenhouse effect is a natural phenomenon which is caused due to trapping of heat radiations by gases such as carbon dioxide, methane, nitrogen oxides, etc. This makes the earth and its atmosphere hotter.
- Greenhouse effect and global warming:** The more amount of

carbon dioxide in the air increases the average temperature of the earth due to greenhouse effect. This leads to global warming.

4. Tropical rainforests are the hot and humid forests where rainfall occurs in plenty round the year. They are located around the equator. The temperature in these forests during summer is above 40°C and in winter it is around 15°C.

Monkey and snakes are common animals found here.

5. Camouflaging is merging of body colour of an organism with its surroundings. It enables a predator animal to locate its prey without being noticed while protects a prey from its predator by not being spotted out easily.
 6. (a) **Arboreal adaptations in monkeys:** Monkeys have a long and coiled prehensile tail for grasping tree branches. Their hands and feet are also modified to hold on to the branches, i.e., they have grasping feet with opposable thumb.
(b) **Arboreal adaptations in Red-eyed frog:** Red-eyed frog and other tree frogs have sticky pads on the tips of digits. These pads help them to cling and climb on the trees.
- F. 1. Weather is defined as the state (or condition) of the atmosphere of a particular place at a particular time in terms of humidity, cloudiness, temperature, wind, etc.

Following factors affect the weather:

- (a) **Temperature:** It depends on the amount of sunlight. As sunlight is more during the summer and daytime, temperature is high during the summer and day.
 - (b) **Humidity:** It is the amount of moisture in the air. It lowers the temperature and makes the weather cool. Low humidity makes the weather dry.
 - (c) **Rainfall:** It brings down the temperature and makes the weather cool.
 - (d) **Wind speed:** It carries moisture and heat with it. High speed wind cools the weather.
2. Following factors affect the climate:
- (a) **Latitude:** Places at high latitudes have low temperature and hence, cool climate while those at low latitude have high temperature and hence, hot climate.
 - (b) **Distance from sea:** The coastal areas have moderate climate while those far from sea have extreme climate.
 - (c) **Altitude:** Places at high altitude have low temperature and hence, cool climate.
 - (d) **Humidity and rainfall:** Rainfall brings humidity into the air. Therefore, the places of high rainfall have humid climate, whereas those of low rainfall have dry climate.

3. Camels have following adaptations for desert life:
 - (a) Limbs of camel have large pads which help it to walk easily on hot and slippery sand.
 - (b) It has a hump that stores food in the form of fat. Therefore, camel can survive without food for long.
 - (c) Camel drinks large quantity of water (up to 40 litres at one time) and stores it in the water cells of stomach wall.
 - (d) The nostrils of camel have flaps which close the nostrils during a dust storm.
 - (e) Camel can adjust its body temperature according to the surrounding air.
 4. A polar bear has following adaptations to live in arctic region:
 - (a) Thick fur on the body and a thick layer of fat under the skin insulate its body and protect it from extreme cold.
 - (b) Its large wide paws with claws help it to walk on snow, dig snow, hold the prey and in self defence.
 - (c) White fur protects polar bear from its enemies and helps in catching prey by camouflaging.
 - (d) It has keen sense of smell to locate its enemy and prey.
 - (e) During winter, it sleeps in its den and survives on stored body fat until spring.
- G.**
1. Places at equator receive more sunlight than those far away from equator. Therefore, they have high temperature than the places lying towards poles.
 2. The more carbon dioxide in air traps the heat radiated by the earth and prevents it from escaping the earth's surface. This increases the earth's temperature and is responsible for global warming.
 3. Desert animals remain buried in sand during daytime to protect themselves from scorching heat of the sun.
 4. Sticky pads on the digits of some frogs help them to cling and climb on the trees.

HOTS

1. Yes, deforestation is a cause of increased level of carbon dioxide in air because green plants absorb carbon dioxide from air for the process of photosynthesis and maintain the amount of carbon dioxide in air.
2. In coastal areas, the sea breeze brings moisture with it. So, there is very high humidity in these areas.
3. Desert animals remain inactive and hidden in the burrows during daytime to avoid scorching heat of the sun and become active at night when it is cool.
4. Frogs, snakes and lizards are cold-blooded animals. Their body temperature changes with the atmospheric temperature. Therefore,

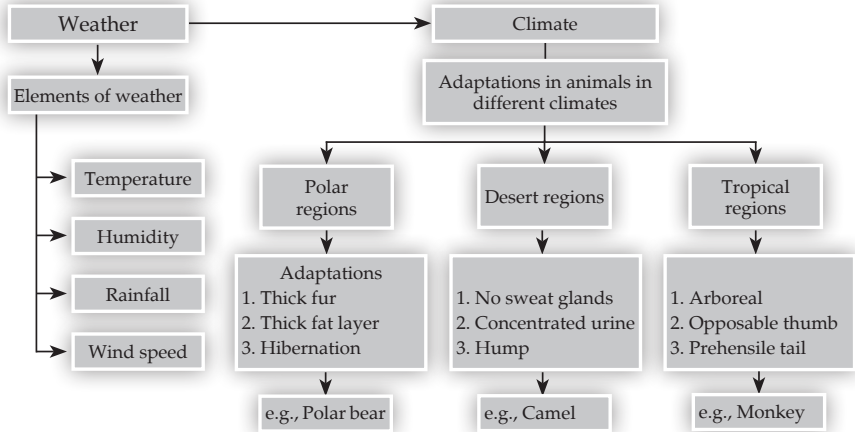
during winter, they undergo hibernation, i.e., they hide themselves in moist and comparatively warmer places.

5. Living in groups and being huddled together keeps penguins warm in severe cold and prevents heat loss from the body.

Value-based Questions

1. Migration.
2. Sudha's mother is an aware and a knowledgeable person.

LET'S MEMORISE



8. Wind, Storm and Cyclone

Checkpoint 1

1. atmosphere 2. pressure 3. expands 4. convection current

Checkpoint 2

1. (a) Winds that carry a lot of moisture are called monsoon winds.
(b) The movement of rapidly rising warm air and the falling droplets of water creates lightning and sound.
(c) A cyclone is a violent storm with an intense spiral, accompanied by heavy rains.
(d) In Japan, a cyclone is called a typhoon.
2. monsoon 2. Cyclones

Let's Drill Our Skills

- A. 1. (b) 2. (b) 3. (c) 4. (d) 5. (a) 6. (c) 7. (c)

- B. 1. True 2. True 3. False 4. True

- C. 1. A tornado is a violent, dark funnel-shaped cloud extending from a thunderstorm that reaches the ground from the sky.

2. A storm accompanied by lightning and thunder is called a thunderstorm.
 3. The centre of a cyclone which is a cloudless calm area is called eye of the cyclone.
- D.**
1. The envelope of the air that surrounds our earth is called atmosphere.
 2. The weight of air acting on unit surface area is called air pressure.
 3. Storm surge is a condition which causes an abnormal rise in the level of sea water in the coastal areas. It is caused due to fierce winds associated with cyclones.
 4. The moisture-carrying winds are called monsoon winds.
- E.**
1. Following precautions should be taken during a thunderstorm when inside home:
 - (a) Close the windows and doors tightly.
 - (b) Do not touch electrical equipment or telephones.
 - (c) Keep listening to a battery operated radio for the latest information.
 2. A cyclone is a violent storm with an intense spiral which is accompanied by heavy rains. Cyclones are formed by strong winds blowing around a central area having low atmospheric pressure.
 3. Following dangers are associated with cyclones:
 - (a) Cyclones can uproot trees, collapse houses and buildings and topple electric poles. Hence, they can destroy life and property.
 - (b) They can cause storm surge which would result in loss of property, human lives, livestock and destruction of vegetation.
 - (c) They can cause prolonged heavy rains which may lead to floods.
 - (d) The rail and road transport may remain blocked by flood water even after cyclone is over.
 4. Following safety measures should be taken to prevent cyclone disaster:
 - (a) Construction of storm shelters.
 - (b) Afforestation, i.e., planting trees on a large-scale.
 - (c) Connecting roads help in evacuating people quickly to safer areas.
 - (d) Warnings should be given rapidly and repeatedly to general public, fishermen, etc. through cyclone forecast services.
 - (e) Generating public awareness through informative brochures, pamphlets, talk shows, etc. on media.

F. 1. Activity to demonstrate that air exerts pressure:

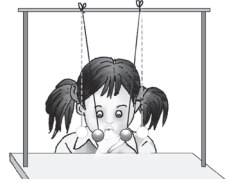
Take a glass and fill water up to its brim. Place a piece of cardboard over the top of the glass. Now, holding the cardboard in place, turn the glass upside down. Remove your hand gently away from the cardboard. You will observe that water stays in the glass.



It is due to the air pressure which pushes against the cardboard from below and keeps the water in the glass.

2. Activity to show that moving air lowers the pressure of the area it occupies:

Take two ping-pong balls and hang them about 10 cm away from each other with the help of a thread. Blow between the two balls and try to separate them.



When air is blown between the balls, the air pressure between the balls is reduced and the balls come close to each other. This proves that moving air lowers the pressure of the area it occupies.

3. Activity to show that air expands on heating:

Take a small glass bottle. Tie a balloon tightly on the neck of the bottle. Place this bottle in a container having hot water for some time. You will observe that the balloon blows up.

This is because the air inside the bottle gets heated by the hot water. It becomes less dense, i.e., expands and also lighter. As a result, it gets filled in the balloon.

