Science Booster 7

1 Nutrition in Plants

ANSWERS

CHECK POINT 1

1. (F) **2.** (T) **3.** (T) **4.** (F)

CHECK POINT 2

1. Parasitic plants **2.** Symbiosis **3.** Heterotrophic mode **4.** Insectivorous plants
5. *Rhizobium*

PRACTICE TIME

A. 1. (a) **2.** (b) **3.** (d) **4.** (b) **5.** (b) **6.** (a) **7.** (c) **8.** (a)

B. 1. green; plants **2.** sun **3.** starch **4.** insectivorous **5.** algae; fungi **6.** symbiotic

C. 1. Green plants are called autotrophs because they can make food from simple inorganic substances.

2. Light.

3. Chlorophyll is essential for photosynthesis because it traps energy from sunlight.

4. Fungi derive their nutrients by digesting complex substances from dead and decaying plants and animals, and then absorbing them.

5. Chlorophyll converts solar energy into chemical energy. In plants, glucose is stored in the form of starch.

6. Raw materials for photosynthesis are water, carbon dioxide, chlorophyll and energy from the sun.

D. 1. $\text{Carbon dioxide} + \text{Water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Glucose} + \text{Oxygen}$

2. In lichens, as alga is green it makes food by photosynthesis and provides it to the fungus, whereas fungus provides shelter, water and minerals to the alga. Such an association is called symbiosis.

3. Taking food and its utilisation by the organism is called nutrition. The components that provide nutrition are called nutrients of the food. These are carbohydrates, proteins, fats, vitamins and minerals.

Stomata help in photosynthesis by taking carbon dioxide and expelling oxygen and in respiration by taking oxygen and expelling carbon dioxide.

4. *Rhizobium* lives in the root nodules of leguminous plants and converts atmospheric nitrogen into soluble nitrates for them. This helps plants grow well.

E. 1. Availability of chlorophyll, sunlight, carbon dioxide and water are the necessary conditions for photosynthesis. Green plants use these raw materials and make food in the form of glucose.

- Chlorophyll is a green pigment found in chloroplasts. It traps solar energy.
- Carbon dioxide is obtained from air through stomata.
- Water is absorbed by roots and transported up to the leaves.
- Energy of sunlight is trapped by chlorophyll which makes carbon dioxide and water to combine.

2. Following features make the leaf a suitable place for photosynthesis to occur:

- Leaves have flattened structure for obtaining maximum sunlight.
- They are thin to allow sunlight to reach all their cells.
- They have stomata for obtaining carbon dioxide and releasing oxygen.
- They have a network of xylem vessels for supply of water to all the cells.

3. Differences between autotrophic and heterotrophic nutrition.

Autotrophic nutrition	Heterotrophic nutrition
1. It occurs only in green plants.	1. It occurs in all nongreen plants and animals.
2. Carbon dioxide and water are needed for the synthesis of food.	2. Heterotrophs derive their food from green plants or autotrophs directly or indirectly.
3. Chlorophyll and sunlight are essential for the synthesis of food.	3. Chlorophyll is absent, hence, no photosynthesis.

4. *Cuscuta* develops special root-like structures called haustoria which enter the tissues of the stem of host plant and obtain prepared food.

5. (a) Nongreen plants obtain their food from green plants called the host. This is called parasitic mode of nutrition, for example, *Cuscuta* and *Apodanthes*. Nongreen plants such as fungi and some bacteria obtain their food from dead and decaying matter of plants and animals. This is called saprophytic mode of nutrition.

(b) In symbiotic mode of nutrition, two organisms mutually benefit each other by giving and taking, for example, an association of an alga and a fungus

in lichens and *Rhizobium* in root nodules of legumes. In parasitic mode of nutrition, only one organism is benefitted, for example, *Cuscuta* and *Apodanthes*.

6. Plants obtain nitrogen from the soil in the form of nitrates. They absorb nitrates in the form of their solution in water through roots. They need nitrogen to prepare proteins which are needed for their growth, i.e., formation of new cells, tissues, etc.

7. (a) (i) 1—Energy from the sun 2—Water 3—Carbon dioxide 4—Oxygen

(ii) Photosynthesis

(iii) Water is taken from soil through roots and transported to the leaf by xylem vessels.

Carbon dioxide is taken from air through the stomata on the surface of leaf.

(iv) Chloroplast

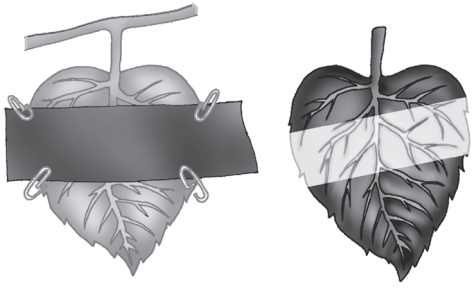
(b) (i) To show that sunlight is necessary for photosynthesis.

(ii) Not to let the sunlight fall on a part of leaf.

(iii) Because in the white part of the leaf in picture B, photosynthesis did not occur.

8. The necessity of sunlight for photosynthesis can be shown by the following activity:

Procedure: Keep a green potted plant in dark for about 48 hours to destarch its leaves. Pluck one leaf and test it for iodine to confirm that the plant is destarched. Cover a part of a healthy leaf on both the sides with a strip of black paper. Place this plant in sunlight for at least four hours or more. Pluck the leaf and remove black paper-strip. Boil the leaf first in water and then in alcohol. This destroys the chlorophyll and the leaf becomes colourless. Wash the leaf with warm water and put it in a petri dish. Pour few drops of iodine solution on the leaf to test for starch.



Observation: The uncovered part of the leaf that was exposed to sunlight turns blue-black, while the part covered with black strip does not turn blue-black.

Conclusion: This shows that starch is formed only in those parts which are exposed to sunlight. No starch is formed in the covered part which could not get sunlight. Hence, sunlight is necessary for photosynthesis.

F. 1. Because in the absence of sunlight chloroplasts start changing its form giving yellow colour to the leaf.

2. This is because insectivorous plants grow in nitrogen-deficient soil. To meet their nitrogen requirement, they feed on insects.

3. Bacterium *Rhizobium* lives in the nodules on the roots of leguminous plants. It converts atmospheric nitrogen into soluble nitrates which make the soil rich in nitrates and hence fertile.

2 Nutrition in Animals

ANSWERS

CHECK POINT 1

1. eating **2.** Earthworm **3.** Parasitic **4.** ingestion **5.** assimilation

CHECK POINT 2

1. incisor **2.** taste buds **3.** milk; permanent **4.** Enamel

CHECK POINT 3

1. Starch **2.** Villus **3.** Bile **4.** Hydrochloric Acid **5.** Ruminants

PRACTICE TIME

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

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

C. 1. Salivary amylase. It digests starch into maltose.

2. Premolars and molars. They are used for grinding and chewing the food.

3. Pancreatic juice.

4. Small intestine and large intestine.

5. Rumen.

6. The partially-digested food which is taken back into the mouth from stomach for rechewing by the ruminants is called cud.

7. Because the caecum, where cellulose is digested, is reduced and nonfunctional in man, and also cellulose-digesting bacteria are absent in it.

D. 1. *Amoeba* captures food by pushing finger-like pseudopodia around the food and engulfing it.

2. Hydrochloric acid kills bacteria that enter stomach along with food and water. It also makes food acidic for the action of digestive enzymes secreted by gastric glands.

3. (a) Peristaltic movements.

(b) They are produced by a series of contraction and relaxation of muscles of alimentary canal.

(c) These movements help the food move along the length of alimentary canal and churn the food into a fine paste to mix well with digestive juices.

4. Bile juice makes the food alkaline and helps in the digestion of fat.

5. (a) Because a part of their stomach called rumen is specialised to store half-chewed food.

(b) In caecum.

6. Rumen, Reticulum, Omasum and Abomasum are the parts of a ruminant stomach. Abomasum is the true stomach.

7. Animals that eat dead and decaying matter of plants and animals present in the soil are called saprophagous animals, e.g., earthworms.

8. Assimilation is utilisation of absorbed nutrients by the body cells for energy and synthesis of new substances.

Different nutrients are assimilated in following ways:

- Glucose is used to release energy in the cells.
- Amino acids are used to build new substances for the cells.
- Fats are stored in the fatty tissues in various parts of the body.

9. In ruminants, cellulose is digested with the help of cellulose-digesting bacteria which are found in the caecum part of their alimentary canal.

E. 1. Steps involved in the process of nutrition are ingestion, digestion, absorption, assimilation and egestion.

Process of nutrition in *Amoeba:*

- **Ingestion:** *Amoeba* pushes finger-like pseudopodia around its food and engulfs it.
- **Digestion:** The engulfed food is digested inside the food vacuole.
- **Absorption:** The digested food diffuses into the surrounding cytoplasm.
- **Assimilation:** The absorbed food is used for energy, growth and repair.
- **Egestion:** The undigested food is expelled from the body surface at any point.

2. Digestion is the process of breaking down food into simple soluble molecules by the action of digestive enzymes.

Role of saliva in digestion: Saliva moistens the food and makes the chewed food slippery for easy swallowing. It contains enzyme *salivary amylase* which digests starch into maltose.

Role of bile juice in digestion: Bile juice makes the food alkaline and helps in the digestion of fat.

Role of pancreatic juice in digestion: It helps in the digestion of proteins and carbohydrates.

3. (a) (i) Starch converts into maltose which in turn changes into glucose.

(ii) Protein breaks into amino acids.

(iii) Fats break into fatty acids and glycerol.

(b) The nutrients in their simplest form are absorbed by small intestine and are passed to all the cells of body through blood. Inside the cells, they are assimilated for following purposes:

(i) Glucose is used as fuel for getting energy.

(ii) Amino acids are used for building new living material for growth or repair of cells.

(iii) Fatty acids and glycerol are stored as fat in the fatty tissue of various parts of the body.

4. Stomach has following functions:

- It churns food into fine paste called chyme and mixes the digestive juices with it.
- It secretes hydrochloric acid which kills bacteria that come along with food and makes food acidic for the action of enzymes.
- The chemical digestion of proteins starts in the stomach.

5. The lining of small intestine is very thin which allows rapid entry of substances. Its inner wall contains numerous finger-like projections called villi which increase the surface area of intestine to about five times for the absorption of digested food. The villi are richly supplied with blood vessels to carry away absorbed nutrients.

6. (a) **1.** Salivary gland **2.** Mouth **3.** Liver **4.** Stomach **5.** Pancreas **6.** Caecum **7.** Small intestine **8.** Large intestine **9.** Rectum **10.** Anus

(b) **Functions of mouth:** In mouth, the food is chewed and masticated by teeth into a fine paste. It is moistened and starch is converted into maltose with the help of saliva.

Functions of stomach: It churns food into a fine paste called chyme. It mixes hydrochloric acid and digestive juice to the food. Food is partially digested in the stomach.

Functions of pancreas: It releases the pancreatic juice which helps in the digestion of carbohydrates and proteins.

Functions of large intestine: It absorbs water and salts from undigested food.

7. Four different types of teeth are found in man. These are:

(a) Incisors for biting the food.

(b) Canines for tearing the food.

(c) Premolars, and

(d) Molars for grinding and chewing the food.

Care of teeth can be taken by:

- Avoiding sticky and starchy foods, sweets, ice creams, etc.
- Brushing teeth twice a day.
- Rinsing mouth after eating food.
- Massaging teeth.
- Eating raw food such as carrot, radish, fruits for self-cleaning of teeth.

F. 1. In herbivores, caecum contains cellulose-digesting bacteria. These bacteria are not found in the caecum of man. Hence, it is nonfunctional and is not well-developed.

2. It is because the enzyme, *salivary amylase* in saliva changes starch of *chapati* into maltose which is sweet in taste.

G. 1. Salivary glands
2. Starch
3. Chewing, mastication, moistening and beginning of digestion of food
4. No
5. No
6. No
7. Stomach
8. Gastric glands
9. Gastric juice
10. Churns food into thin paste
11. Small intestine
12. Liver
13. Fat
14. Pancreas
15. Pancreatic juice
16. Proteins, Fats, Carbohydrates
17. Intestinal glands
18. Proteins, Fats, Carbohydrates
19. No
20. Absorption of water and salts

3 Fibres

ANSWERS

CHECK POINT 1

1. Yak **2.** Shearing **3.** Cashmere goat **4.** Nali **5.** Camel family **6.** Petrochemicals

CHECK POINT 2

1. (T) **2.** (F) **3.** (T) **4.** (F) **5.** (T)

PRACTICE TIME

A. 1. (c) **2.** (c) **3.** (b) **4.** (a) **5.** (b) **6.** (d) **7.** (a) **8.** (b)

B. 1. wool; silk **2.** natural; synthetic **3.** South America **4.** cocoons **5.** munga

C. 1. The rearing of silk moths for obtaining silk is called sericulture.

2. The process of washing the sheared hair of a sheep with soapy water is called scouring.

3. The small fluffy fibres in sheared hair of sheep are called burrs.

4. After shearing, sheep is immersed in antiseptic solution to protect it from skin infection.

5. China.

D. 1. In India, sheep are reared in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Haryana, Punjab, Rajasthan and Gujarat.