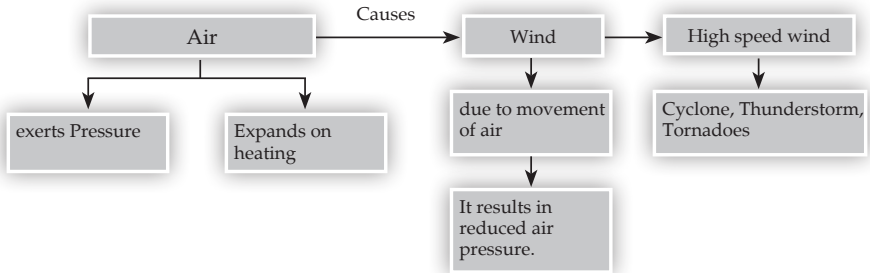
HOTS

1. The vacuum cleaner works on the principle of air pressure. The air pressure outside the vacuum cleaner is higher than the air pressure inside it. This helps it to suck air containing dirt into it.
2. During storm, the air moves faster. The faster the air moves, the lower its pressure becomes. So, the faster air moving above the roof has less pressure than the pressure below the roof. This difference in air pressure above and below the roof creates a lifting force on the roof and the roof gets blown away during heavy storm.

Value-based Questions

1. The weight of air acting on a unit area of a surface is called air pressure.
2. Air pressure is used to fill *pitchkari*, doctor's syringe and fountain pen. Air pressure also helps the birds to fly and aeroplanes to lift up.
3. Mudit's mother is an aware and a knowledgeable person.

LET'S MEMORISE



9. Soil

Checkpoint 1

- (a)—ii (b)—i (c)—v (d)—iii (e)—iv
- (a) Humus (b) Topsoil or A-Horizon (c) Earthworm

Checkpoint 2

- Clayey soil
- Loamy soil
- Sandy soil
- Loamy soil
- Clayey soil

Checkpoint 3

- True
- False
- True
- False
- False

Let's Drill Our Skills

- A. 1. (d) 2. (d) 3. (c) 4. (b) 5. (b) 6. (a) 7. (b)

- B. 1. humus

2. Sandy

3. Clayey

4. pores or gaps

5. deforestation

6. Loamy

- C. 1. Soil is the natural resource present on the uppermost layer of the earth's surface which is capable of supporting life.

2. The dead and decaying organic matter present in the soil is called humus.

3. The process of breakdown of rocks into fine particles by the action of water and wind is called weathering.

4. The addition of harmful substances in the soil is called soil pollution.

- D. 1. Topsoil or Horizon A is the topmost layer of the soil.

2. Bedrock is called the parent rock.

3. Humus is made by the dead and decaying remains of plants and animals present in the soil.

4. Soil erosion is the main cause of floods, famines and landslides.

- E. 1. **Importance of soil:**

(a) Soil provides plants a surface to grow.

(b) It provides nutrients required by plants to grow.

(c) It gives surface to roots of plants for anchorage.

(d) It is a habitat for millions of organisms.

2. If we pour some water over the soil, some air bubbles are seen coming out it. This shows that soil contains air.

3. Humus makes the soil fertile as it contains all the nutrients required by the plants to grow.

4. The removal of topsoil by either strong winds, flowing water or rain is called soil erosion.

Following factors lead to soil erosion:

- (a) A bare land which is not covered by trees or grass leads to soil erosion.
 - (b) Overgrazing, excessive ploughing and deforestation lead to soil erosion.
5. Loamy soil is considered the most fertile soil because it has following features:
- (a) Loamy soil contains clay, sand and silt in right proportions.
 - (b) It has adequate air spaces between its particles, required for the growth of plants.
 - (c) It has the right water holding capacity.
 - (d) It can be ploughed easily.
 - (e) It has necessary nutrients required for the growth of plants.
6. Earthworms are called friends of farmers because they improve the fertility of soil by turning over soil layers. This allows air to pass into the deeper layers of soil. They drag leaves, etc., to their burrows which later on change into humus. Their waste and dead remains increase soil fertility.
- F. 1. The presence of air in soil can be shown by following activity:
Take some soil in a beaker. Pour some water over it. You will observe some air bubbles coming out of the soil. This is the air present in the gaps between soil particles which comes out when water is added to the soil. This shows that air is present in soil.
2. The rate of percolation of a soil sample can be calculated by using the following formula:

$$\text{Percolation rate of soil} = \frac{\text{Volume of water percolated (mL)}}{\text{Percolation time (min)}}$$

Given that,

percolation time of soil sample = 45 min

Volume of water percolated = 900 mL

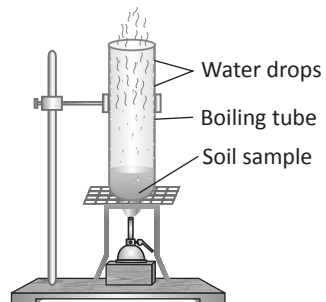
$$\therefore \text{The rate of percolation of soil} = \frac{900}{45}$$

$$= 20 \text{ mL per min}$$

3. Activity to show that soil contains water:

Take a boiling tube. Put two spoonfuls of soil sample in it. Heat the boiling tube on a flame and observe.

On heating, water in the soil evaporates and condenses on the inner walls of the boiling tube on the upper side. This proves that soil contains water.



4. (a) Differences between sandy soil and clayey soil:

Property	Sandy soil	Clayey soil
1. Main constituent	Large-sized sand particles	Smaller-sized clay particles
2. Space between particles	Quite large	Quite less
3. Presence of air	Not well-aerated	Can hold sufficient air
4. Water holding capacity	Cannot hold much water	Can hold much water
5. Nutrients	Cannot hold nutrients	Can hold nutrients
6. Ploughing	Easy to plough	Difficult to plough

(b) Differences between clayey soil and loamy soil:

Property	Clayey soil	Loamy soil
1. Main constituent	Smaller-sized clay particles	Clay, sand and silt present in right proportions
2. Space between particles	Quite less	Sufficient
3. Presence of air	Can hold sufficient air	Well-aerated
4. Water holding capacity	Can hold much water	Right water holding capacity
5. Nutrients	Can hold nutrients	Can hold nutrients
6. Ploughing	Difficult to plough	Easy to plough

5. (a) A– Topsoil or A-horizon, B–Subsoil or B-horizon, C– Weathered parent rock or C-horizon, D– Bedrock

(b) Layer A, i.e., topsoil is a home for living organisms.

(c) Topsoil is the darkest layer of the soil.

(d) Layer C, i.e., C-horizon is made of small lumps of rocks.

G. 1. Humus is important for the soil because it contains all the nutrients required by plants. It improves water-holding capacity of the soil and provides food to soil organisms such as earthworms, beetles, millipedes, etc.

2. We should look after the soil because of the following reasons:

(a) Soil is a natural resource which supports life on the earth.

- (b) We get food from the plants which grow in the soil.
 - (c) It is a home for millions of organisms.
 - (d) It takes millions of years to the soil to get formed and we cannot replace it in our lifetime.
3. Sandy soil has large gaps between its particles which are filled with air. Therefore, sandy soil is well-aerated.
 4. Air is an important part of soil because the roots of plants and the organisms living in the soil use the air present between the soil particles for respiration.

HOTS

1. Loamy soil is ideal for them.
2. Excessive use of fertilisers damages the soil. It can change the soil chemistry by increasing acidity or alkalinity of soil. Fertilisers are water soluble. They can leach out rapidly and can lead to soil and water pollution.
3. Yes, these days crops are being produced by the method of organic farming, which does not make use of fertilisers.
4. Since water drains out very quickly from sandy soil, it cannot hold water and nutrients which are essential for the growth of plants. This is a disadvantage for farmers trying to grow plants in sandy soil.

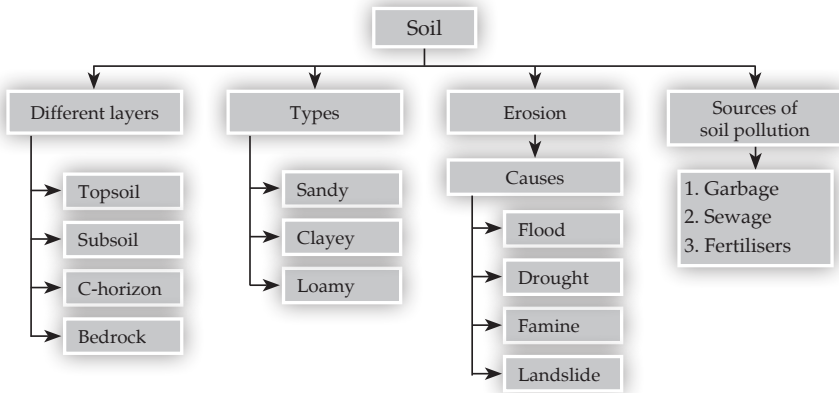
Value-based Questions

1. The condition when excess water is given to plants is called waterlogging.
2. If plants are watered excessively, they would die because in the condition of waterlogging, the air present in soil will escape and the roots of plants will not get air to respire.
3. We should save our natural resources.

Learning by Doing

H	J	L	R	N	F	Z	K	T	N
U	O	P	T	O	P	S	O	I	L
M	S	R	S	B	C	D	I	C	O
U	J	F	U	A	N	B	U	I	A
S	Q	P	B	A	O	C	A	T	M
F	T	R	S	O	I	L	N	K	Y
E	R	C	O	N	D	A	M	V	Z
G	N	S	I	L	T	Y	S	L	Y
D	P	J	L	K	T	I	J	K	N
B	E	D	R	O	C	K	H	J	W

LET'S MEMORISE



10. Respiration in Animals and Plants

Checkpoint 1

1. The process of taking oxygen into the body and then oxidation of food with this oxygen and release of carbon dioxide and energy is called respiration.
2. Glucose is used by cells for producing energy.
3. $\text{Glucose} + \text{Oxygen} \rightarrow \text{Carbon dioxide} + \text{Water} + \text{Energy}$
4. During fast running, more energy is needed. This increases demand for oxygen in the muscles, but supply of oxygen remains the same. Under shortage of oxygen, muscles respire anaerobically and glucose breaks down into lactic acid. The accumulation of lactic acid causes muscle cramps.
5. Anaerobic plant — yeast. Anaerobic animal — roundworm.
6. Lactic acid is the end product of anaerobic respiration in skeletal muscles.