2. Sorter's disease is a fatal blood disease. The people who work in the sorting department of a wool factory may develop this disease due to chances of getting infected with anthrax bacteria.

3. Wool mark is a symbol of quality of woollen garments which assures that woollen cloth is made from pure wool. The International Wool Secretariat (IWS) in North Yorkshire, United Kingdom confers wool mark logo.

4. China. In India, silk making reached in AD 300 through traders and travellers.

5. When the silkworm or caterpillar larva of silk moth enters the pupal stage, its salivary gland secretes a fibre made up of fibroin protein. The pupa wraps this fibre around itself. This fibre hardens on exposure to air and forms a cover around pupa called cocoon.

E. 1. (a) **Steps involved in the production of wool:**

(i) **Shearing:** It is the process of shaving the body of sheep to obtain fleece.

(ii) **Scouring or washing:** It is the process of washing sheared hair of sheep with soapy water.

(iii) **Sorting:** It is the process of sorting out the hair of different textures after scouring.

(iv) **Carding:** The sorted fibres are passed through rollers for straightening.

(v) **Dyeing:** The carded fibres are dyed in various colours.

(iv) **Spinning:** The dyed fibres are made into yarn by straightening, combing and rolling. The longer fibres are made into wool, whereas the shorter fibres are spun and woven into woollen cloths.

(b) Scouring removes grease, dust and dirt from the sheared hair.

(c) The straightening of scoured and sorted hair of sheep by passing them through rollers is called carding of wool fibres.

(d) Rampur bushair, Nali, Lohi, Bakharwal, Patanwadi and Marwari.

2. (a) Risks associated with a particular occupation are called occupational hazards. For example, people working in the sorting department of wool industry are always at the risk of getting infected with anthrax bacteria which causes a fatal blood disease called sorter's disease.

(b) People working in silk industry often develop respiratory diseases such as asthma and bronchitis, infectious skin diseases, bow-leggedness, severe headache, fever, body pain, etc.

(c) Pupal stage is a resting stage in the life cycle of a silk moth. It starts when the caterpillar larva stops feeding and its salivary gland secretes a fibre that spins around it forming a ball-shaped structure called cocoon. Inside the cocoon, the pupa develops into an adult moth.

(d) Wool and silk fibres burn slowly and are self-extinguishers. They smell like a burning hair. Wool fibre turns brown and leaves a shiny hollow bead, whereas silk fibre forms a silvery bead on burning. These beads turn into powder when crushed.

F. 1. Woollen shawls; Jammu and Kashmir

2. Coarse wool

3. Gujarat

4. Nali; Rajasthan, Punjab, Haryana

5. Cashmere; Jammu and Kashmir

G. 1. If pupae are not killed at right time, they will cut the thread into several small pieces while coming out of the cocoon.

2. Workers of sericulture industry develop asthma, chronic bronchitis and difficulty in breathing due to inhalation of vapour arising from boiling cocoons.

3. Synthetic silk is much cheaper because it needs lesser investment of manpower for its production, whereas production of natural silk takes longer time and involves larger association of manpower.

H. Down: 1. SCOURING **3.** FLEECE **4.** PASHMINA **7.** COCOON

Across: 2. CARDING **5.** LOHI **6.** SORTER'S DISEASE **8.** ANGORA

4 Heat and Temperature

ANSWERS

CHECK POINT 1

1. (T) **2.** (T) **3.** (F) **4.** (F) **5.** (T)

CHECK POINT 2

1. (T) **2.** (F) **3.** (T) **4.** (F) **5.** (T)

PRACTICE TIME

A. 1. (a) **2.** (b) **3.** (b) **4.** (d) **5.** (a)

B. 1. heat **2.** Anders Celsius **3.** 32 **4.** clinical

C. 1. Heat is a form of energy which can be transformed into other forms of energy like electrical energy, light energy, mechanical energy, etc.

2. In an electric bulb, the electrical energy gets transformed into heat energy of the filament, which is then transformed into light energy.

3. The thermometer which is used to measure the body temperature of humans is called clinical thermometer.

4. A laboratory thermometer is generally used to measure temperatures ranging from –10°C to 110°C.

5. There is a kink near the bulb in the capillary tube of a clinical thermometer but not in that of a laboratory thermometer.

D. 1. We feel hot after rubbing our palms together because in doing so our muscular energy is transformed into heat energy.

2. The temperature is a measure of the degree of hotness or coldness of a body. The device used for measuring the temperature of a body is called thermometer.

3. It is convenient to use digital thermometer because it measures temperature accurately using thermistor instead of mercury and shows the reading in the form of digits.

4. If a thermometer falls or breaks while giving jerks and the mercury spills in the form of small droplets, then take a small ball of kneaded wheat flour and roll it over the mercury droplets to pick them all. Put this contaminated wheat flour ball in a polythene bag, give it a tight knot and hand it over to your nearest pharmacy to dispose it off.

5. The two common scales for measuring temperature are Celsius scale and Fahrenheit scale.

- On Celsius scale, the freezing point of water is taken as 0°C and boiling point as 100°C.
- On Fahrenheit scale, water freezes at 32°F and boils at 212°F.

E. 1. Heat energy can be transformed or changed into other forms of energy.

- In a thermal power station, heat energy is produced by burning coal and is transformed into electrical energy.
- In a steam engine, heat energy is transformed into mechanical energy.

Similarly, other forms of energy are also transformed into heat energy.

- During the working of an iron, a geyser or a heater, electrical energy gets transformed into heat energy.
- When we rub our palms together, they become warm. Here, the muscular (mechanical) energy gets transformed into heat energy.

2. Structure of a clinical thermometer: A clinical thermometer is formed of a long and narrow glass tube with a bulb at its one end. This bulb is filled with mercury. The glass tube encloses a thin capillary tube. The capillary tube has a kink just a little above the bulb. Two scales, i.e., Celsius and Fahrenheit scales are shown on the thermometer. The range of Celsius scale on the clinical thermometer is 35°C to 42°C and that of Fahrenheit scale is 94°F to 108°F.

Using a clinical thermometer: Wash and dry the thermometer. Then give it one or two jerks and make sure that the mercury in the capillary tube has fallen well below 35°C. Put the bulb of the thermometer under the tongue for one minute. Take it out and read the temperature.

Precautions to be taken while using a clinical thermometer:

- The thermometer should be washed with an antiseptic lotion or with clean water and dried with a clean dry cloth before and after every use.
- The thermometer should be given two or three soft jerks to bring the mercury in the capillary, well below 35°C.
- While giving jerks, care should be taken that the thermometer does not hit any object, otherwise its delicate bulb is likely to break.
- Thermometer should not be held by the bulb while reading it.
- While the thermometer is inside mouth, one should not laugh or talk or yawn or make any other action.
- Note the reading in clear light. The thermometer can be given small rotations to make the capillary and the level of mercury clearly visible.
- Keep the level of mercury along the line of sight while reading the thermometer.

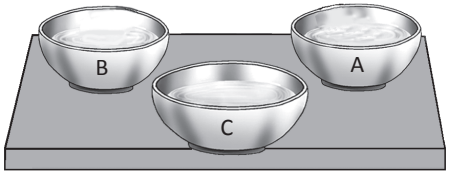
3. Precautions to be taken while using a laboratory thermometer:

- While the laboratory temperature is being taken, the bulb of the thermometer should be kept vertical and in contact with the object whose temperature is to be measured. It should not touch the bottom or the sides of the container.
- The reading of temperature should be taken without removing the thermometer from its position.
- The eye of the observer and the mercury in the capillary tube should be at the same level.
- The thermometer should not be used to measure temperatures below its lowest marking or above its highest marking.

4. Our sense of touch is not a reliable method to measure the temperature. This can be proved by performing following activity.

Procedure: Take three bowls and label them A, B and C.

Half fill each of the bowls with ice-cold water, bearable hot water and lukewarm water respectively. Now, put your left hand in bowl A and right hand in bowl B simultaneously. Keep your hands in the two bowls for about 1 minute. Then, remove both the hands and put them together in bowl C.



Observation: The left hand feels that the water in bowl C is hot whereas the right hand feels that the water in bowl C is cold.

As the right and left hands do not give same feeling of either hotness or coldness of the water in bowl C, we cannot always rely on our sense of touch.

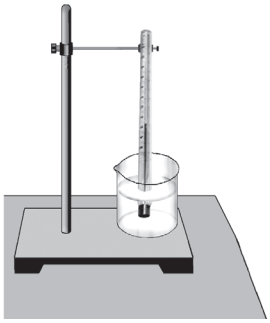
5. The three scales to measure temperature are:

- **Celsius scale (°C):** On this scale, the freezing point of water is 0°C and boiling point is 100°C.
- **Fahrenheit scale (°F):** On this scale, the freezing point of water is 32°F and boiling point is 212°F.
- **Kelvin scale (K):** On this scale, the freezing point of water is 273K and boiling point is 373 K.

Interconversion of Scales:

- Interconversion of °C and °F scales: $°C = \frac{5}{9}(°F - 32)$, $°F = \frac{9}{5}°C + 32$
- Interconversion of °C and K: K = °C + 273, °C = K – 273
- **Conversion of 50°C into °F:** $°F = \frac{9}{5} \times 50 + 32 = 9 \times 10 + 32 = 122\ °F$

6. A laboratory thermometer consists of a very thin capillary tube of glass, which is surrounded by thick and supportive glass walls. The upper end of the capillary is closed after evacuation and the lower end is drawn into a delicate bulb-like shape, with a thin glass wall. The bulb is filled with mercury. The stem of the thermometer has marks as horizontal lines to read a particular temperature. These marks are known as calibrations. A laboratory thermometer is generally used to measure temperatures ranging from –10°C to 110°C.



The temperature of water can be measured using a laboratory thermometer as follows:

Take a beaker and fill it a little more than half with tap water. Hang a laboratory thermometer on an iron stand such that its bulb is completely dipped in water.

Observe till the mercury thread in the capillary tube becomes steady and read the level of mercury. This reading gives the temperature of tap water taken in the beaker.

7. Differences between Laboratory Thermometer and Clinical Thermometer

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 of temperature that can be measured with a laboratory thermometer is –10°C to 110°C.	2. The range of temperature 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.

F. 1. Human beings have little variations is their body temperatures. Actually, the normal body temperature, i.e., 37°C is the average value of body temperatures of a large number of healthy persons.

2. It is not convenient to use a laboratory thermometer for measuring human body temperature because we have to take the thermometer out of mouth to note the reading. If we use laboratory thermometer, on taking it out of mouth, the mercury will start falling down in the absence of kink in the capillary tube. Therefore, it is not used to measure human body temperature.

3. The temperature of our body does not fall below 35°C or rise above 42°C. That is why the range of clinical thermometer is from 35°C to 42°C.

4. To measure the temperature of human body, we put the thermometer in mouth for a few minutes and then take it out of mouth to note the reading. Because of the kink near the bulb, mercury level is prevented from falling on its own.

5 Transfer of Heat

ANSWERS

CHECK POINT 1

1. (T) **2.** (F) **3.** (T) **4.** (T) **5.** (T)

CHECK POINT 2

1. Convection **2.** Convection currents **3.** Ocean currents **4.** Sea breeze
5. Land breeze

CHECK POINT 3

1. Radiation **2.** Waves **3.** Thermal radiation **4.** Dark colour

CHECK POINT 4

1. (T) **2.** (F) **3.** (T) **4.** (T) **5.** (F)

PRACTICE TIME

A. 1. (b) **2.** (d) **3.** (a) **4.** (d) **5.** (a)

B. 1. higher; lower **2.** sea **3.** cold **4.** poor **5.** vacuum **6.** good

C. 1. Conduction

2. All metals like copper, gold, silver, aluminium, iron, etc. are good conductors of heat.

3. Anything that can flow is called fluid. Since both gases and liquids can flow, they are called fluids.

4. The radiation carrying heat energy is called thermal radiation.

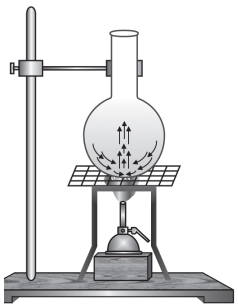
5. The water at the surface of ocean moves from equatorial region to polar regions.

D. 1. The materials which do not conduct heat through them easily are known as insulators. Wood, brick, plastic, glass wool, wool, cotton, ice, snow, air and water are some insulators.

2. Good conductors of heat such as:

- Steel, copper and aluminium are used to make cooking utensils, so that they can easily transfer the heat from the source to the food being cooked.
- Copper, iron and aluminium are used to make the base of an electric iron, solar heating pipes and boilers in chemical and textile industries.