Checkpoint 2

1. inhalation
2. mechanical
3. limewater
4. 4.4; 16.4
5. chest cavity
6. inhalation; lungs

Checkpoint 3

1. tracheae
2. skin; vascular
3. gills
4. skin

Let's Drill Our Skills

- A.** 1. (d) 2. (b) 3. (b) 4. (a) 5. (b)
- B.** 1. (e) 2. (d) 3. (a) 4. (c) 5. (b)
- C.** 1. The anaerobic breakdown of sugars is called fermentation.
2. The small apertures on the sides of insect body are called spiracles.
3. Taking in air rich in oxygen into the lungs is called inhalation.
4. Giving out air rich in carbon dioxide from the lungs is called exhalation.

- D. 1. Trachea and bronchi carry air from outside to lungs.
 2. Diaphragm is the muscular partition between thoracic cavity and abdominal cavity.
 3. Carbon dioxide gas turns limewater milky.
 4. The apertures on the sides of insect body are called spiracles.
 5. During heavy exercise, more energy is needed. This increases oxygen need in the body so that more glucose can be oxidised to get more energy.
 6. Anaerobic respiration occurs in the absence of oxygen.
- E. 1. The diaphragm and rib muscles play important role in breathing. During inhalation, they both contract and increase the volume of thoracic cavity to reduce air pressure inside the lungs so that air from outside enters the lungs. On the other hand, during exhalation, they both relax and attain their normal positions. This reduces the volume of thoracic cavity and increases air pressure inside the lungs that the used air from the lungs goes out.
2. The process of inhalation involves movements of ribs and diaphragm as follows:
 (a) The ribs move upwards and outwards while diaphragm moves downwards.
 (b) The volume of thoracic cavity and lungs increases.
 (c) The air pressure inside the lungs decreases.
 (d) The atmospheric air from outside having higher pressure rushes into the lungs.
3. The inhaled and exhaled air have following differences:

Inhaled air		Exhaled air	
1. Oxygen	21%	1. Oxygen	16.4%
2. Carbon dioxide	0.03%	2. Carbon dioxide	4.4%

4. The oxygen supplied to the cells of living organisms is used for the oxidation of food to release energy. This energy is used for life processes taking place in the body.
5. The respiratory organs in fishes are gills. Gills have a network of fine blood capillaries. The oxygen dissolved in water enters the blood capillaries and the carbon dioxide present in blood capillaries is released into the water.
- F. 1. The mechanism of breathing in humans involves inhalation and exhalation as follows:
 (a) **Inhalation:**
 (i) The ribs move upwards and outwards while diaphragm moves downwards.
 (ii) The volume of thoracic cavity and lungs increases.
 (iii) The air pressure inside the lungs decreases.
 (iv) The atmospheric air from outside having higher pressure rushes into the lungs through nostrils and air passages.

(b) **Exhalation:**

- (i) The ribs move downwards and inwards while diaphragm moves upwards.
- (ii) The volume of thoracic cavity and lungs decreases.
- (iii) The air pressure inside the lungs increases.
- (iv) The air from the lungs is pushed out and expelled through air passages and nostrils.

2. (a) Aerobic and anaerobic respirations have following differences:

Aerobic respiration	Anaerobic respiration
1. Occurs in the presence of oxygen.	1. Occurs in the absence of oxygen.
2. Glucose is oxidised completely.	2. Glucose is oxidised incompletely.
3. End products are carbon dioxide and water.	3. End products are either ethyl alcohol and carbon dioxide or lactic acid.
4. More energy is produced.	4. Very little energy is produced.
5. Occurs in most of the plants and animals.	5. Occurs in few organisms like yeast, some bacteria and some parasitic worms.

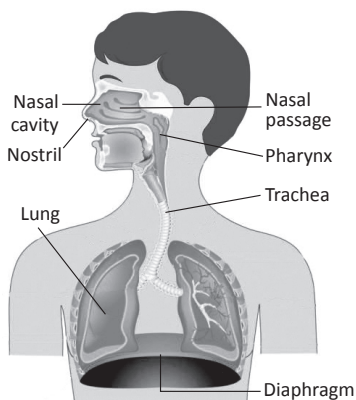
(b) Breathing is a mechanical process of pumping air into and out of the lungs. On the other hand, respiration is a chemical process of exchange of oxygen and carbon dioxide between the outside air and body cells, and the oxidation of glucose to release energy.

3. The respiratory system of human beings consists of following organs:

(a) **Nose and nasal passage:** Air enters through nose and in the nasal passages it gets filtered, warmed and moistened.

(b) **Pharynx:** It is a common passage for food and air. The air from nasal passages reaches trachea through pharynx.

(c) **Trachea or windpipe:** It is divided into two bronchi which enter the lungs of their respective side. Inside lungs, they divide and redivide into bronchioles. The bronchioles further divide and finally end into air sacs or alveoli.



The air from pharynx reaches the lungs through trachea.

- (d) **Lungs:** They are main respiratory organs. They are spongy, elastic and bag-like structures. They enclose millions of alveoli inside them. The surface of alveoli is covered with a fine network of blood capillaries.

The alveoli provide a large surface area for the exchange of gases between alveoli and blood capillaries around them.

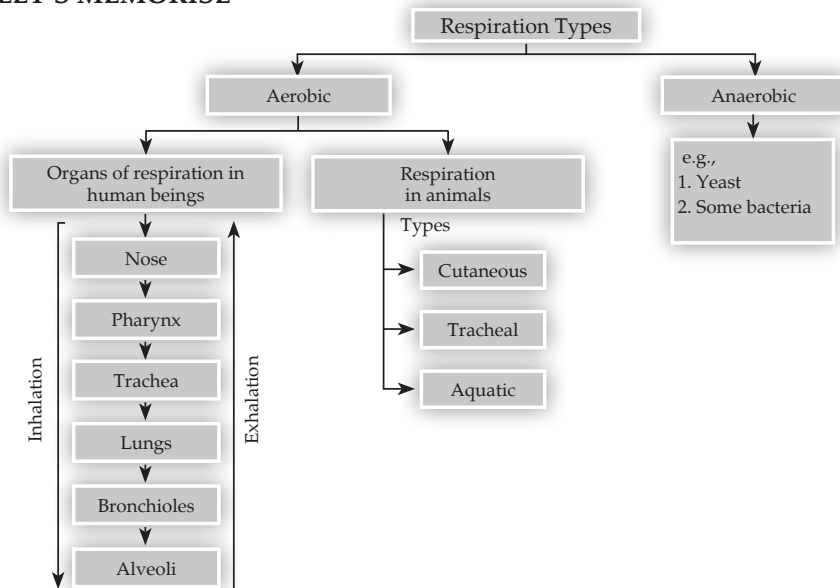
HOTS

1. In fast running, muscles need more energy. In the absence of required oxygen for oxidation of more glucose, the muscle cells respire anaerobically and produce lactic acid. This lactic acid accumulates in muscles causing cramps and muscle fatigue.
2. When a cockroach is immersed in water, its spiracles (through which air enters the tracheal system) are blocked and tracheal tubes get filled with water and hence, the cockroach fails to get fresh air and dies.
3. When we breathe through nose, the unwanted particles and dust particles are trapped in the hairs present in nasal passages. Thus, only clean air enters the lungs. It is not so when we breathe through our mouth.

Value-based Questions

1. It is dangerous to sleep under a tree at night because carbon dioxide released during respiration by plants at night is not utilised in photosynthesis. This results in an increase in the amount of carbon dioxide under a tree.
2. Anurag's mother is an aware and a knowledgeable person.

LET'S MEMORISE



11. Transportation in Animals and Plants

Checkpoint 1

- (a) Plasma transports dissolved food to cells.
(b) It transports oxygen to the cells.
- The lifespan of RBCs is 90 to 120 days.
- While blood cells (WBCs) provide immunity.
- (a) The circulatory system takes away waste products from the body cells.
(b) It provides body cells with food and oxygen.
- Haemoglobin is a pigment dissolved in RBCs which gives them red colour and carries oxygen.
- Blood platelets help in blood clotting.

Checkpoint 2

- Arteries
- Tricuspid valve
- William Harvey
- Aorta
- Stethoscope

Checkpoint 3

- kidney
- nitrogenous wastes
- bean-shaped
- nitrogenous wastes

Checkpoint 4

- Translocation
- Transpiration
- Xylem
- Root hair

Let's Drill Our Skills

- A. 1. (c) 2. (a) 3. (b) 4. (b) 5. (c) 6. (b)
- B. 1. haemoglobin 2. White blood cells (WBCs) 3. Pulmonary
4. Arteries 5. urea 6. salts; urea
- C. 1. The process of removing toxic wastes from the body is called excretion.
2. The loss of water as water vapour from aerial parts of a plant is called transpiration.
3. The blood vessel which carries blood from heart to different body parts is called artery.
4. The blood vessel which carries blood from different body parts to heart is called vein.

- D. 1. Cuspid valves are present on the opening between auricle and ventricle.
2. Pulmonary artery carries deoxygenated blood.
3. Urinary bladder stores urine.
4. The vessels that connect arteries with veins are called capillaries.
5. A doctor uses stethoscope to hear heartbeats.
6. The number of heart beats in humans is 72 times per minute.
- E. 1. The lub-dub are two sounds of heart made during a heart-beat. The lub sound is caused by the closure of cuspid valves while the dub sound is caused by the closure of semilunar valves.
2. The rhythmic contraction and relaxation of auricles and ventricles is called heartbeat.
3. The circulatory system has following functions in human body:
(a) It takes away waste products from the body cells.
(b) It provides body cells with food and oxygen.
4. Transpiration builds a suction force in the xylem vessels. This force helps to pull water up to the top of a tree.
5. The septum in the heart acts as a demarcating wall which prevents mixing of deoxygenated and oxygenated blood present in the right and left halves of the heart respectively.
6. Waste products like carbon dioxide, ammonia, urea, etc. are necessary to remove from the body because if they accumulate in the body, they may prove to be toxic.
- F. 1. The upward movement of water and minerals from roots to the tips of leaves against gravity through xylem vessels is called ascent of sap. Transpiration helps in ascent of sap by building a suction force in the xylem vessels. This force helps to pull water and dissolved minerals up to the top of a tree.
2. The human heart works by rhythmic contraction and relaxation of auricles and ventricles in following manner:
(a) When auricles and ventricles are relaxed, both right and left auricles get filled with deoxygenated and oxygenated blood respectively. They get deoxygenated blood from body parts through vena cavae and oxygenated blood from lungs through pulmonary veins.
(b) Now, both the auricles contract and their cuspid valves open up. Blood is pumped from right and left auricles to their respective ventricles.
(c) Both the auricles relax and ventricles contract. The cuspid valves are slam shut and semilunar valves open up.
(i) The blood from left ventricle is pumped into aorta and is distributed to all body parts by arteries.
(ii) The blood from right ventricle is pumped into pulmonary aorta to be transported to lungs for oxygenation.

3. (a) Blood is a fluid connective tissue. It is a red-coloured viscous (thick and sticky) fluid that flows in the blood vessels.
On the other hand, plasma is one of the components of the blood. It is a nonliving, yellowish fluid which makes up more than half of blood volume.
- (b) Xylem are the cells of vascular system of plants which transport water and dissolved minerals upwards from roots to the tips of leaves against the force of gravity. On the other hand, phloem are the cells of vascular system of plants which carry food synthesised by the leaves downwards to all the parts of a plant.
- G. 1. Ventricles have thicker walls than auricles because they are the distributing chambers of the heart. They have to pump blood forcibly to the whole body, whereas auricles are the receiving chambers. They only push blood into the ventricles.
2. The valves guarding the openings of auricles into ventricles are called cuspid valves. They make the blood to flow in one direction from auricles to ventricles only and prevent its back flow.
3. White blood corpuscles fight against germs entering the body. They provide immunity against infections. Therefore, they are called soldiers of our body.
4. The water and dissolved minerals in plants are taken from the soil through roots. They are transported against gravity through xylem from roots to the tips of leaves to be used by leaves and other parts of the plant.

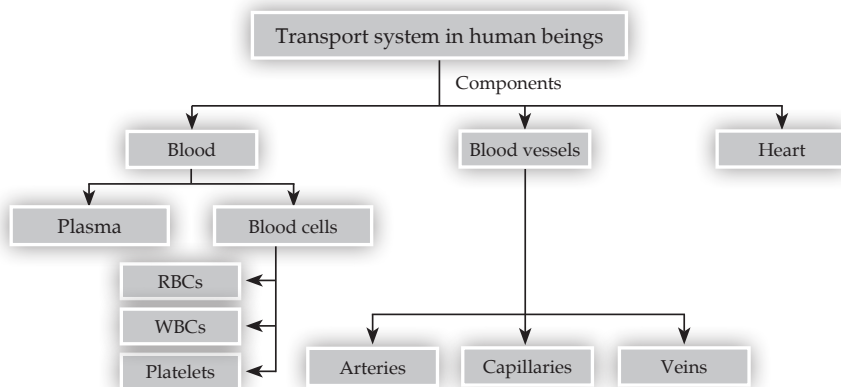
HOTS

1. Transpiration pull in xylem vessels created due to constant evaporation of water from leaves causes the water to rise several metres high in the trees.
2. Sweat evaporates by drawing heat from the body. The fast moving air under a fan speeds up evaporation of sweat and hence, we feel cool while sweating.
3. In arteries, blood flows under pressure from heart to various parts of the body. Therefore, direction of blood flow is maintained by pressure generated by the contraction of ventricles. In veins, blood flows from body parts to heart against the force of gravity. Hence, to prevent backward flow of blood, veins have valves in them.

Value-based Questions

1. Due to blood loss from the body, body cells will not get sufficient oxygen. The cells will die in want of oxygen and ultimately the person may also die.
2. Yes, we should donate blood because it can save the life of a person at the time of emergency or when required.
3. Rishabh is a kind person and a responsible citizen.

LET'S MEMORISE



12. Multiplication in Plants

Checkpoint 1

1. sexual
2. reproduction
3. budding
4. bulb
5. parent

Checkpoint 2

1. Stamen and pistil are male and female reproductive parts of a flower.
2. Flowers which contain either stamens or pistil are called unisexual flowers.
3. The means of pollination are wind, water, insects, birds and mammals.
4. In self-pollination, pollen lands on the stigma of the same flower or of a different flower of the same plant.
In cross-pollination, pollen lands on the stigma of a flower borne on a different plant of the same kind.

Let's Drill Our Skills

- A.** 1. (c) 2. (d) 3. (a) 4. (a) 5. (d)
- B.** 1. (d) 2. (c) 3. (b) 4. (e) 5. (a)
- C.**
1. The transfer of pollen grains from the anthers to the stigma of pistil is known as pollination.
 2. Spore is an asexual reproductive body having a hard protective outer covering which germinates into a new individual.
 3. In grafting of plants, scion is a cutting of stem having a bud.
 4. In grafting of plants, stock is the cut stem of a plant to which the scion is fixed.
- D.**
1. The single cell formed by the fusion of male and female gametes is called zygote.
 2. A type of pollination in which pollen grains land on the stigma of

the same flower or of a different flower of the same plant, is called self-pollination.

3. Potatoes are grown by vegetative propagation of their modified underground stem called tuber.
 4. Budding is the common method of reproduction in yeast.
 5. Spore formation is the method of asexual reproduction in *Rhizopus*.
- E.
1. Fragmentation is a form of asexual reproduction in which an organism breaks into two or more fragments and each fragment grows into a new individual. It is found in the alga *Spirogyra* (pond scum), liverworts and mosses.
 2. Sexual reproduction is a mode of reproduction which involves fusion of male and female gametes formed by male and female parents respectively.
 3. Flower is the reproductive part of a plant. It bears male or female reproductive organs or both and helps in sexual reproduction in plants.
 4. The various agents of cross-pollination are wind, water, insects, birds, mammals, etc.
 5. The various methods of asexual reproduction in plants are budding, fission, fragmentation, spore formation or sporulation and vegetative propagation.
- F.
1. Vegetative propagation in plants has following significance:
 - (a) It is a rapid, easier and cheaper method of plant propagation than raising the plants by seeds.
 - (b) The new plants are exact copies of the parent plant as they are produced from single parent.
 - (c) It produces a large number of plants in a short time.
 - (d) Plants grown vegetatively usually need less attention in the early stages than the plants grown from seeds.
 - (e) Plants like banana, seedless grapes, roses, pineapples and dahlias which do not produce viable seeds can only be grown vegetatively.
 2. (a) The flowers which contain either stamens or pistil are called unisexual flowers, e.g., maize, papaya, cucumber, etc. On the other hand, the flowers which contain stamen and pistil, i.e., both male and female reproductive organs are called bisexual flowers, e.g., rose, mustard, *Petunia*, etc.
(b) Stamens are male reproductive organs of a flower. They produce pollen grains which contain male gametes. On the other hand, carpels, also called pistils, are female reproductive organs of a flower. They contain ovule which forms the female gamete called egg.
 3. Different types of asexual reproduction in plants are as follows:
 - (a) **Budding:** In this method, a small bulb-like projection called bud comes out from parent cell. It grows and finally gets separated from parent cell and forms a new individual. Example: Yeast.

- (b) **Fission:** In this method, an individual divides into two (as in binary fission) or many (as in multiple fission) new individuals. Example: Bacteria.
 - (c) **Fragmentation:** In this type, an organism breaks into two or more fragments and each one grows into a new individual. Example: *Spirogyra*, liverworts and mosses.
 - (b) **Spore formation or sporulation:** In this method, spores are formed in a special structure called sporangium. These spores develop into new individuals. Examples: Fungi and bacteria.
 - (e) **Vegetative propagation:** In this type, new individuals are produced from vegetative parts of plant, i.e., roots, stems, leaves and buds. Example: Banana, garlic, mint, rose, potato, etc.
4. Following are different ways of seed dispersal:
- (a) **Dispersal by wind:** The seeds which are light, small, hairy or winged are dispersed by wind and are blown to far away places. Examples: Grasses, oak, cotton, maple, etc.
 - (b) **Dispersal by water:** The seeds of aquatic plants float on water surface and are carried to far off places by water currents. Examples: Water lily, lotus, etc.
 - (c) **Dispersal by animals:** Seeds are dispersed by animals in the following ways:
 - (i) Some seeds have spines or hooks to cling to the bodies of animals and are carried to long distances. Examples: *Xanthium* and *Urena*.
 - (ii) The pulpy or fleshy fruits are eaten by animals and their seeds are thrown away. Examples: Mango, plum, etc.
 - (iii) Some small and undigested seeds of fruits come out with the excreta of animals. Examples: peepal, banyan, etc.
 - (d) **Dispersal by explosion:** The seeds of some plants are dispersed by bursting of their fruits. Examples: Pea, balsam, geranium, castor, etc.
5. 1. Germinating bud 2. Eye
- (a) Potato is an underground stem tuber.
 - (b) It is swollen due to food stored in it.
 - (c) The eyes in potato give rise to new plants.
- G. 1. Spores cover long distances and remain in the air for a long time. Therefore, to withstand unfavourable conditions of high temperature and drought, they are covered with a hard covering.
2. Insect-pollinated flowers are brightly coloured or scented to attract insects for pollination.
3. Seeds and fruits dispersed by water are large and spongy so that they can float easily on the water surface to far off places by water currents.