3. Because of a large temperature difference between the earth's crust and the core, huge convection currents are developed in the magma. They result in an immense pressure under the landmasses causing eruption of volcanoes and earthquakes.
4. In everyday life, the principle of convection currents is applied to a number of situations as follows:
   - Air coolers and air conditioners are fitted at higher levels on the walls so that the cold air generated by them moves downwards and be more effective in cooling the whole room quickly.
   - Room heaters are placed at or near the floor of the room. The air heated by them rises up setting convection currents in the room. This heats up the air of the room quickly and uniformly.
   - The freezers inside the refrigerators are surrounded by the cooling pipes and have the minimum temperature. Also, the freezers are always located at the top of the refrigerators so as to easily circulate the cool air downwards and keep the refrigerators cold.
5. The absorbance of heat by an object depends upon:
   - **The nature of the material:** Metals and water absorb more heat than nonmetals.
   - **Its distance from the source of heat:** If the source of heat and the object are kept close, the object receives more heat.
   - **The colour of the object:** Dark colours absorb more as well as give out more thermal radiation. Light colours absorb less and give out less thermal radiation.
6. Applications of poor conductors in our everyday life are:
   - Wood, plastic and bakelite are used to make handles of cooking utensils, electric irons, etc.
   - Fluffed up cotton and woollens are used in quilts and garments to prevent the loss of body heat to the cold surroundings in winters.
   - Ice is a poor conductor of heat. Eskimos live in igloos which are made of ice blocks. These houses do not allow the heat from inside to escape to the outer cold surroundings.
   - Asbestos sheets are used to make rooftops of buildings at places with hot climate.
   - Thermocol is used to make ice boxes to store ice.
7. The phenomena of sea and land breezes make the climate of coastal areas mild and pleasant.
8. Plastic and wood are poor conductors of heat so they are used for making handles of cooking utensils like pan, cooker, ladle, etc. They help us handle hot pans safely and save our hands from getting burns.



9. Conduction and convection are such modes which need material medium to transfer heat. But, there is no material medium outside the earth's atmosphere. Hence, heat reaches from the sun to the earth by radiation only.

E. 1. When a liquid or a gas is heated, its particles near the source of heat get heated and move upwards. The space left by them is quickly filled by the colder particles from the surroundings. Now, these particles get heated and rise upwards. Gradually, more and more particles keep on getting heated. The process continues till the whole fluid gets heated.

2. Sea Breeze: During the daytime, the land gets heated faster than the seawater. The air above the land becomes hot and rises up. The cool air from the sea rushes towards the land to occupy the space left by the hot air. The convection currents from the sea to the land cause sea breeze.

Land Breeze: During the night time, the land loses heat faster than seawater. The air above the sea is warmer than that of the land. Thus, the warm air above the sea rises upwards. The cool air from the land rushes towards the sea to occupy the space created. The convection currents from the land to the sea cause land breeze.

3. The mode of transfer of heat from distant sources in the environment, without requiring any medium or contact is called radiation.

When radiation falls on an object, a part of it gets reflected, a part is absorbed and some of the part may be transmitted. The temperature of the object increases and it becomes hot.

4. The amount of heat absorbed or radiated out depends upon the colour of the object. This affects the choice of colours in day-to-day life as follows:

- We wear light-coloured clothes in summers because they reflect most of the heat falling on them.
- Dark-coloured clothes are preferred in winters because they absorb more heat from the surroundings during the daytime.
- The bottom of cooking utensils is painted black while the sides are kept sparkling bright to absorb the maximum heat through the bottom and radiate (give out) minimum from the sides.
- Pipes of solar heaters and containers of solar cookers are painted black from outside so that maximum radiation from the sun can be absorbed.
- The radiators of cars and air conditioners are painted black to radiate the heat away.

5. (a) Conduction (b) Convection (c) Convection

(b) It is shown by fig. (c)

F. 1. People sitting around a fire get heat due to thermal radiation. Thermal radiation does not need a medium to travel. This radiation takes place in all the directions from the source of heat.

2. We will prefer two thin blankets joined together because air is trapped between two thin blankets. As air is a poor conductor of heat, it prevents heat of body from escaping and hence keeps us warm.
3. The presence of a hot object can be felt without any contact because of thermal radiation.
4. Because of more inter-molecular spaces in fluids, transfer of heat does not take place by conduction. In fluids, molecules move from hotter part to colder part carrying heat and hence a convection current is set up.
5. Black coloured surface is a good radiator of heat, hence the radiators of cars are painted black to radiate the heat away.

6 Acids, Bases and Salts

ANSWERS

CHECK POINT 1

1. (T) **2.** (F) **3.** (T) **4.** (T)

CHECK POINT 2

1. lichens **2.** neutral **3.** synthetic **4.** magenta **5.** heat **6.** electricity

PRACTICE TIME

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

B. 1. (c) **2.** (e) **3.** (a) **4.** (b) **5.** (d)

C. 1. Unripe green apples → Malic acid
Vinegar → Acetic acid
Tea → Tannic acid
Sour milk → Lactic acid
Orange juice → Citric acid

2. (a) H_2SO_4 (b) HNO_3 (c) NaOH (d) $NaHCO_3$

3. The substances which are bitter in taste, produce a soapy feeling and contain a base are called basic substances.

4. A substance that changes colour in acids and bases is called an indicator.

5. Acidic substances turn blue litmus paper red.

6. pH paper is used to test the strength of an acid and a base.

7. Sodium chloride (NaCl) is obtained by the reaction between HCl and NaOH.

D. 1. (a) Materials containing acid → curd, lemon, amla.
(b) Materials containing base → caustic soda, baking soda, calcium hydroxide.

2. (a) Turmeric remains yellow with acids and turns red with bases.
(b) China rose turns magenta with acids and green with bases.
(c) Blue litmus turns red with acids and remains blue with bases.
(d) Red litmus turns blue with bases and remains red with acids.

3. Neutralisation is a reaction in which an acid combines with a base to form salt and water.

To neutralise the excess acid formed in the stomach, antacid like milk of magnesia is taken. Milk of magnesia contains a base called magnesium hydroxide.

4. The factory wastes contain harmful acids and bases. If these wastes are allowed to flow directly into the waterbodies, they may harm aquatic plants and animals. Therefore, it is wise to neutralise the factory wastes before disposing them off into rivers or lakes.

5. The compounds that are formed by the reaction of an acid with a base are called salts.

Uses of salts

- The common salt is added to our food. It is also used as perservative in pickles, meat and fish.
- Potassium nitrate is used as a fertiliser.
- Copper sulphate is used in textile industries, electroplating and cleaning.
- Some salts commonly used in laboratory are ammonium chloride, copper sulphate, ferrous sulphate and silver nitrate.

6. An ant's sting contains an acid and baking soda is a base. When baking soda is rubbed on ant's sting, it neutralises the effect of acid. Thus, the pain caused due to an ant's sting gets relieved by rubbing baking soda solution.

E. 1. The neutralisation of the property of a base by an acid can be shown by following activity:

Procedure: Take a test tube and add 10 mL dilute hydrochloric acid to it. Observe its colour. Now, add two drops of phenolphthalein to it. Shake gently. Notice, if there is any colour change. Now, add a drop of sodium hydroxide solution with the help of a dropper and shake gently. Notice, if any colour appears in the solution. Keep adding sodium hydroxide solution dropwise and keep shaking till the colour of the solution becomes pink. Add one drop of dilute hydrochloric acid to this solution. Note your observation. Touch the bottom of the test tube and observe if there is any change in temperature.

Observation: No colour change occurs when phenolphthalein is added to dilute hydrochloric acid. The solution remains colourless. Pink colour appears when sodium hydroxide is added to this solution. On adding a drop of dilute hydrochloric acid to this solution, the solution becomes colourless. The solution becomes pink again on adding a drop of sodium hydroxide. The test tube becomes warm.

Conclusion: 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.

2. Differences between acids and bases are:

Acids	Bases
1. Acids are sour in taste.	1. Bases are bitter in taste.
2. Most acids are corrosive in nature, but all acids are not corrosive.	2. Most bases are also corrosive in nature, but all bases are not corrosive.
3. Acids are soluble in water.	3. All bases are not soluble in water.
4. Acids turn blue litmus red.	4. Bases turn red litmus blue.
5. Acids do not give any soapy feeling.	5. Bases give a soapy feeling when rubbed on fingers.
6. Acids can be tested with indicators which give them specific colours.	6. Bases also can be tested with indicators which give them specific colours.

3. A china rose indicator can be prepared by following method:

Procedure: Pour some water into a beaker. Put 10–12 china rose petals in it and heat the beaker containing mixture on a burner till the water becomes warm. Keep the mixture on the burner till water becomes coloured. This coloured water is china rose indicator.

Now, take some china rose indicator in three test tubes and add some vinegar, lemon juice and soap solution to them separately.

- With vinegar, china rose indicater turns magenta.
- With lemon juice, china rose indicater turns magenta.
- With soap solution, china rose indicater turns green.

Conclusion:

- With vinegar and lemon juice, china rose indicator turns magenta. So, they are acidic in nature.
- With soap solution, china rose indicator turns green. So, it is basic in nature.

F. 1. (a) Solution C is a base. Solution D is neutral. Three acids, i.e., A, B and E have been tested.

(b) The colour of turmeric paper would be red in solution C.

(c) (ii)

2. A turmeric stain on a white shirt turns red when washed with soap because soap is base and in basic solution, yellow turmeric powder turns to red.

G. Down: 1. ACID **3.** NEUTRAL **4.** TAMARIND **5.** SALT **7.** BASES

Across: 2. INDICATOR **6.** MAGENTA **8.** SPINACH **9.** SOUR

7 Physical and Chemical Changes

ANSWERS

CHECK POINT 1

1. (T) **2.** (T) **3.** (F) **4.** (F)

CHECK POINT 2

1. milky **2.** sulphide **3.** chemical **4.** Air; moisture **5.** supersaturated

PRACTICE TIME

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

B. 1. (T) **2.** (T) **3.** (F) **4.** (F) **5.** (F)

C. 1. Magnesium burns with a dazzling white flame.

2. Galvanisation, Alloying, etc.

3. Inflating a balloon is a physical change.

4. Magnesium hydroxide is basic in nature because its aqueous solution turns red litmus blue.

5. Spoiling of food and rotting of an egg.

D. 1. Physical changes: Melting of butter and stretching a rubber.

Chemical changes: Rusting of iron and burning of coal.

2. Rust is a reddish-brown substance that appears on the surface of iron articles when they are left exposed to moist air.

Iron	+	Water	+	Oxygen	→	Rust
Fe		H_2O		O_2		$(Fe_2O_3 \cdot H_2O)$
						(Hydrated iron oxide)

3. Stainless steel is a special substance which is made by mixing some carbon and metals like chromium, manganese and magnesium with iron.

4. The process of mixing two or more metals or metals and nonmetals to make alloy is called alloying.

5. The process of forming crystals from a solution is called crystallisation.

6. By galvanisation, a layer of zinc is deposited on iron article. This coating of zinc does not allow the iron article to come in contact with air and moisture, and prevents rusting.

E. 1. The conditions necessary for rusting to take place can be shown by performing following activity.

Procedure: Take three test tubes. Label them as A, B and C respectively. Now, place one clean and shiny iron nail in each of the test tubes. In test tube A, put some anhydrous calcium chloride and cork it. Anhydrous calcium chloride absorbs all the water (moisture) present in the 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. A layer of oil is formed over boile 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. Observe in which test tube has the iron nail rusted.

Observation: Only the iron nail placed in test tube C has rusted.

Conclusion:

- Test tube A has no moisture with iron nail. Dry air alone has no effect on iron nail.
- Test tube B has no air with iron nail. Water (moisture) alone has no effect on iron nail.
- Test tube C has both air and moisture. So, the iron nail gets rusted.

Thus, it can be concluded that both air and moisture are necessary for rusting to take place.

2. The various methods by which rusting can be prevented are:

- **Coating an iron article with paint:** Applying a coat of paint on iron articles prevents them from coming in contact with air and moisture. This prevents rusting of iron article.
- **Coating an iron article with grease:** Applying a coat of grease on an iron article cuts off its contact with air and moisture. This prevents the iron article from getting rusted.
- **Galvanisation:** This is the process of depositing a layer of zinc on iron. The coating of zinc does not allow the iron article to come in contact with air and moisture and, thus, prevents it from rusting.
- **Alloying:** Some metals are mixed with other metals or nonmetals to prevent them from rusting. This process is called alloying and the new substance formed is called alloy. Stainless steel is an alloy.

3. Crystals of copper sulphate can be made by performing following activity:

Procedure: Fill a test tube half with water and heat it. When the water starts boiling, add a teaspoonful of copper sulphate to it. Stir well and keep adding copper sulphate till no more amount of powder can be dissolved. Filter the solution using a filter paper and collect it in a test tube. Cover the filtrate with a filter paper and place the solution in a test-tube stand. Leave the test-tube stand in a place where it cannot be disturbed. Allow it to cool to the room

temperature. At this temperature, filtrate will behave as supersaturated solution because we prepare a saturated solution at higher temperature. Observe the solution after few hours.