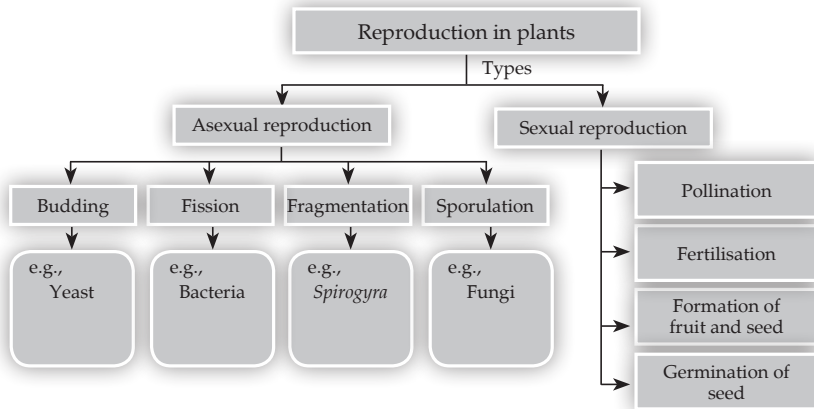
HOTS

1. The seeds dispersed by animals have spines and hooks to cling to the body of animals.
2. Flowers pollinated by moths are white and scented because moths are nocturnal and cannot differentiate colours at night. They, however, have well developed sense of smell.
3. Green cover on stagnant water surface is formed by the excessive growth of algae.

Value-based Questions

1. Growing leaflets from edges of leaf is vegetative propagation.
2. The plants grow and develop early. They are exact copies of the parent plant.
3. Ananya is a knowledgeable person.

LET'S MEMORISE



13. Motion and Time

Checkpoint 1

1. relative 2. clock 3. 3600 4. Atomic 5. stop watch

Checkpoint 2

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

Checkpoint 3

1. (b) 2. (a) 3. (d) 4. (c) 5. (f) 6. (e)

Let's Drill Our Skills

A. 1. (a) 2. (c) 3. (d) 4. (c) 5. (c)

B. 1. rest 2. curvilinear 3. sloping 4. day 5. curved

C. 1. An object is said to be at rest, if it does not change its position with respect to a fixed object or a fixed point with time.

2. An object is said to be in motion, if it changes its position with respect to a fixed point or an object with time.
 3. The ratio of total distance travelled by an object to the total time taken is called average speed.
 4. If an object covers equal distances in equal intervals of time, the object is said to be in uniform motion.
- D.**
1. If an object does not change its position with respect to a fixed object or a fixed point with time, it is said to be at rest.
 2. The to and fro motion of the bob about its mean position is called oscillatory motion.
 3. The diagrammatic representation of the interrelation of two quantities is called a graph.
 4. The freely hanging object of the pendulum is called bob.
 5. Odometer can record the distance travelled by the vehicles.
 6. The following natural phenomena repeat at regular time intervals:
 - (a) Wilting of leaves of plants during autumn.
 - (b) Flowering in plants during spring.
- E.**
1. Rest and motion are relative terms. When an object does not change its position with respect to a fixed object or a fixed point with time, it is said to be at rest. On the other hand, when an object changes its position with respect to a fixed point or an object with time, it is said to be in motion.
 2. The distance travelled by an object in unit time is called speed. The SI unit of speed is metre per second (m/s).
 3. The speed of a moving object is the ratio of distance travelled by the object to the time taken.

$$\text{Speed} = \frac{\text{Distance travelled by the object}}{\text{Time taken to travel this distance}}$$

$$4. \quad \text{Speed} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

$$\text{Speed of Maruti car} = \frac{120}{3} = 40 \text{ km/hr}$$

$$\text{Speed of Zen car} = \frac{150}{4} = 37.5 \text{ km/hr}$$

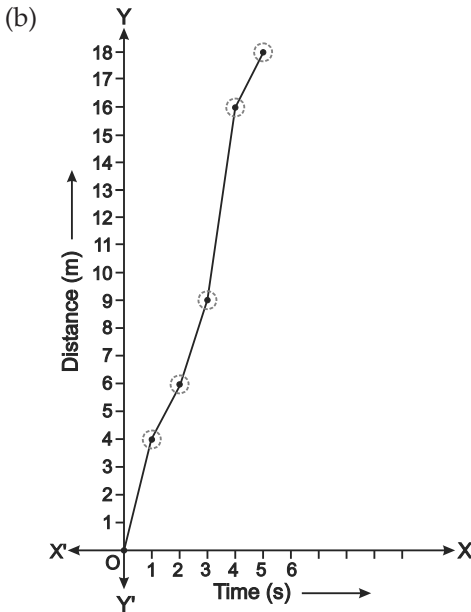
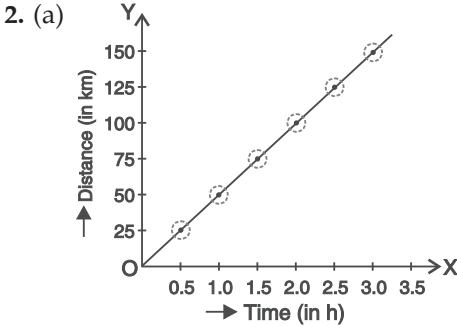
As the speed of Maruti car is more than the Zen car, the Maruti car was moving faster.

5. Given, distance = 12 m, time = 15 s

$$\begin{aligned} \text{Speed} &= \frac{\text{Distance travelled}}{\text{Time taken}} \\ &= \frac{12}{15} = 0.8 \text{ m/s} \end{aligned}$$

- F. 1. If an object covers equal distances in equal intervals of time, the object is said to be in uniform motion. On the other hand, when an object covers unequal distances in equal intervals of time, it is said to have a nonuniform motion.

The distance-time graph for a body in uniform motion is a sloping straight line, whereas for a nonuniform motion, it is a zig-zag line or curved line.

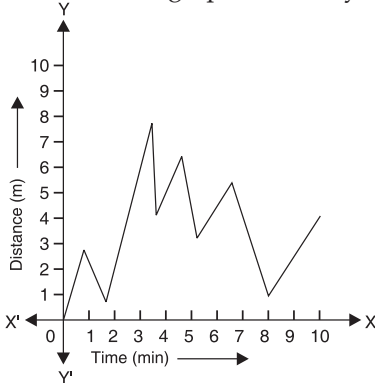


HOTS

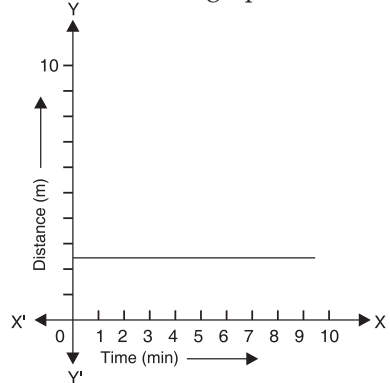
1. $t = 25 \text{ min} = 1500 \text{ s}; v = 60 \text{ km/h} = 60 \times \frac{5}{18} \text{ m/s} = \frac{300}{18} \text{ m/s}$

Now, $s = v \times t = \frac{300}{18} \times 1500 = 25000 \text{ m}$ or 25 km.

2. Distance-time graph for honeybee



Distance-time graph for train



3. Given, $v = 2 \text{ m/min} = \frac{2}{60} \text{ m/s}$

$$s = v \times t = \frac{2}{60} \times 45 = 1.5 \text{ m or } 150 \text{ cm or } 0.0015 \text{ km}$$

4. The stone will have nonuniform motion as it starts moving from rest and attains the maximum velocity just before striking the ground because of the acceleration due to gravity.

Value-based Questions

1. Given, time = $8:20 - 8:00 = 20 \text{ min or } 1200 \text{ seconds}$

$$\text{Distance} = 2 \text{ km or } 2000 \text{ m}$$

$$\text{Speed} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

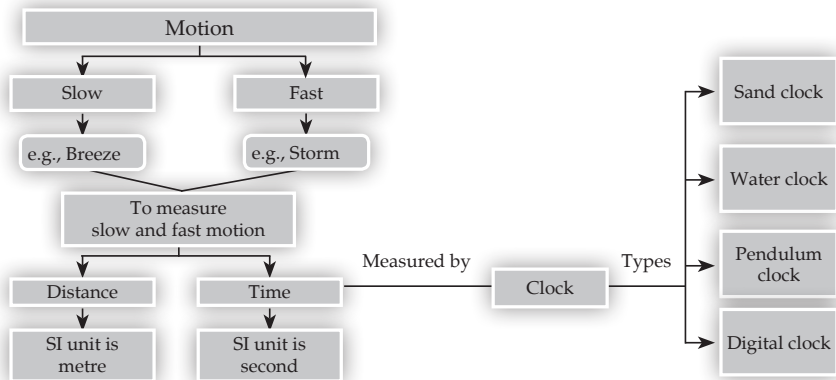
$$\text{Speed} = \frac{2}{20} = 0.1 \text{ km/min}$$

or

$$= \frac{2000 \text{ m}}{1200 \text{ s}} = 1.66 \text{ m/s}$$


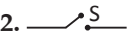

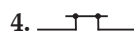
2. Urvashi is a kind and a helpful person.

LET'S MEMORISE



14. Electric Current and Its Effects

Checkpoint 1

1.  2.  3.  4. 