Observation: Blue-coloured crystals of copper sulphate are formed.

4. The characteristics of a chemical change are:

(a) A new substance is formed in a chemical change.
(b) Heat, light or any other radiation may be released or absorbed in this change.
(c) Sound is also produced in some chemical changes.
(d) There is also change in colour.
(e) There is also change in smell.
(f) Sometimes, evolution of a gas also occurs.
(g) Most chemical changes are irreversible changes.

5. Differences between physical and chemical changes

Physical change	Chemical change
1. A change in which no new substance is formed is called a physical change.	1. A change in which a new substance is formed is called a chemical change.
2. A physical change is usually accompanied by a change in shape, size or state. For example, dissolving salt in water, inflating a balloon, etc.	2. A chemical change is usually accompanied by a change in colour, release or absorption of heat or light, evolution of a gas, production of sound of a gas or change in smell. For example, rusting of iron, spoiling of food, burning of coal, etc.
3. Most physical changes are reversible changes.	3. Most chemical changes are irreversible changes.

6. (a) Carbon dioxide is released in test tube A and hydrogen gas is released in test tube B.

(b) To identify carbon dioxide, it is passed into freshly prepared limewater. It turns limewater milky.

To identify hydrogen gas, a burning matchstick is brought near it. Since hydrogen gas is inflammable, it burns with a pop sound.

7. (a) When magnesium ribbon is burnt, magnesium oxide is formed.

$$2Mg + O_2 \rightarrow 2MgO$$

(b) When magnesium oxide is mixed with water, magnesium hydroxide is formed.

$$MgO + H_2O \rightarrow Mg(OH)_2$$

(c) When zinc reacts with dilute hydrochloric acid, hydrogen gas is evolved.

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$$

(d) When an iron nail is dipped in copper sulphate solution, copper is displaced from its solution and iron sulphate is formed.

$$Fe + CuSO_4 \rightarrow FeSO_4 + Cu\downarrow$$

(e) When iron filings react with sulphur, iron sulphide is obtained.

$$Fe + S \rightarrow FeS$$

F. 1. Evaporation of perfume is a physical change.

2. When carbon dioxide gas comes in contact with limewater, a white solid substance called calcium carbonate ($CaCO_3$) is formed which makes the solution milky. It is a chemical change.

3. In coastal region, the air has moisture in it which causes rusting of iron articles faster.

G. Across: 1. ALLOY **4.** MAGNESIUM **6.** CHEMICAL **7.** HYDROGEN
Down: 2. LIME **3.** RUST **5.** SULPHUR

8 Weather, Climate and Adaptations

ANSWERS

CHECK POINT 1

1. meteorology **2.** weather **3.** humidity **4.** Hygrometer

CHECK POINT 2

1. Climate **2.** Torrid zone **3.** Frigid zones **4.** Altitude

CHECK POINT 3

1. (T) **2.** (T) **3.** (F) **4.** (T) **5.** (F)

PRACTICE TIME

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

B. 1. afternoon **2.** meteorologists **3.** migrate **4.** equator **5.** Sweat **6.** polar

C. 1. It is the amount of water vapour present in the air.

2. Spider monkey, red-eyed tree frog.

3. The long and coiled tail which is adapted for grasping things is called prehensile tail.

4. Camouflaging.

5. Plant food.

6. Large-scale felling of trees, and industrialisation have affected the climate drastically.

D. 1. Relative humidity is the amount of water vapour present in the air at a particular temperature in relation to the maximum amount of water vapour the air can hold at that temperature. Relative humidity is determined as ratio and is expressed in the form of percentage.

2. Latitude, distance from the sea, humidity, rainfall and altitude affect the climate of a place.

3. (a) Animals like monkeys have prehensile tail and opposable thumb for grasping tree branches.

(b) Tree frogs have sticky pads on the tips of their digits to cling and climb on the trees.

4. Blubber is a thick layer of fat under the skin. It is found in polar animals like polar bears, penguins, etc. It provides insulation to the body.
5. Tree frogs have sticky pads on the tips of their digits which help them to cling and climb on the trees.

E. 1. The prediction of weather conditions by a weatherman is called weather forecasting.

Benefits of weather forecasting:

- Weather forecasting allows people to prepare for bad weather.
- It is helpful to protect life and property.
- It is helpful to plan activities and events.
- It helps farmers to plan various agricultural activities.

2. Latitude is the distance of a place from the equator. The places in the equatorial region and nearby get straight sunrays. Therefore, they have warm climate with maximum rainfall.

As we move away from the equator, towards the poles, the sunrays become slanting and the intensity of light and heat decreases. Therefore, the climate of such places becomes cold.

3. Elephants are adapted to live in tropical rainforests. They have large fan-like ears, which help them to regulate the body temperature. They use their long pointed tusks to dig roots of food plants and dig into the trees to get the inside pulp. The trunk of the elephants acts as a human hand for picking and holding things. The pillar-like legs of elephants balance their bulky body.
4. Penguins have following polar adaptations:
   - They have white feathers on the belly. This helps them to merge with their white surroundings and protect from predators.
   - They have thick feathers which protect them from biting cold and make their body waterproof.
   - They have blubber which protects them from extreme cold.
   - They have streamlined body, fipper-like wings and webbed feet to swim.
   - They live in groups and remain huddled together which keeps them warm.
5. Elements of weather are temperature, humidity and rainfall. Temperature changes during daytime because as the sun rises, its rays fall slanting. This time the temperature is low. As the sun moves up high in the sky, i.e., at noon, the sunrays fall straight which increase the temperature of the atmosphere. In the evening when the sun sets, the sunrays again fall slanting lowering the temperature of air.

   The temperature is minimum in the early morning and maximum during the afternoon.

F. 1. Mumbai is close to sea as compared to Pune, therefore, being in the same latitude, it receives more rainfall than Pune.

2. The large beak of toucan helps it to reach and get the fruits from branches on which it cannot sit.

3. Monkeys are adapted to live on trees. For getting food, shelter and protection from enemies they have to grasp the tree branches. A long prehensile tail helps them to live on trees.

G. Elements of Weather;

Factors: Temperature, Rainfall

Measured by: Hygrometer

9 Wind, Storm and Cyclones

ANSWERS

CHECK POINT 1

1. wind **2.** air pressure **3.** atmosphere **4.** reduced **5.** temperature; air pressure

CHECK POINT 2

1. (F) **2.** (T) **3.** (T) **4.** (F) **5.** (T)

PRACTICE TIME

A. 1. (b) **2.** (b) **3.** (c) **4.** (b) **5.** (c)

B. 1. (T) **2.** (T) **3.** (F) **4.** (T) **5.** (T)

C. 1. high; low **2.** wind **3.** warm **4.** lightning; thunder **5.** surges

D. 1. The weight of air acting on a surface causes air pressure. In other words, the force exerted by air on a surface is called air pressure.

2. When air is heated, it expands, becomes lighter and rises up.

3. Cyclones are strong winds blowing around a central area having low atmospheric pressure.

4. A tornado is a violent, dark funnel-shaped cloud extended from a thunderstorm that reaches the ground from the sky.

5. A storm accompanied by lightning and thunder is called a thunderstorm.

E. 1. During summer, the winds that blow from the oceans towards the land carrying a lot of moisture are called monsoon winds.

2. The centre of the cyclone is a cloudless, calm area. In this area, the winds are not strong and there is no rain. This is called the eye of the cyclone.

3. Fierce winds associated with cyclones can lead to a condition which causes an abnormal rise in the level of sea water in the coastal areas. This is called storm surge.

4. The direction of wind depends on the temperature and the air pressure.

5. The dangers associated with cyclones are:

- Cyclones are accompanied by very strong winds which can uproot trees, collapse houses and buildings and topple electric poles. Many people may be killed.

- Cyclones may also cause prolonged heavy rains. This may lead to floods causing loss of life and property. Water becomes contaminated and people may suffer from waterborne diseases like jaundice, typhoid, etc.
- Even after a cyclone is over, rail and road transport may remain blocked by flood waters.

F. 1. 'Air exerts pressure' can be demonstrated by the following activity:

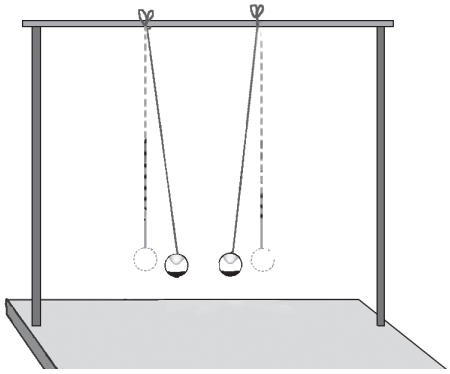
Procedure: Fill water up to the brim of a glass. Place a piece of cardboard over the top of the glass. Now, holding the cardboard in place over a sink, turn the glass upside down. Remove your hand gently away from the cardboard.

Observation: The water stays in the glass.

Conclusion: The air outside exerts an upward pressure on the cardboard. This air pressure is more than the weight of water in the glass. This keeps the water in the glass. This shows that air exerts pressure.

2. The morning air lowers the pressure of area. It can be shown by following activity:

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



Observation: The balls are pushed towards each other.

Conclusion: When we blow between the ping-pong balls, the air pressure between them gets reduced. The air pressure outside the balls is higher. This pushes the balls towards each other. Moving air lowers the pressure of the area it occupies.

3. Cyclones are caused by strong winds blowing around a central area having low atmospheric pressure.

The warm air above the seas rises upwards and creates an area of low pressure. It gets cooler and loaded with moisture. Cooler air rushes to fill the space created by the rising warm air. This cycle keeps repeating. This leads to the formation of a very low pressure system with winds of great force revolving around it. These strong winds rotate faster and faster forming a very huge circle called a cyclone.

4. Following safety measures can be taken to prevent disasters caused due to cyclones:

- Construction of storm shelters.
- Afforestation, i.e., planting trees on a large-scale.
- Connecting roads help in evacuating people quickly to safer areas.
- Cyclone forecast services, i.e., warnings should be given rapidly and repeatedly to general public, fishermen, etc.
- Generating public awareness about the safety measures through informative brochures and pamphlets, talk shows over television and discussions with experts over radio.

5. Moving air is called wind. Winds are caused due to change in temperature and pressure in the air. On getting heat from the sun, the air warms up. The warm air expands, becomes light and rises up. This reduces the air pressure at this place. The cooler air is denser and rushes in to take the place vacated by warm air. This is how winds are caused.

6. (a) When the bottle is kept in hot water, the air inside it becomes warm and expands. The increased volume of air inflates the balloon.

(b) On putting the bottle in cold water, the air inside it gets cooled and its volume becomes less. This deflates the balloon.

7. The air pressure acting on the cardboard from below balances the pressure exerted due to weight of water from above. Thus, it keeps the cardboard in place and does not let it fall down.

8. The differences between a tornado and a cyclone are:

Tornado	Cyclone
1. A tornado is a form of storm and has a dark funnel-shaped cloud that reaches to the ground from the sky.	1. A cyclone is a storm which develops on the sea and has high speed swirling winds around a low pressure centre.
2. It is formed when a rising column of hot air meets a horizontal current of cold air.	2. It is formed when the air over tropical sea rises up after being heated by the sun and pressure.
3. In tornado, the low pressure central area is mostly affected because the centre sucks dust, debris and that comes in its way and throws them out near the top.	3. In cyclone, central area called eye is of low intensity of winds and is free from clouds. But a wide area around the eye is badly affected.
4. Wind speed in tornado is up to 400 km/h which is most violent.	4. The wind speed around the eye of a cyclone is up to 200 km/h.

9. If we are inside our home during a thunderstorm, we should take following precautions:

- Close the windows and doors tightly. Draw blinds over the windows. This will prevent glass shattering into the house.
- Do not touch electrical equipments or telephones.
- Keep listening to a battery operated radio for latest information.
- Avoid contact with electrical equipments or cords.
- Avoid corded phones.

G. 1. (a) When the boy sucks through the straw, it creates a partial vacuum inside the straw. Hence, due to the pressure difference, the liquid rises up into the straw.

(b) Because of small hole in the straw, the girl is not able to create partial vacuum inside the straw. As a result, water inside the straw rises up very slowly and the girl feels difficulty to drink it.

2. The air around the equator is hot and hence rises up leaving low pressure area behind it. The cooler air from both the hemispheres moves in to take the place of warm air.

3. When air is blown between the ping-pong balls, the air pressure between them gets reduced. The higher air pressure outside the balls pushes them towards each other.