Checkpoint 2

1. increase
2. current; time
3. fuse

Checkpoint 3

1. North-South
2. Hans Christian Oersted
3. temporary
4. current
5. decrease

Let's Drill Our Skills

- A. 1. (b) 2. (a) 3. (b) 4. (c) 5. (b) 6. (d) 7. (c) 8. (c)
- B. 1. False 2. True 3. False 4. False 5. True
- C. 1. A conductor of electricity behaves as magnet when current flows through it. It is called magnetic effect of current.
2. The production of heat in a conductor of electricity due to passage of current is called heating effect of current.
- D. 1. An electric bulb uses the heating effect of current.
2. The filament of a bulb is made of tungsten metal.
3. Two or more cells combined together to provide more electric current is called battery.
4. Fuse wire is a thin small wire made of tin or an alloy of tin and copper.
- E. 1. Nichrome is used to make the heating coils of electrical devices such as electric iron, electric kettle, geyser, heater, etc. This is because nichrome can withstand very high temperature without melting.
2. An electric fuse is made of a thin wire of tin or an alloy of tin and copper which is stretched between two screws fitted on a ceramic base.
- When a circuit is overheated due to short-circuiting or overloading, the fuse wire melts a little before any other part of the circuit could, and the circuit is broken. The flow of current stops and burning of circuit is prevented.
3. There are three factors on which the amount of heat produced in a circuit depends. These are: (a) the time for which the current flows, (b) the amount of current flown, and (c) the nature of material of the wire, component or device.
4. The strength of an electromagnet depends directly on the amount of current flowing through coil and the number of turns in the coil. It depends inversely upon the length of the electromagnet.

- F.**
1. An electric bell works on the principle of magnetic effect of current as follows:
 - (a) When the switch is pushed 'On', the current flows through the coil of U-shaped electromagnet placed in electric bell.
 - (b) The magnetised electromagnet attracts the armature which is connected to hammer.
 - (c) The hammer hits the gong and produces the sound.
 2. The heating effect of electric current is used in electric fuse, electric iron, electric kettle, room heater and geyser to produce heat for various purposes.
 3.
 - (a) Electromagnets are used in the picture tubes of television and computer screens. They help in image formation.
 - (b) Doctors use electromagnets to remove iron dust from a patient's eyes.
 - (c) Electromagnets are used to separate iron scrap from the junk in industries.
 - (d) Electromagnets are used in the receivers of telephones.
 - (e) Electromagnets are used in electric motors.
 4.
 - (a) (i)
 - (b) (iii)
 - (c) (ii). This is because the amount of current flowing through the coil is more than that in case (i).
- G.**
1. The melting point of a fuse is kept low so that in case of short-circuiting or overloading, it can melt little before any other part of the circuit to save the circuit from burning.
 2. Electromagnets are called temporary magnets because as soon as the current through them is switched off, they lose their magnetism.

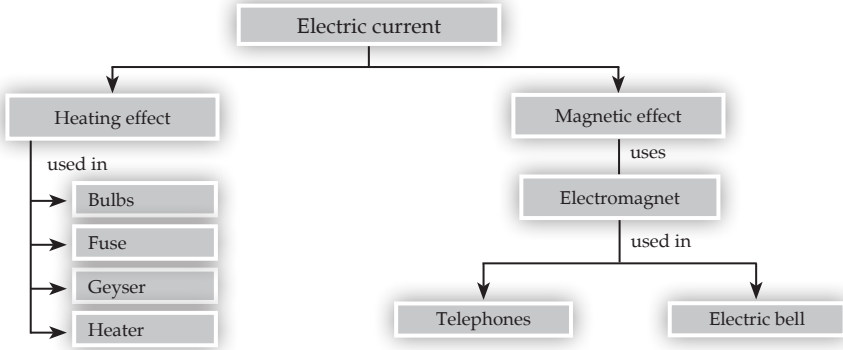
HOTS

1. Argon is a nonreactive (inert) gas and it does not allow the filament to burn. Hence, bulbs are filled with inert gas like argon to prevent the burning of filaments.
2. Electromagnets are very strong and can be demagnetised whenever required by switching off the electric supply while permanent magnets cannot be demagnetised instantly.
3. If a fuse wire is made of a metal of high melting point then it will not blow up in case of short-circuit or overloading and the electric appliances as well as wiring may get damaged.

Value-based Questions

1. The rubber is a bad conductor of electricity. It does not allow electric current to pass through it. Thus, gloves made from rubber protect us from electric shock.
2. Abhinav is an aware and knowledgeable person.

LET'S MEMORISE



15. Light

Checkpoint 1

1. straight 2. equal 3. pole 4. Concave 5. Convex

Checkpoint 2

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

Let's Drill Our Skills

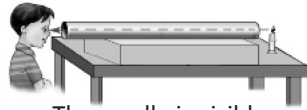
- A. 1. (c) 2. (a) 3. (b) 4. (d) 5. (b) 6. (c)
- B. 1. far; object 2. convex 3. diminished, virtual; erect 4. distant
5. convex 6. incident
- C. 1. The geometric centre of a spherical mirror is called its pole.
2. The image which is always inverted and can be formed on a screen is called real image.
3. The splitting of white light into its seven colours after passing through a prism is called dispersion.
4. The band of seven colours obtained as a result of dispersion of white light after passing through a prism is called spectrum.
- D. 1. The centre of the hollow sphere of which the mirror is a part is called centre of curvature.
2. The distance between the pole and the focus of a spherical mirror is called focal length.
3. A band of seven colours obtained on a screen, after dispersion of white light through a prism is called spectrum.
4. Concave mirror is used as dentist's mirror.
5. A ray of light travelling out from the mirror from the point of incidence is called reflected ray.
- E. 1. The image formed by a plane mirror has following characteristics:
(a) The size of the image is equal to the size of the object.

- (b) The image formed is virtual and erect.
 - (c) The image is laterally inverted.
 - (d) The image is formed at the same distance behind the mirror as the object is placed in front of it.
2. The interchanging of left and right sides of an object with its image is called lateral inversion. Due to lateral inversion, the left side of the object appears right side of the image and right side of the object appears left side of the image.
 3. Convex mirror is a diverging mirror. It can form images of objects spread over a large area by capturing larger view area. Also, it always forms erect and small-sized image of an object. This helps the driver to view the traffic or any other object behind the vehicle easily.
 4. Uses of convex lenses:
 - (a) Convex lenses are used in cameras, except the pinhole camera.
 - (b) Convex lenses are used in telescopes and microscopes.
 - (c) Convex lenses are used in spectacles to help people see nearby things clearly.
 5. The word 'AMBULANCE' is written inverted on the concerned vehicles so that the driver of the vehicle going ahead can read it straight in his rear view mirror which forms inverted image of it.
 6. Differences between concave and convex mirrors are as follows:

Concave mirror	Convex mirror
1. In concave mirror, the inner surface behaves as reflecting surface.	1. In convex mirror, the outer surface behaves as reflecting surface.
2. It converges light rays, hence, called converging mirror.	2. It diverges light rays, hence, called diverging mirror.
3. It forms mostly real and inverted images of various sizes of an object at different positions except when object is between pole and focus of the mirror.	3. It forms virtual and erect image of diminished size of an object in all positions.
4. It is used as reflector in solar cookers, solar furnaces, torches, headlights of vehicles telescopes and microscopes; also as make-up mirror and as dentist's mirror.	4. It is used as rear-view mirror in vehicles and distance view mirror at the turning points of narrow passages and staircases.

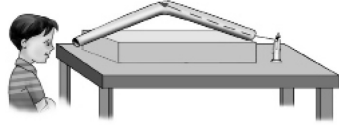
F. 1. Activity to show that light travels in a straight line:

Take a flexible tube and place a lighted candle on a table. Place your one eye at one end of the tube and look at the candle.



The candle is visible through the straight tube

Now, bend the tube a bit. Place the eye at one end of the tube and try to locate the candle light.

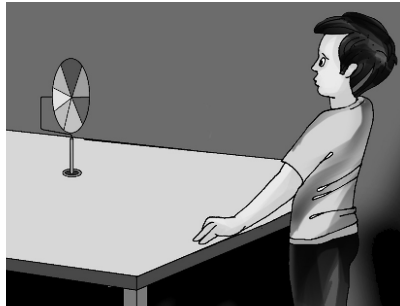


The candle is not visible through the bent tube

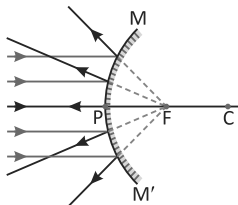
Now, the light is not seen. This shows that light travels in straight line, that is why, we can see it clearly through a straight tube.

2. Activity to show that white light is made of seven colours:

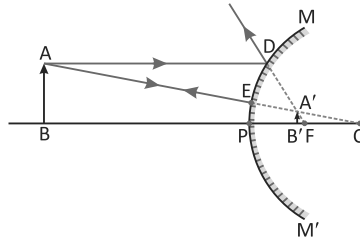
Take a circular disc of cardboard of about 8 inches in diameter. Cover it with a white paper. Divide the disc into seven equal parts and colour each part as shown in the figure. Make a small hole at the centre of the disc, using the tip of a compass. Take out a motor from an old or waste toy car. Fix the motor at the hole. Connect the motor with a dry cell to rotate the disc. As the rotation of the disc becomes fast, the colours on the disc merge into each other and the disc appears white.