H. Down: 1. CYCLONE **3.** TYPHOONS **4.** ATMOSPHERE **7.** WIND
Across: 2. LIGHTNING **5.** BAROMETER **6.** TORNADO **8.** HURRICANE

10 Soil

ANSWERS

CHECK POINT 1

1. Horizons **2.** Topsoil **3.** Clay **4.** Gravel

CHECK POINT 2

1. ploughed **2.** clayey **3.** Loamy **4.** Pores

CHECK POINT 3

1. (T) **2.** (T) **3.** (T) **4.** (F) **5.** (F)

PRACTICE TIME

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

B. 1. humus **2.** Sandy **3.** Clayey **4.** air spaces **5.** water **6.** soil erosion

C. 1. (b) **2.** (a) **3.** (e) **4.** (c) **5.** (d)

D. 1. A-Horizon or Topsoil **2.** C-Horizon **3.** Loamy soil **4.** Loamy soil **5.** Percolation

E. 1. The removal of topsoil by either strong winds or flowing water is called soil erosion.

2. The organic matter like dead and decaying remains of plants and animals present in the soil is called humus.

3. The downward movement of water through the soil is called percolation. Percolation rate can be calculated using the formula:

$$\text{Percolation rate (mL/min)} = \frac{\text{volume of water (mL)}}{\text{percolatin time (min)}}$$

4. When toxic substances, chemicals, salts, disease-causing germs, etc. get mixed with the soil, the soil is said to be polluted.

5. Given: Volume of water = 90 mL, Time taken = 45 min

$$\therefore \text{ Percolation rate (mL/min)} = \frac{\text{volume of water (mL)}}{\text{percolatin time (min)}} = \frac{900 \text{ mL}}{45 \text{ min}} = 20 \text{ mL/min}$$

6. A vertical section of soil showing its different layers or horizons is known as soil profile. The different horizons of soil are:

- A-Horizon, or topsoil
- B-Horizon, or subsoil

- C-Horizon, or parent rock

Below the C-horizon, bedrock is found which is very hard and solid rock.

7. Soil is made up of different sized rock particles. They are clay, silt, sand and gravel. Some other components of soil are humus, living organisms, water and air.

8. Soil organisms use the air present in soil for respiration.

F. 1. Humus is important because it makes the soil fertile. It improves the water-holding capacity of the soil. Humus allows air to enter the pores of soil and provides food to earthworms, beetles, millipedes, etc.

2. The various uses of soil are as follows:

- Soil enables plants to grow. It provides all the nutrients required by the plants to grow.
- Soil is home for millions of soil organisms such as insects, earthworms, bacteria, fungi, etc.
- It provides anchorage to trees and vegetation.
- Soil is also essential for the forests of the world.
- Soil is used for agricultural production of crops.
- Soil is used in making pottery and bricks.
- The microorganisms living in soil help in recycling nutrients from dead plants and animals.

3. The various components of a soil sample can be separated into different layers by following activity:

Procedure: Take a glass container and put some soil in it. Fill three-fourths of the container with clean water. Stir the mixture well with a glass rod and secure the lid firmly. Leave the set-up undisturbed for a couple of days in a safe place.

Observation:

- Gravel settles at the bottom and forms the lowermost layer.
- A layer of sand is formed above the layer of gravel.
- A layer of clay is formed above the layer of sand.
- Dead leaves and animal remains are seen floating on water.

Conclusion: Based on the size of the particles, soil separates into three layers, i.e., gravel, sand and clay. The dead and rotting remains of plants and animals are humus.

4. Characteristics of A-horizon are:

- It is darker than other layers.
- It is rich in humus and minerals needed by plants for their growth.
- It is soft and porous.
- It can hold more water.

Characteristics of B-horizon are:

- It contains comparatively less amount of humus but rich in minerals.
- It is generally harder and more compact than topsoil.
- It is lighter in colour because of the presence of less amount of humus.

Characteristics of C-horizon are:

- It is made up of small lumps of rocks.
- It is porous in nature.

Characteristics of bedrock:

- It is a hard and solid rock.
- It produces soil over a long period of time.

5. 'The soil contains water' can be shown by following activity:

Procedure: Put a spatulaful of soil in a beaker. Heat the beaker.

Observation: On heating the beaker containing soil, some water droplets get deposited on the inner walls of the beaker.

Conclusion: The soil contains water in it.

6. The characteristics of a good soil are:

- It has good water-holding capacity and at the same time, well-drained to prevent roots from rotting.
- It is rich in humus and has a lot of air spaces.
- It is a mixture of different-sized particles.
- It is loose enough to allow roots to expand easily.
- It has different nutrients in right proportion to grow plants well.

7. When toxic substances, chemicals, salts, disease-causing germs, etc. mix with soil, the soil becomes polluted. Soil gets polluted in many ways:

- Excessive use of pesticides, fertilisers, herbicides, weedicides and insecticides.
- Direct discharge of toxic industrial wastes into the soil.
- Seeping of contaminated water into the soil.
- Dumping of large quantities of solid waste into the soil.
- Oil and petroleum leaks from vehicles get washed off on the road into the surrounding soil.
- Septic tank leakage.

Soil pollution can be controlled by:

- Proper treatment of industrial wastes.
- Adopting proper methods for the management of solid waste disposal.
- Recycling of materials like glass, paper, plastic, etc.
- Reusing of materials like plastic bag, cloth, paper, etc.
- Reducing the use of fertilisers, pesticides, etc.

8. (a) A–Topsoil B–Subsoil C–Weathered parent rock D–Bedrock

(b) Layer A (topsoil).

(c) A–horizon or topsoil is the darkest layer.

(d) Layer C or weathered parent rock is made up of small lumps of rocks.

G. 1. Loamy soil is ideal for the gardeners.

2. The soil erosion is a great cause of concern because formation of soil is a continuous but a slow process. It takes hundreds or thousands of years to form 2.5 cm of soil from parent material.

3. Because of less water-holding capacity, sandy soil is light and dry. Hence, this soil is not suitable for the growth of plants.

H. HUMUS, TOPSOIL, LOAMY, SUBSOIL, CLAY, SOIL, BEDROCK, SILT

11 Respiration in Animals and Plants

ANSWERS

CHECK POINT 1

1. Respiration **2.** Aerobic **3.** lactic acid **4.** Anaerobic

CHECK POINT 2

1. Nasal passages **2.** Bronchi **3.** Thoracic cavity **4.** Haemoglobin
5. Cellular respiration

CHECK POINT 3

1. (T) **2.** (F) **3.** (F) **4.** (T) **5.** (F)

PRACTICE TIME

A. 1. (a) **2.** (b) **3.** (b) **4.** (a) **5.** (b) **6.** (c)

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

C. 1. Roundworm, flatworm.

2. Lungs

3. Glucose

4. Rib muscles and muscles of diaphragm.

5. Aerobic and anaerobic are two types of respirations found in living organisms. Aerobic respiration occurs in the presence of oxygen and its end products are carbon dioxide, water and energy.

Anaerobic respiration occurs in the absence of oxygen. Its end products are ethyl alcohol or lactic acid, carbon dioxide and energy.

D. 1. Mechanism of inhalation

- The ribs are raised upwards and outwards by the contraction of rib muscles and the diaphragm moves down (flattens).
- The volume of thoracic cavity and lungs increases and the air pressure inside the lungs decreases.
- Air from the atmosphere having higher pressure rushes into lungs through nostrils and air passages and the lungs get filled with fresh air.

2. Anaerobic breakdown of sugars into alcohol is called fermentation. The end products of fermentation are ethyl alcohol, carbon dioxide and energy.

3. Composition of inhaled and exhaled air:

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

Their composition differs because oxygen is used and carbon dioxide is released during respiration.

4. One should always breathe through nose because when air passes through nasal passages, it becomes moist and warmed up to body temperature. Dust, smoke particles, pollen or microbes that enter with inhaled air are trapped by the hair of nasal passages. Thus, a clean and filtered air enters the lungs.

5. Plants do not release carbon dioxide during daytime because carbon dioxide formed during respiration is utilised in the process of photosynthesis.

E. 1. Differences between aerobic and anaerobic respiration:

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

2. (a) It is anaerobic respiration.

(b) Yeast is used for making wine and beer.

3. The mechanism of breathing involves inhalation, i.e., taking in air rich in oxygen and exhalation, i.e., giving out air rich in carbon dioxide.

During breathing, ribs, diaphragm and their muscles work together as follows:

During inhalation:

- The ribs are raised upwards and outwards by the contraction of rib muscles and the diaphragm moves down (flattens).
- The volume of thoracic cavity and lungs increases and the air pressure inside the lungs decreases.
- Air from the atmosphere having higher pressure rushes into lungs through nostrils and air passages and the lungs get filled with fresh air.

During exhalation:

- The ribs move downwards and inwards and the diaphragm moves upwards (ribs and diaphragm return to their original position).

- The volume of thoracic cavity and lungs decreases and the air pressure inside the lungs increases.
- Air from the lungs is pushed out through air passages and nostrils.

4. Plants do not have respiratory organs. Each part of plant independently takes in oxygen and gives out carbon dioxide into surrounding air. Different parts of plants have different structures for obtaining oxygen as follows:

(a) Leaves and young stems have stomata for gaseous exchange.

(b) Old woody stems have lenticels below bark for gaseous exchange.

(c) Roots have root hair that extend into air spaces present between soil particles for gaseous exchange.

5. (a) 1. Bronchiole 2. Pulmonary artery 3. Blood capillaries 4. Alveolar cavity

(b) Exchange of gases takes place in alveolar cavity.

F. 1. The respiratory organs of cockroach are tracheae which open outside through small openings called spiracles. Through these openings gaseous exchange occurs. When a cockroach is put in water, its spiracles get blocked and gaseous exchange does not take place. The respiration gets stopped. Hence, the cockroach dies ultimately.

2. Whales and dolphins have lungs for respiration but they live in water. For inhaling and exhaling air, they often come to the surface of water. When they exhale, they release a fountain of water.

G. 1. Ethyl alcohol **2.** Oxygen

H. Down: 1. GILLS **2.** RIBS **3.** SPIRACLES **4.** INHALATION **5.** STOMATA

Across: 2. RESPIRATION **6.** YEAST **7.** TRACHEAE **8.** TRACHEA **9.** BREATH

12 Transportation in Animals and Plants

ANSWERS

CHECK POINT 1

1. Pulmonary arteries
2. Aorta
3. Stethoscope
4. Red Blood Corpuscles (RBCs)
5. White Blood Corpuscles (WBCs)

CHECK POINT 2

1. kidneys **2.** Renal artery **3.** Nephron **4.** dialysis **5.** dialyser

CHECK POINT 3

1. (T) **2.** (F) **3.** (T) **4.** (F)

PRACTICE TIME

A. 1. (c) **2.** (c) **3.** (a) **4.** (b) **5.** (b) **6.** (b)

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

C. 1. Veins **2.** Cardiac muscles **3.** Pulmonary artery **4.** Carbon dioxide, lungs **5.** Kidney **6.** Phloem

D. 1. The rhythmic contraction and relaxation of heart is called heartbeat. The number of heartbeats in man is 72 per minute.

2. Blood supplies oxygen and nutrients to every cell of the body. It removes wastes from the cells. It regulates the temperature of the body and protects the body against many infections.

3. Pulse is the throbbing movement of blood under pressure in the arteries, caused due to pumping of heart. It can be felt in the radial artery on the inner side of the wrist.

The contraction of ventricles and closing of pulmonary and aortic valves make the lub-dub sounds.

4. The blood carrying oxygen from the lungs is transported to the left auricle of heart by pulmonary vein. Blood from left auricle reaches the left ventricle by its contraction. From left ventricle, it is pumped into aorta and is distributed to all body parts by arteries.

5. Removal of wastes is necessary because if they accumulate in the body, they will prove to be toxic.

6. Transpiration helps in the upward movement of water and minerals from roots to the leaves. Also, it produces cooling effect which protects the plant from heat of the sun.

7. The upward movement of water and minerals from roots to the tips of leaves through stem against the force of gravity is called ascent of sap.
Transpiration helps in ascent of sap by generating transpiration pull.

E. 1. Differences between arteries and veins:

Artery	Vein
1. It is thick-walled with narrow lumen.	1. It is thin-walled with wide lumen.
2. In artery, blood flows from heart to other body parts.	2. In vein, blood flows from body organs to the heart.
3. It supplies blood to body organs.	3. It collects blood from body organs and brings it back to heart.
4. It carries oxygenated blood.	4. It carries deoxygenated blood (except pulmonary arteries).

2. (b) 1. Aorta 2. Pulmonary artery 3. Pulmonary veins 4. Left auricle
5. Left ventricle 6. Inferior vena cava 7. Right ventricle 8. Right auricle

(c) Part 5, i.e., left ventricle pumps oxygenated blood into aorta for distribution to all parts of the body.

(d) Pulmonary veins.

(e) Deoxygenated blood.

3. (a) There are four chambers in human heart. These are:
(i) Right auricle (ii) Right ventricle (iii) Left auricle (iv) Left ventricle

(b) Left auricle.

(c) Because heart is completely divided into two halves by a thick muscular septum.