3. The images of an object formed by convex mirror for all positions of the object are diminished, virtual and erect.



(a) When the object is at infinity



(b) When the object is between infinity and pole of the mirror

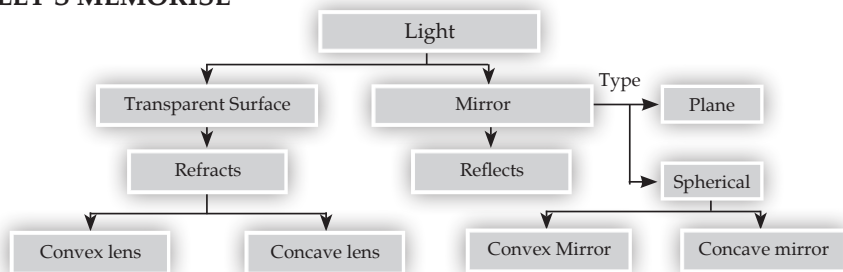
HOTS

1. Yes, light can be concentrated by using mirrors. This is done by converging the light rays at a point. On the other hand, light cannot be amplified because on amplification the rays get diffused.
2. In a concave mirror, the image formed may be smaller or enlarged and real or virtual, depending upon the position of an object, while in the convex mirror, the image formed is always virtual and smaller than the object.

Value-based Questions

1. Plane mirror cannot be used as rear-view mirror because image formed by plane mirror is equal to the size of the object and at the same distance behind the mirror as the object is placed in front of it.
2. Smaller and virtual images are formed by convex mirrors.
3. Rahul's father is an aware, knowledgeable and responsible person.

LET'S MEMORISE



16. Water – A Natural Resource

Checkpoint 1

1. 1.6%
2. increasing
3. infiltration
4. Rain
5. Toxic

Checkpoint 2

1. Wise and careful use of water is called water conservation.
2. Rainwater harvesting is a method of water conservation which involves collecting and storing rainwater to be used in the future.
3. World Water Day is celebrated on 22nd March.

Let's Drill Our Skills

- A.** 1. (c) 2. (c) 3. (d) 4. (c) 5. (a)
- B.** 1. False 2. False 3. True 4. True 5. True
- C.** 1. The level of groundwater where the rocks are permanently saturated with water is known as water table.
2. The groundwater collected between the layers of hard rocks is known as aquifer.

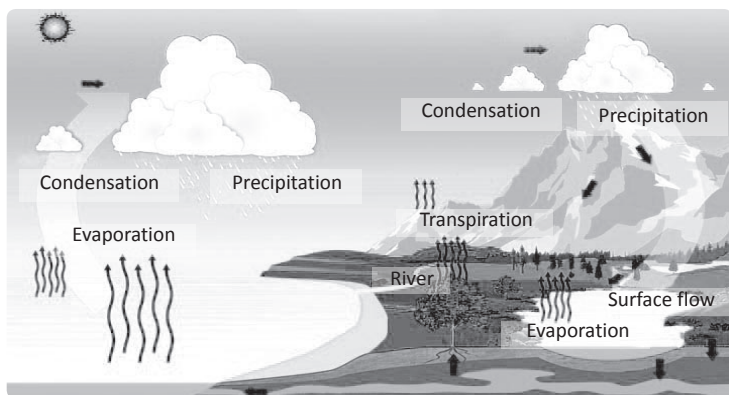
3. The process of seeping of water into the ground is called infiltration.
 4. The process of collecting and storing rainwater to be used in future is called rainwater harvesting.
- D.**
1. The constant circulation of water on the earth is called water cycle.
 2. About 1.6% of water on the earth is present in glaciers and polar ice caps.
 3. Rainwater harvesting is a method of water management.
 4. Rapidly increasing population and its changing lifestyle has increased the demand for groundwater.
 5. The water vapour comes into air by evaporation from waterbodies.
 6. The underground water comes from rains by infiltration.
- E.**
1. The water on the earth is found in all the three states as follows:
 - (a) In the liquid form, water is present in oceans, rivers, seas, lakes, ponds, etc.
 - (b) In the solid form, water is found as ice and snow on high mountains, glaciers and at the poles.
 - (c) In the gaseous form, water is present as water vapour in air.
 2. On the earth, water is not equally distributed. About 98% of the total water is present in oceans, 1.6% as ice in glaciers and polar ice caps, 0.36% as underground water, 0.036% water as surface water in lakes, streams and rivers and some amount is present as water vapour in air.
 3. Following problems are caused due to water scarcity:
 - (a) Crop production is affected leading to insufficient supply of food.
 - (b) People have to walk miles to fetch water.
 - (c) People have to stand in long queues to get their daily water.
 4. The groundwater collected between the layers of hard rocks is known as aquifer.
Tubewells and handpumps are used to draw water from an aquifer.
 5. Putting mulch around the plants and trees slows down evaporation of water from the soil. This allows more water to seep underground and helps in increasing the water table.
 6. Rainwater harvesting is a good approach to water management. It is one of the methods of water conservation which involves collection and storage of rainwater to be used in future. Rainwater harvesting is carried out in two ways. One is to collect rainwater from rooftops and store it in covered tanks with the help of pipes. Another way is to allow rainwater to infiltrate into the ground directly. This recharges the groundwater which can be reused by drawing with the help of pumps or from wells. Thus, rainwater harvesting helps in fulfilling different water needs and combats the water scarcity.

- F. 1. The continuous circulation of water from the earth's surface to the air and back to the earth's surface is called water cycle.

The water cycle occurs in following manner:

- Water from seas, oceans and other waterbodies evaporates by the heat of the sun. It changes into water vapour and mixes with the air.
- The water vapour rises high, becomes cool and condenses into tiny droplets of water.
- The tiny droplets of water form clouds in the sky. These tiny droplets join together and form larger drops.
- The larger drops of water fall on the earth as rain.
- The rainwater fills back waterbodies.

In this way, the water cycle is completed.



- Following are the major causes of groundwater depletion:
 - Rapidly rising population and changing lifestyles:** This has increased the demand for water. Due to which groundwater is being extracted excessively for household, agricultural and industrial needs.
 - Agricultural activities:** To cater to the food demand of rising population, there is need to increase crop production. It has led to drilling of a large number of wells and tubewells for irrigation purpose.
 - Reduced forest cover:** A large number of forests have been removed to clear land for agriculture and construction of houses and other buildings. This led to less chances of infiltration of rainwater causing lowering of water table.
- Following are the different ways to conserve water:
 - In the bathroom:**
 - Turn-off the taps while brushing teeth or shaving.
 - Leaky taps must be repaired.
 - Ultra-low flush models of toilets should be used.

(b) **In the kitchen:**

- (i) Do not leave tap open while washing dishes.
- (ii) Use the least amount of detergent while washing dishes.
- (iii) Wash vegetables, etc. in a container filled with water.

(b) **In general:**

- (i) Do not over water plants.
- (ii) Mulch the plants and trees.
- (iii) Waste should not be disposed off near waterbodies.
- (iv) The old practices of water harvesting such as bawris, etc. should be revived.
- (v) Irrigating plants by drip irrigation method prevents wastage of water.
- (vi) The rainwater should be conserved to be used in future by the practice of rainwater harvesting.

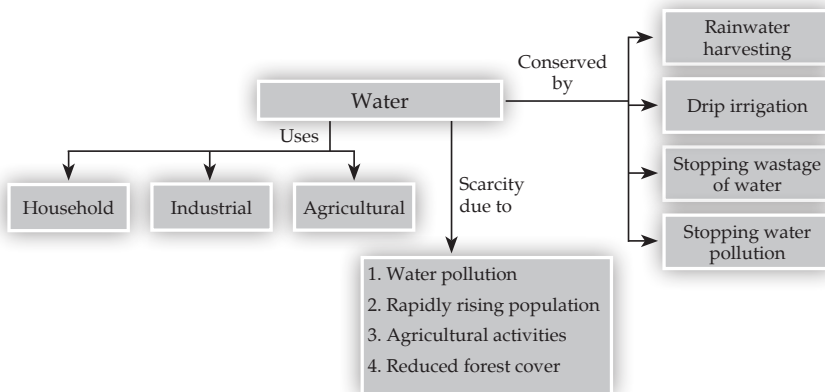
HOTS

- 1. Fog and mist are made of water vapour and suspended particles.
- 2. During severe water scarcity, we should stop watering plants daily, washing cars and other vehicles, taking bath in bath tubs, etc.
- 3. Water cycle maintains the sea level. The water on the earth's surface is always on the move in a constant cycle. This continuous circulation of water from the earth's surface to air and back to the earth's surface is called water cycle.

Value-based Questions

- 1. The street was stinking due to open drains overflowing with dirty water containing household and other wastes.
- 2. To prevent the contamination of water, we should not throw wastes in waterbodies.
- 3. Divya is an aware, concerned and responsible citizen.

LET'S MEMORISE



17. Forest – The Green Lifeline

Checkpoint 1

1. bodies; decaying
2. food; photosynthesis
3. perennials
4. living organisms
5. ayurvedic

Checkpoint 2

1. Deforestation
2. desertification
3. 15; 20
4. wastelands
5. deserts

Let's Drill Our Skills

- A.** 1. (a) 2. (d) 3. (d) 4. (c) 5. (b) 6. (a) 7. (c) 8. (b)
- B.**
1. nutrients
 2. fertile
 3. carbon dioxide; inorganic
 4. desertification
 5. Sunder Lal Bahuguna; 1974
- C.**
1. Canopy is the topmost layer of crown formed by the leaves and branches of very tall trees in a forest.
 2. Humus is the decomposed organic matter that makes the topsoil rich in nutrients and blackish or brownish in colour.
 3. The microorganisms like bacteria and fungi that convert remains of dead and decaying animals and plants into humus are called decomposers.
 4. The removal of topsoil by wind and water is called soil erosion.
- D.**
1. The careful use of natural resources is called conservation and management of natural resources.
 2. The clearing of forest to use the land for housing or industry is called deforestation.
 3. The topmost layer of leaves and branches of trees in a forest is called canopy.
 4. Decomposers, i.e., bacteria and fungi cause decay of organic matter.
 5. The human populations that live in forests are called tribes.
- E.**
1. Important benefits of forests:
 - (a) Forests purify air, i.e., provide clean and fresh air for breathing to all living beings.
 - (b) Forests regulate climate by reducing temperature and bringing rainfall.