4. (a) Excretory organs of human body are kidneys, skin, lungs, liver and large intestine.

(b) (i) Kidneys expell urea as urine.
(ii) Skin removes water, salts and urea as sweat.
(iii) Lungs remove carbon dioxide produced during respiration.
(iv) Liver cells convert ammonia into less toxic urea.
(v) Large intestine removes undigested food as faeces through anus.

(c) Sweat glands are found in the skin. They remove water, salts, urea, etc. from the blood flowing through skin by tiny pores on the surface of skin in the form of sweat.

5. There are three types of blood cells. These are:

(a) **Red blood cells:** They give red colour to the blood and transport oxygen to all the cells of the body.

(b) **White blood cells:** They are called soldiers of the body because they fight against germs and provide immunity to the body.

(c) **Blood platelets:** They are minute cells which help in the clotting of blood.

6. Transportation of water:

The root hair absorb water from the soil. The water from the root hair is passed to the xylem vessels of root through the cells of root cortex by the process of diffusion. These vessels transport water to the xylem vessels of stem and then to xylem vessels of leaves and all the parts of the plant.

Transportation of nutrients and food:

The food formed in the mesophyll cells of leaves enters into the phloem and through pholem is transported to all parts of the plant.

7. (a) • Auricles are the receiving chambers of the heart. They have thin walls.

• Ventricles are the distributing chambers. They have thick walls.

(b) RBC transports oxygen to all the body cells, whereas WBC defends the body against infections and provides immunity.

(c) Xylem transports water and minerals from roots through stem up to the tips of leaves against gravity, whereas phloem carries food produced by leaves to all the parts of plant.

F. 1. In arteries, blood flows with jerks and under great force which keeps the blood flow in one direction. On the other hand, the flow of blood in veins is not jerky or under pressure. The valves present inside the veins make the blood to flow in one direction only, i.e., towards the heart.

2. Transpiration pull, which is an upward pull, makes the water to rise in tall trees. The transpiration pull is caused due to loss of water by transpiration.

G. Across: 1. HEARTBEAT **3.** NEPHRON **4.** PHLOEM **6.** BLADDER **8.** ARTERY **9.** VEIN **10.** LUNGS

Down: 1. HAEMOGLOBIN **2.** AORTA **5.** VENTRICLE **7.** DIABETES

13 Reproduction in Plants

ANSWERS

CHECK POINT 1

1. Grafting **2.** Layering **3.** Tissue culture **4.** Underground stem

CHECK POINT 2

1. Stamen **2.** Pollination **3.** Fertilisation **4.** Plumule **5.** Wind

PRACTICE TIME

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

B. 1. same **2.** layering **3.** animals **4.** zygote **5.** water

C. 1. Asexual reproduction

2. Budding, Fission, Fragmentation and Sporulation or spore formation.

3. Ovary.

4. *Dahlia*–roots, *Bryophyllum*–leaves, Onion and mint–stem

5. Maize

6. By budding

7. Stamen and pistil.

D. 1. By vegetative propagation, plants lose their reproductive power after a few generations which makes them prone to many infections.

2. To be dispersed by the wind.

3. Growing plants from roots, stems or leaves by using different techniques is called artificial propagation in plants. For example, grafting, stem cutting, etc.

4. Tissue culture technique is a technique in which cells are grown in a medium that contains nutrients and hormones. This technique is used for growing many plants such as *Asparagus, Chrysanthemum,* Orchids, etc.

5. Seed dispersal avoids overcrowding and prevents competition among plants for space, sunlight, water and minerals. It provides better chances to survive.

6. Reproduction is essential because it ensures the continuity of life generation after generation.

E. 1. Advantages of Vegetative Propagation

- Vegetative propagation is rapid, easy and cheap method of plant propagation. Such plants take less time to grow. They bear flowers and fruits early.

- The new plants are exact copies of the parent plant.
- The parent plant produces a large number of plants in a short time.
- Plants like banana, seedless grapes, roses, pineapples and Dahlias which do not produce seeds can only be grown vegetatively.

2. In grafting, a bud or cutting with buds of one plant, called the scion, is kept over the cut stem of a rooted plant, called the stock. The scion and the stock are then firmly tied together.

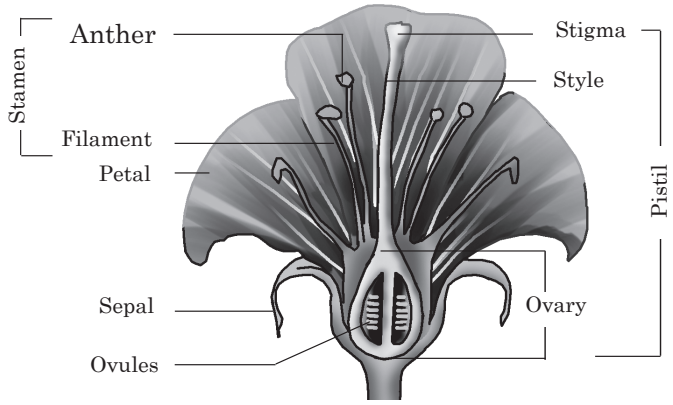
After some time, the tissues of the stock and scion join together to form one plant. The stock supplies the essential nutrients to the scion.

Advantages of Grafting:

- Plants, flowers and fruits of desired quality can be obtained.
- New varieties can be developed.
- Plants which cannot be grown by cutting or from seeds can be developed quickly by grafting.

3. Functions of different parts of flower:

- **Sepals:** They protect flower during bud stage.
- **Petals:** They protect the reproductive parts of flower and in some plants, they produce scent and attract insects.
- **Stamens:** They are male reproductive parts of flower and produce pollen grains.
- **Pistil:** It is the female reproductive part of flower that contains one or more ovules. An ovule contains an ovum.



4. Insect-pollinated flowers have following features:

- Anthers are large and loosely attached.
- Stigma hangs out of the flowers to trap the pollen grains.
- Have nectaries that produce nectar.
- Have sweet smell and bright colours.
- Have sticky stigma and sticky pollen grains.

5. Sexual reproduction in plants involves the following steps:
- Pollination: Transfer of pollen grains from anthers to the stigma
- Fertilisation: Union of male gamete with the female gamete to form zygote
- Formation of seed: Development of zygote into seed
- Formation of fruit: Maturation of ovary into fruit
- Germination of seed: Formation of young plant from the seed

6. Pollination is essential because it makes the union of male and female gametes possible.

Various agents of pollination:
- Wind–Maize
- Water–*Vallisneria*
- Insect–Sunflower

7. Flower is the reproductive part of a plant which develops fruits and seeds. Seeds are enclosed in fruits. Seeds and fruits are dispersed to various places by different agents such as air, water, insects, birds, etc. A seed has an embryo inside it. On reaching the moist soil, a seed grows into a new plant. Thus, a flower helps to produce new plants.

8. (a) Various methods of dispersal of seeds and fruits are:
- Dispersal by wind
- Dispersal by water
- Dispersal by animals
- Explosive mechanism

(b) The seeds which are dispersed by air are small, light and hairy so that they are blown to far away places. Seeds of some plants like maple and drumstick have wings, and that of madar and cotton have hair for floating in the air.

9. (a)
- Sexual reproduction needs two (male and female) individuals while asexual reproduction needs only one individual.
- Sexual reproduction involves fusion of male and female gametes while asexual reproduction does not involve any gametes.

(b) When plants grow from modified vegetative parts, it is called natural vegetative propagation. For example, roots modified as root tubers in *Dahlia,* stem modifies as stem tuber, rhizome and bulb in potato, ginger and onion respectively. Leaves of some plants such as *Bryophyllum* grow adventitious buds in the notches which develop into new plants. On the other hand, when the plants are grown from vegetative parts by using some developed techniques, it is called artificial vegetative propagation such as stem cutting, layering, grafting and tissue culture.

(c) In self-pollination, the pollen grains are transferred to the stigma of same flower or of different flower of the same plant while in cross-pollination

pollen grains are transferred to the stigma of another flower borne on a different plant of the same kind.

10. (a) 1–Ovule 2–Placenta 3–Ovary 4–Thalamus

(b) 1. Ovule forms the seed.

2. Placenta provides attachment as well as nutrition to ovules.

3. Ovary encloses ovules and develops into a fruit on maturing.

4. Thalamus supports all the parts of a flower.

11. (a) Artificial (b) Stems; Potato (c) Adventitious buds, *Bryophyllum*

(d) Layering; Jasmine (e) Grafting; Mango (f) Tissue culture; *Asparagus*

(g) *Dahlia*; (h) Rose

F. 1. Potato is a modified stem because it has buds in the depressions called eyes. These eyes represent the nodes. The buds in eyes give rise to new plants. Sweet potato is a modified root because it does not have nodes or adventitious buds on it.

2. The wind may carry pollen grains to unsuitable places, i.e., away from their target sites. Some pollen grains might be damaged in the midway. Therefore, to ensure pollination, wind-pollinated flowers produce large amount of pollen grains.

3. Seeds and fruits dispersed by water are large and spongy so that they may float on water and may be carried to far off places by water currents without being damaged.

G. Across: 1. FLOWER **3.** CALLUS **4.** POTATO **5.** SCION **6.** OVULE **7.** GRAFTING **8.** SPORE **9.** NECTAR

Down: 1. FERTILISATION **2.** POLLINATION **5.** STEM **6.** ONION **7.** GINGER **8.** SEED

14 Motion and Time

ANSWERS

CHECK POINT 1

1. (T) **2.** (F) **3.** (F) **4.** (T) **5.** (F) **6.** (F)

CHECK POINT 2

1. Graph **2.** Line graph **3.** Axes **4.** Tabular data **5.** Inclined straight line
6. Horizontal line

PRACTICE TIME

A. 1. (d) **2.** (d) **3.** (c) **4.** (b) **5.** (c)

B. 1. revolutionary motion **2.** speed **3.** Sundial **4.** stopwatch **5.** mean **6.** origin

C. 1. We observe
- The distance travelled by the object, and
- The time taken to travel this distance.

2. X-axis and Y-axis
3. kilometre/hour (km/h)
4. Sand clock
5. Speedometer
6. Nonuniform motion

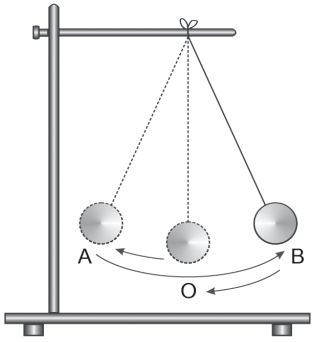
D. 1. We measure the distance covered by an object and time taken to cover this distance.

2. We know, 1 km = 1000 m and 1 h = 60 min = 60 × 60 s

$$\therefore \quad 1 \text{ km/h} = \frac{1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{5}{18} \text{ m/s}$$

3. If a moving body covers unequal distances in equal intervals of time or equal distances in unequal intervals of time, it is said to be in nonuniform motion. On the other hand, if a moving body covers equal distances in equal intervals of time, it is said to be in uniform motion.

4. If initially, the bob is displaced from its mean position, say O to point A and released, it comes back to its mean position and continues to move forward to point B, comes back towards the mean position. Thus, the motion of the bob starting from point O to point A, then A to B via O, and finally back to O from B, is counted as one oscillation.



5. Multiples of second

1 minute = 60 seconds

1 hour = 60 minutes = (60 × 60) seconds = 3600 seconds

1 day = 24 hours

1 month = 30 days

1 year = 12 months = 365.25 days or 365 days 6 hours

Some other multiples of second are decade, century and millennium.

Submultiples of second

Microsecond and nanosecond are some of the submultiples of a second.

6. Average speed is the mean of all the speeds of a body when it is in nonuniform motion.

The average speed is calculated by dividing the total distance travelled by the total time taken in covering the distance.

$$\text{Average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

7. As the distances travelled vary during the same duration of time, the motion represented by the data is nonuniform motion.

8. The speed of a moving vehicle is measured with the help of a speedometer. It shows the speed in km/h or miles per hour (MPH).

Odometer is used to measure the distance travelled by an object. It records the distance in kilometres.

9. Speed of an object is defined as the distance travelled by the object in a unit time. The SI unit of speed is m/s (metre per second). The other commonly used unit is km/h (kilometre per hour).

E. 1. The time taken by the bob to complete one oscillation is known as the time period of the simple pendulum.

The time period of a simple pendulum can be calculated experimentally as follows:

Take a 1 m long cotton thread and tie a metallic bob to one of its ends. Tie its other end to a rigid support (iron stand) in such a manner that the thread and the bob do not touch the ground or any other object. Let the bob come to rest. Mark the mean position of the bob carefully with a pen or a chalk on the ground or the wall behind the pendulum. Keep a stopwatch ready. Slightly

displace the bob to one side and release without pushing it. Start the stopwatch as soon as the bob reaches the mean position. Count 1 oscillation when the bob crosses the mean position, in the same direction. Count 20 such oscillations and stop the stopwatch at the end of 20th oscillation.

Now, calculate time period by dividing the time taken for completing the oscillations by the number of oscillations.

2. The speed of a ball rolling on the floor can be measured by following method:

Take each of the footballs (toys), one at a time. Place the football on a surface and mark its initial position. Carefully, start the stopwatch as soon as you allow the football to move and stop it when the football stops. Note this time. Mark the last point of the journey of the football. Measure the length of the path travelled by the football. Now, calculate the speed of the football by dividing the distance travelled by the time taken.

3. A sundial can be made as follows:

Take a big cardboard sheet and cut out a circular piece of 50 cm diameter. Take a wooden rod of about 20 cm. Fix it upright at the centre of cardboard disc with the help of a good adhesive. Keep this arrangement in the sun on a sunny day in an open space at 6 am in the morning. Observe the shadow of the central rod on the disc, mark its position at the circumference of the disc with the help of a pencil and write the time at this point. Note the position of the shadow and mark its presence near the circumference of the disc after every hour till the sunset. Your sundial is ready.

4. Before the invention of pendulum clock, the time was measured by rising and setting of the sun, from one new moon to next one, by the earth to complete one revolution around the sun, by sundials, water clocks and sand clocks.

(a) The time period of a simple pendulum is not affected by increasing or decreasing displacement of the bob.

(b) Time period is directly proportional to the length of the simple pendulum. Hence, if the length of the string is increased, the time period would also increase and *vice versa*.

F. 1. Distance swum by a fish = 18 m, Time taken = 6 s

$$\therefore \quad \text{Speed of the fish} = \frac{\text{Distance}}{\text{Time}} = \frac{18\text{ m}}{6\text{ s}} = 3\text{ m/s}$$

2. For Santro car,

Distance = 120 km, Time = 3 h, speed = ?

$$\therefore \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{120\text{ km}}{3\text{ h}} = 40\text{ km/h}$$

For Maruti Zen car,

Distance = 150 km, Time = 4 h, Speed = ?

$$\therefore \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{150 \text{ m}}{4 \text{ h}} = 37\frac{1}{2} \text{ km/h}$$

From the above calculations, we have 40 km/h > $37\frac{1}{2}$ km/h

Thus, Santro car was moving faster.

3. Amit, Aman and Neeraj all the three ran a race of same distance, i.e., 100 m. But, they covered the track in different interval of time. Let us arrange the time taken by them in increasing order.

Aman (18.9 s) < Amit (19.5 s) < Neeraj (20.5 s)

Thus, we see that Aman covered the track in the least duration of time, so he won the race. Also, we observe that Neeraj took maximum time to cover the track, hence he got the third position.

4. Distance = 12 m, Time = 15 s, speed = ?

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{12 \text{ m}}{15 \text{ s}} = 0.8 \text{ m/s or } 80 \text{ cm/s}$$

($\therefore$ 1 m = 100 cm)

Thus, the speed of the ant was 80 cm/s or 0.8 m/s.

5. Speed = 5 m/s, Distance = 62 m, Time = ?

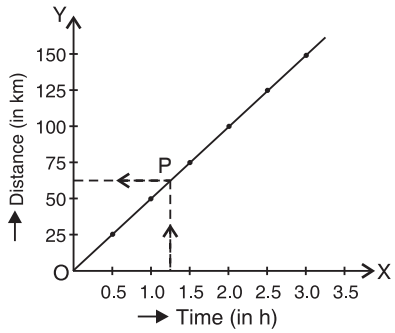
As $\quad \text{Speed} = \frac{\text{Distance}}{\text{Time}}$,

Hence, $\quad \text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{62 \text{ m}}{5 \text{ m/s}} = 12.4 \text{ s}$

6. Distance = 200 km, Time = 2.5 h, Average speed = ?

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}} = \frac{200 \text{ km}}{2.5 \text{ h}} = 80 \text{ km/h}$$

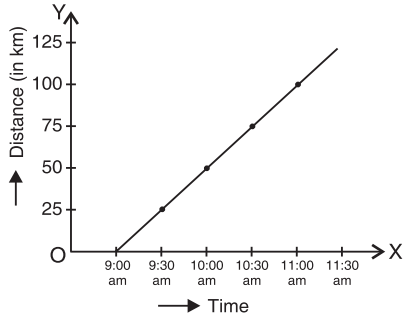
7. (a) Let us draw a distance–time graph using the given data.



From the graph, we observe that the object is moving with a uniform speed. When we move from the point 1.25 h (of time axis) vertically upward, we arrive at point P on the graph then move parallel to time axis towards

distance axis. Hence, we reach at a point where the value is 62.5 km. Thus, the distance travelled at time 1.25 h is 62.5 km.

(b) Using the data, let us plot a distance–time graph.



(i) The graph so obtained is a straight line, hence, the vehicle is moving with a uniform speed.

(ii) Time duration = 9:30 – 9:00
= 30 min
Distance covered = 25 – 0 = 25 km

$$\therefore \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{25 \text{ km}}{30 \text{ min}} = \frac{25 \text{ km}}{\frac{1}{2} \text{ h}} \quad (\because 60 \text{ min} = 1 \text{ h})$$

$$= 50 \text{ km/h}$$

$$\text{Again, speed (in m/s)} = 50 \text{ km/ h}$$

$$= 50 \times \frac{5}{18} \text{ m/s} = 13\frac{8}{9} \text{ m/s}$$

G. 1. A car will move unequal distances in equal intervals of time on a crowded road. So, its motion will be nonuniform motion, whereas people jogging in park will have no obstacles in their way, so they will run equal distances in equal intervals of time and will reach at a fixed point after a definite interval of time. Hence, their motion will be uniform periodic motion.

2. $\text{Speed} = 2 \text{ m/min}, \text{Time} = 45 \text{ s} = \frac{45}{60} \text{ min}$

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$= 2 \text{ m/min} \times \frac{45}{60} \text{ min}$$

$$= 1.5 \text{ m}$$

$\because \quad 1 \text{ m} = 100 \text{ cm}$

$\therefore \quad 1.5 \text{ m} = 1.5 \times 100 \text{ cm} = 150 \text{ cm}$

Also $\quad 1000 \text{ m} = 1 \text{ km}$

$\therefore \quad 1.5 \text{ m} = 1.5 \div 1000 \text{ km} = 0.0015 \text{ km}$

15 Electric Current and Its Effects

ANSWERS

CHECK POINT 1

1. Electric current **2.** Cell or Battery **3.** Open circuit **4.** Straight line
5. Closed key **6.** Conductor

CHECK POINT 2

1. heating **2.** filament **3.** resistance **4.** nichrome **5.** electric fuse

CHECK POINT 3

1. (T) **2.** (F) **3.** (F) **4.** (T) **5.** (T)

PRACTICE TIME

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

B. 1. positive, negative **2.** battery **3.** tungsten **4.** nichrome **5.** copper **6.** temporary

C. 1. Electric bulb **2.** Battery **3.** Fuse **4.** Ammeter **5.** Electromagnet

D. 1. Electric bulb, geyser, heater, electric iron, etc. are based on heating effect of electric current.

2. Electromagnet is a soft iron bar wrapped around by a coil of conducting wire which behaves as a magnet on passing electric current through it.

Uses of electromagnet:

- To separate iron scrap from the junk in industries.
- Doctors use very small but strong electromagnets to remove iron dust from a patient's eyes.
- In electric motors and receivers of telephones.
- In picture tubes of television and computer screens. They help in the formation of image on the screen.
- A number of electromagnets are used in a car which help in moving of different parts and generate electricity as well.

3. The amount of heat produced by the current-carrying conductor is affected by the following factors:

- The material of the conductor

- The length of conductor
- The thickness of conductor
- The time for which the current flows

4. The Bureau of Indian Standards is an authority who tests/marks the electrical devices/appliances and gives its marking known as ISI mark for superior quality. This mark has a great importance because it ensures the safety and energy saving by the device.

5. The strength of an electromagnet can be increased by increasing:

- the amount of current flowing through the coil
- the number of turns of copper wire in the coil

E. 1. When amount of current is increased through a conductor, it produces more heat. This fact can be shown experimentally as follows:

Procedure: Make 3 circuits to glow a bulb, one with a single cell, the second with two cells and the third with three cells. Switch each circuit 'on' for two minutes and then switch it 'off'. Touch and feel the glass of the bulb in each circuit.

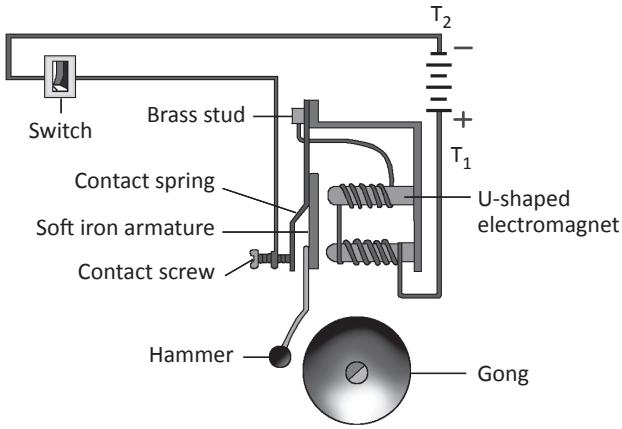
Observation and Conclusion: The bulb in the second circuit is hotter than that in the first circuit while the bulb in the third circuit is the hottest. It is because on increasing the number of cells in the respective circuits, the amount of current passing through them is increased. Therefore, more is the current flowing through a material, larger is the heat generated.

2. A fuse is a safety device which limits the current in an electric circuit. If the current in a circuit exceeds a specified value, the fuse wire melts and breaks the circuit.

When a circuit gets overheated due to overloading, the fuse melts a little before any other part of the circuit melts. This stops the flow of current, and further heating and burning of the circuit is prevented.

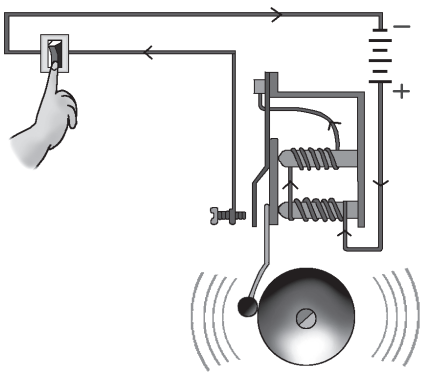
3. Structure of Electric Bell: An electric bell is made up of the following components.

- **Electromagnet:** There is a U-shaped electromagnet. It is magnetised when the push button of the bell is pressed.
- **Armature:** It is a soft iron strip which is attracted by the electromagnet, when it is magnetised.
- **Hammer:** It is a small metallic sphere which is made of steel. It is attached to the armature at its one end with the help of a soft, springy thin piece of metal. The hammer strikes with the gong to produce sound.
- **Gong:** It is a big metallic hemisphere, to which the hammer strikes to produce sound.
- **Contact screw:** It is a make and break screw which is adjustable. It is used to adjust the contact between the armature and the push button of the bell to produce best sound. It can change the frequency of the ringing bell.



Working of an Electric Bell

- The terminals T_1 and T_2 are connected to a battery through a push button switch. When the switch is pushed 'on', the current flows through the electromagnet and contact screw. As a result, the electromagnet is magnetised and attracts the armature.
- The hammer connected at the end of armature moves to hit the gong and produces a sound. This time, the contact between the contact spring and contact screw breaks. As the circuits breaks, the electromagnet gets demagnetised.
- The coil is no longer a magnet. The armature moves back. The circuit is made again and as a result, the above steps are repeated.



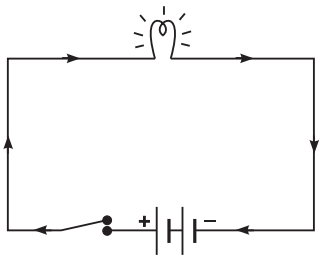
The bell goes on ringing, until the push button is released.

4. 1. (c) This electromagnet consists of maximum number of turns in the coil and a battery of three cells. Hence, its magnetic field is of the greatest strength.

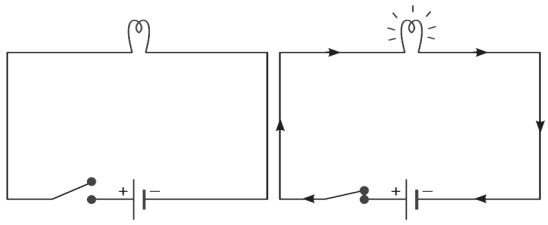
2. (a) +ve terminal is longer than the –ve one.

3. (c) Circuit is complete with closed switch.

5.



6.



(a) Open circuit (b) Closed circuit

F. 1. Besides giving light, an electric bulb also gives out heat which is not desirable because it consumes more electricity and causes wastage of it. However, using fluorescent tubes and compact fluorescent lamps (CFLs) is a better option as they produce light by using very small amount of electricity. Hence, they save energy and produce better quality of light.