2. Plants and animals are interdependent on each other as follow:
 - (a) Animals obtain food, oxygen and shelter from the plants.
 - (b) Plants depend on animals for carbon dioxide, inorganic nutrients, pollination and seed dispersal.
 3. Food, wood, rubber, gum, resin, honey, lac, bamboo, fuel wood, fodder, etc., are some important products obtained from forests.
 4. Air pollution caused by suspended particulate matter (SPM) affects the functioning of leaves by clogging their stomata. The closing of stomata reduces the rate of photosynthesis and transpiration in plants.
 5. Forests are called nature's lungs because:
 - (i) Their green vegetation releases oxygen during photosynthesis.
 - (ii) They utilise atmospheric carbon dioxide.
 - (iii) They maintain a balance of oxygen and carbon dioxide in the atmosphere.
- F.**
1. Forests can be conserved by taking following measures:
 - (a) Large-scale felling or cutting of trees must be stopped.
 - (b) When trees are cut, more trees should be planted in their place.
 - (c) Overgrazing by cattle and other animals should be stopped.
 - (d) To develop new forests, more saplings should be planted every year during the rainy season.
 - (e) Forests must be protected from insects, pests and infections by treating them with insecticides and pesticides.
 - (f) Forest fires must be checked. People should avoid smoking or cooking in the forest area.
 - (g) Various activities leading to soil erosion must be avoided.
 - (h) By conserving air, land and water, i.e., the pollution of air, land and water should be controlled so that trees and vegetation could survive.
 2. Deforestation is the large scale cutting of trees to clear a land area for agriculture, housing or industrial use. On the other hand, desertification is the process of conversion of a green area into a dry and sandy area due to low rainfall or no rainfall for a long period of time or deforestation, overgrazing and soil erosion.
 3. Following are the causes of deforestation:
 - (a) Increased demand of fuelwood, paper and timber.
 - (b) Increased demand of land for industries, houses, roads, railway tracks and for agriculture.
 - (c) Increased mining activity and overgrazing.
 - (d) Lowering of water table causes plants and trees to wilt and die.
 - (e) Fire is also responsible for the destruction of forests on a large scale.
 4. Following are the consequences of deforestation:
 - (a) Increase in the overall temperature of the earth (global warming).
 - (b) Lesser rain causing desertification, i.e., spread of deserts.

- (c) Increased soil erosion (loss of humus from soil).
 - (d) Imbalanced ecosystem leading to lowering of groundwater, disturbed oxygen and carbon dioxide ratio in the air.
 - (e) Danger to wildlife due to loss of habitat.
 - (f) Loss of forest produce.
 - (g) Loss of biodiversity (variety of plants and animals).
- G. 1.** Forest cover is necessary because forests control soil erosion by binding soil. They hold rainwater and allow it to infiltrate, thus, prevent floods. Forests make the soil fertile by recycling the nutrients. Also, forests purify the air.
- 2.** We should conserve forests because they are an important natural resource. They are essential for preservation of environment and survival of all animals. They regulate the climate by reducing the temperature of surroundings. They help in bringing rainfall, control soil erosion, provide shelter to animals. They also provide us with food, wood, fuelwood, etc.
- 3.** Plants remove carbon dioxide from the air and use it in the process of photosynthesis. They release oxygen during the same process. They hold soil particles together and thus, decrease the amount of dust in the air. In this way, they purify the air.
- 4.** In the forest, the fallen leaves, dead plants and animals and their wastes are decomposed by microbes into inorganic compounds. These inorganic compounds get mixed with soil and make humus. This makes the forest soil fertile.

HOTS

- 1.** Clearing of forests (deforestation) reduces the number of plants and trees which use carbon dioxide from air to prepare their food. Due to less number of trees, carbon dioxide level in air will increase. The increased amount of CO_2 will trap more heat from the sun and will finally increase overall temperature of atmosphere, leading to global warming.
- 2.** The absence of decomposers from forests will lead to the accumulation of fallen leaves, dead plants and animals and their waste products. The topsoil of forest floor will be without nutrients and will not be suitable for the growth of vegetation.
- 3.** Forest are natural sources of all the things required by people. They provide food, wood, shelter, fibres, medicines, etc. Hence, people lived in forests.
- 4.** Trees are planted along the roads to reduce air pollution and to provide shade to the passengers.

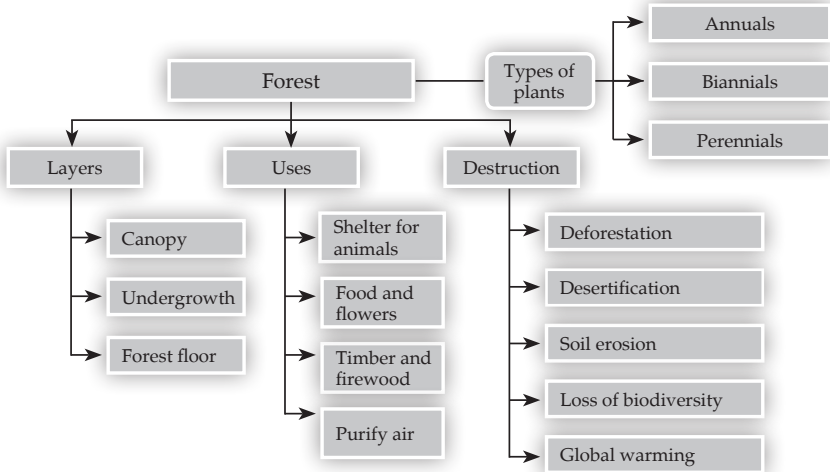
Value-based Questions

- 1.** Forests can be conserved by creating awareness about their importance among people. This awareness can be created by

organising debates, road shows, competitions in poster making on forests in schools and at community level.

2. Nikhil is an aware, sensitive to nature and a responsible citizen.

LET'S MEMORISE



18. Dealing with Waste Water

Checkpoint 1

1. screening
2. sewage treatment plant; waste water treatment plant
3. sludge
4. Chlorine; ozone

Checkpoint 2

1. drinking
2. pollutants
3. Manure
4. water-borne

Let's Drill Our Skills

- A. 1. (a) 2. (d) 3. (d) 4. (c) 5. (d)
- B. 1. sewage
2. human waste; domestic waste
3. methane, hydrogen, carbon dioxide; hydrogen sulphide
4. oil; fats
- C. 1. Sludge is a solid organic matter which settles at the bottom of sedimentation tank.
2. The substances which change the quality of air, water and soil and make them unfit for use are called contaminants.
3. An establishment where waste water is treated to remove physical, chemical and biological contaminants from it and to make it reusable is called waste water treatment plant.

- D. 1. The waste water which carries industrial, domestic and human waste is called sewage.
2. The tank which collects sludge at water treatment plant is called digester.
3. The dissolved impurities present in waste water are nitrates, sulphates, phosphates, detergents, pesticides, etc.
4. Biogas is obtained by decomposing sludge.
5. Ozone and chlorine are used to kill germs in water.
- E. 1. Sewage contains following contaminants:
- (a) **Organic impurities:** They are human waste, animal waste, food waste, soaps, detergents, pesticides, etc.
- (b) **Inorganic impurities:** They are nitrates, sulphates, phosphates, metals, etc.
- (c) **Nutrients:** They are nitrogen, phosphorus, etc.
- (d) **Microorganisms:** They are mainly disease-causing microbes which may cause typhoid, cholera, dysentery, etc.
2. Sewage contains a large number of germs and impurities. If it is discharged untreated into the rivers, it will pollute river water and many aquatic animals such as fishes, tortoises, etc. will die.
3. When sewage is passed through bar screens, the large objects like rags, wood pieces, sticks, stones, polythene bags, etc., present in it are left behind and are removed.
4. Biogas is formed during the decomposition of sludge in digesters by the action of anaerobic bacteria.
5. Water pollution in homes can be controlled as follows:
- (a) Used oils and fats should not be thrown in the drain.
- (b) Hazardous household products such as paints, cleaning liquids, insecticides, etc. should not be thrown in the drain.
6. At public places, we can reduce water pollution by following ways:
- (a) By not throwing plastic bags or any other material in rivers, lakes or any other waterbodies.
- (a) By disposing off waste properly after fairs, weddings, processions, etc.
- F. 1. (a) Used oils and fats should not be thrown in the drain because they may choke the pipes and damage the drainage system.
- (b) Using manure is better than using fertilisers in the gardens because it retains the fertility of soil, whereas use of fertilisers causes water pollution and can make the soil barren after a long period.
2. (a) This picture shows a waste water treatment plant.
- (b) It is necessary to pass the waste water through grit tanks so as to allow the grit, sand, stones and other heavy objects which escape from bar screen to settle at the bottom of the tank.

- (c) Aeration is important as it allows the decomposition of organic waste present in water by aerobic bacteria. After the process of aeration, the waste water is safe to be discharged into the rivers and lakes.
- (d) Water is sometimes disinfected before discharging into waterbodies to make it free from harmful microbes.

HOTS

1. Yes, if she over waters the plants, the fertilisers get dissolved in water and reach groundwater, thus, causing contamination of water.
2. Clarified water is passed through aeration tank for the decomposition of organic waste present in it by the aerobic bacteria. This makes waste water safe to be discharged into the waterbodies.

Value-based Questions

1. The sources that pollute water are factories, domestic sewage, runoff chemicals from fields, etc.
2. The industrialists can be made aware of the pollution and can be convinced to protect water resources by discussing and demonstrating the harmful effects of pollution of waterbodies and other natural resources.

LET'S MEMORISE