2. The fuse wire is made of tin or alloy of tin and copper because these materials have a melting point lower than that of normal connecting wires and devices. This helps melt the fuse wire before any other component and saves them from burning.

3. Electric iron, toaster, geyser, room heater, bulb, fuse, MCB, etc. use heating effect of electric current.

In some appliances, heat produced due to flow of current is waste. For example, electric bulb, mixer and grinder, air conditioner, refrigerator, etc.

16 Light

ANSWERS

CHECK POINT 1

1. straight **2.** path **3.** incident **4.** real **5.** equal

CHECK POINT 2

1. reflects **2.** virtual **3.** concave **2.** convex

CHECK POINT 3

1. (F) **2.** (T) **3.** (T) **4.** (F) **5.** (F) **6.** (F)

PRACTICE TIME

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

B. 1. (c) **2.** (a) **3.** (b) **4.** (e) **5.** (d)

C. 1. Concave mirror.

2. Luminous objects such as a burning candle, a glowing bulb, sun, stars, etc.

3. Convex lens.

4. Red.

5. Concave lens.

6. The seven colours of white light are Violet, Indigo, Blue, Green, Yellow, Orange and Red.

D. 1. Mirrors are smooth and polished reflective surfaces commonly made of glass. These are of two types–plane mirrors and curved or spherical mirror. Further, spherical mirrors are of two types, namely, concave mirror and convex mirror.

2. The interchanging of left and right sides of an object with its image formed by a plane mirror is called lateral inversion.

For example, when you lift your left hand in front of a plane mirror and touch your left earlobe, you see that right hand of your image lifts up and touches the right earlobe. This is an example of lateral inversion.

3. The principal focus is a point at principal axis where light rays parallel to principal axis, after reflection or refrection either pass through it (in concave mirror, convex lens) or appear to come from this point (in convex mirror, concave lens).

The distance between the pole and principal focus of a mirror is called its focal length.

4. A lens which has a bulge at the centre and is narrow towards the edges, is called a convex or converging lens. It is because it gathers the rays of light falling on it at a point.

A lens which is thin at the centre and thick towards the edges, is called a concave or diverging lens. It is because it spreads the rays of light falling on it.

5. Differences between a real image and a virtual image:

Real Image	Virtual Image
1. It is formed when the rays of light actually meet at a point after reflection or refraction.	1. It is formed when the rays of light appear to meat at a point but actually they do not meet after reflection or refraction.
2. It can be obtained on a screen.	2. It cannot be obtained on a screen.
3. It is always inverted. For example image obtained on the screen in a cinema hall.	3. It is always erect. For example, image of our face viewed in a looking glass.
Examples: Images formed by concave mirror and convex lens.	Examples: Images formed by plane mirror, convex mirror and concave lens.

6. The splitting of light into its seven constituent colours is called dispersion of light.

7. Uses of lenses are:

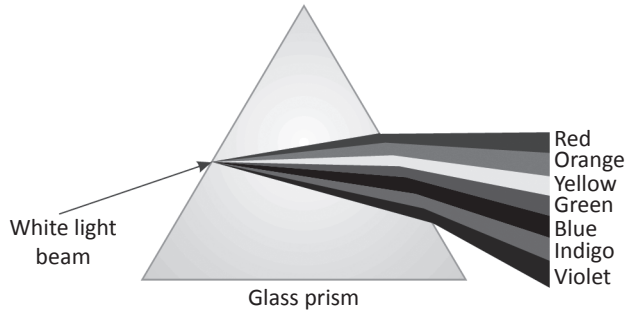
- Convex lenses are used in cameras of all types, except a pinhole camera.
- Convex lenses are used in telescopes, microscopes, magnifying glasses and in spectacles to help people see nearby things clearly.
- Concave lenses are used in spectacles to help people see distant objects clearly.

E. 1. To get a real image of the sun with a concave mirror, take a concave mirror, a sheet of white paper and a metallic plate. Paste the white sheet of paper on a metallic sheet using glue or cellophane tape. This will act as a screen. Now, go in the sun and hold the concave mirror in your one hand and screen in other hand. Focus the sunlight reflected by the mirror to fall on the screen. Now, adjust the distance between mirror and screen so that you get a small bright and sharp white spot on the screen. This is the image of the sun.

2. 'White light is made of seven colours' can be shown by following activity:

Procedure: Take a prism. Place it on a table in front of a window in a room, so that sunlight falls on one of the faces of the prism. Look into the prism, adjust your eye by slightly changing its position, till you see a spread of colours

in the form of a thick band of violet, indigo, blue, green, yellow, orange and red.



Hold a sheet of white paper in front of the opposite face of the prism. You can see the band of these seven colours on it.

3. Concave and convex mirrors are made from glass spheres, therefore, they are called spherical mirrors.

The images formed by concave mirror are real or virtual, larger, smaller or same size as that of the object, and erect or inverted. The images formed by convex mirror are always erect, diminished and virtual.

Applications of Spherical Mirrors

Concave mirrors are used as:

- reflectors in solar furnaces to attain very high temperature.
- reflectors in torches, headlights of vehicles, in telescopes, microscopes, etc.
- a dentist's mirror, to see an enlarged image of the tooth.
- make-up mirrors at beauty parlours.
- shaving mirrors by the barbers.

Convex mirrors are used:

- for vigilance at big shops and warehouses.
- as side mirrors or rear view mirrors in vehicles.
- as distance view mirrors at the turning points of narrow staircases.

4. A concave mirror converges the light falling on it at a point, so it is called a converging mirror.

To differentiate between a concave and a convex mirror without touching them, we place an object in front of them at different positions and observe the nature of image formed by them. If the image is smaller in size, the mirror is convex and if the image is larger in size then the mirror is concave.

F. 1. Convex mirror forms, virtual and erect image of smaller size than the object. It can form images of objects spread over a large area. This helps the driver to view the traffic behind the vehicle. Hence, convex mirrors are used as side mirrors in vehicles.

2. A cylindrical glass container full of water acts as a magnifying glass (convex lens) and forms the images of lemons and decorative marbles kept inside it bigger in size, virtual and erect. Hence, they appear larger.

3. Concave lens of suitable power.

G. Down: 1. DIVERGENCE **2.** VIRTUAL **3.** CONVEX

Across: 4. REFLECTION **5.** REAL **6.** SPECTRUM

17 Water

ANSWERS

CHECK POINT 1

1. water **2.** water vapour **3.** transpiration **4.** droplets of water **5.** groundwater

CHECK POINT 2

1. (F) **2.** (F) **3.** (T) **4.** (F) **5.** (T)

PRACTICE TIME

A. 1. (d) **2.** (b) **3.** (c) **4.** (b) **5.** (b)

B. 1. Typhoid; cholera **2.** Groundwater **3.** aquifer **4.** population **5.** Conservation **6.** Rainwater harvesting

C. 1. The circulation of water between environment and land is called water cycle.

2. The water beneath the earth's surface that seeps through the soil and reaches to the bedrock is called groundwater.

3. The seeping of water under the ground through soil is called infiltration.

4. The level of water under the ground is called water table.

5. Water conservation.

6. Rains.

D. 1. Groundwater is mainly used for drinking and agricultural purposes. It is drawn through wells, handpumps, tubewells, etc.

2. Due to water scarcity,

(a) Crop production is affected which causes insufficient supply of food.

(b) People have to walk miles to fetch water or have to stand in long queues to get water.

(c) People may have to buy water at high prices.

3. We can draw water from an aquifer through tubewells and handpumps.

4. Putting a layer of mulch which includes leaves, bark, etc. slows down the evaporation and retains the moisture in the soil. This helps more water to seep under the ground and increase the water table.

5. The seawater is salty and thus it is unfit for use. Therefore, we cannot use seawater for drinking or irrigation.

6. Rainwater harvesting is a method of collecting and storing rainwater to be used in future. This water can be used for washing and irrigation purposes.
7. The thoughtful and judicious use of water to fulfil the demand of water for various purposes is called water conservation.

E. 1. Due to acute water shortage:
- Crop production is affected. This may cause insufficient supply of food.
- People have to walk miles to fetch water.
- People have to stand in long queues to get their daily water.
- People may have to buy water at high prices.
- People may drink dirty (contaminated) water which can cause waterborne diseases like cholera, dysentery, typhoid, etc.

2. Water on the earth is found in all the three states, i.e., solid, liquid and gas.
- In the liquid form, water is present in oceans, rivers, seas, lakes, ponds, etc.
- In the solid form, water is found as ice and snow on high mountains, glaciers and at the poles.
- In the gaseous form, water is present as water vapour in the air.

3. About three-fourths of the earth's surface is covered with water in the solid and liquid forms. In solid form, about 1.6% of the total water is found as glaciers and polar ice caps. In liquid form, about 98% of the total water on the earth is present in oceans, 0.036% in lakes, streams and rivers. Also 0.36% is found in underground aquifers.

4. The major causes of groundwater depletion are:
- **Rapidly rising population and changing lifestyles:** Increase in population has increased the demand for groundwater. More and more groundwater is being extracted leading to depletion of ground water.
- **Agricultural activities:** Increase in population has also led to an increase in the crop production. For this, more and more wells have been drilled for irrigation in the past few decades.
- **Reducing forest cover:** Due to clearing of forests, less amount of water is seeping into the ground, thereby causing lowering of water table.

5. Various ways of conserving water are:
- Turning off tap while brushing, shaving, etc.
- Repairing leaky taps immediately.
- Using bucket and mug instead of shower for bathing.
- Using least amount of detergent for washing clothes, utencils, etc.
- Not overwatering plants, but mulching them.
- Adopting rainwater harvesting.

F. 1. This is because at the time of our parents and grandparents, the size of population was small and there was no scarcity of water.

2. The sea level roughly remains the same because water continuously circulates between the atmosphere, land and oceans by the process of evaporation and condensation.

G. 1. GROUNDWATER **2.** RAINWATER **3.** AQUIFER **4.** FOREST
5. WATER TABLE **6.** INFILTRATION **7.** WATER CYCLE **8.** MULCH
9. WELL **10.** SNOW

18 Forest

ANSWERS

CHECK POINT 1

1. Canopy **2.** Recreation Parks **3.** Tribals **4.** Suspended particulate matter

CHECK POINT 2

1. pollination **2.** Oxygen **3.** Deforestation; pollution **4.** afforestation

PRACTICE TIME

A. 1. (a) **2.** (d) **3.** (c) **4.** (b)

B. 1. (F) **2.** (T) **3.** (F) **4.** (F) **5.** (T)

C. 1. About 3.9 billion hectares.

2. Living things and their environment together form an ecosystem.

3. Increased level of carbon dioxide gas in the air causes global warming.

4. Large-scale planting of tree saplings is called afforestation.

5. In the year 1970.

D. 1. (a) Forests purify and provide fresh air by using carbon dioxide during photosynthesis and releasing oxygen in atmosphere.

(b) Forests prevent soil erosion by holding soil particles together.

2. Plants are producers. They make food by trapping solar energy, using carbon dioxide from air, and water and minerals from soil. Herbivores, which are primary consumers, eat plants and carnivores, which are secondary consumers, prey upon herbivores. Thus, plants provide food to all animals directly or indirectly. On the other hand, plants depend on animals for inorganic nutrients and carbon dioxide.

3. The roots of plants hold soil particles together. The plants growing on the ground check the free flow of water and also that of the wind. This prevents the topsoil from being washed away by water or blown away by wind. Hence, forests help in the conservation of soil.

4. Social forestry is a scheme introduced by the Indian Government in 1970. In this scheme, urban and rural wastelands are used to grow trees by local people.

5. (a) Plants need carbon dioxide for photosynthesis which is released by animals during respiration.

(b) Plants need inorganic salts which they get from the soil. The bodies of dead and decaying animals are broken down by microbes into inorganic compounds. These compounds get percolated into the soil and provide nutrients to the plants.

6. The conversion of a green area into a dry and sandy one due to low rainfall and removal of vegetation is called desertification.

E. 1.
- Plants purify air by using carbon dioxide in photosynthesis and releasing oxygen in the atmosphere. This maintains a balance of oxygen and carbon dioxide in the atmosphere.
- Forests provide food to all wild animals directly or indirectly. Herbivores eat plants and carnivores prey upon herbivores.
- Forests provide us firewood (fuel), timber, plywood, bamboo, wood for paper, gum, resin, fibre, nonedible oils, honey, beeswax, lac and *bidi* leaf. Rubber and oils like pine oil, olive oil, khus oil, sandalwood oil, etc. are also obtained from forests.
- Plants are sources of many ayurvedic medicines.
- Trees regulate climate and maintain water cycle.
- Forests act as natural absorbers of rainwater. The trees hold rainwater and prevent its free flow. This reduces the chances of flood.
- Trees hold the soil particles and prevent their free flow due to rainwater and flying away due to air. This prevents soil erosion.
- Forests check air pollution.
- Forests provide habitat for a large variety of wild animals.
- Forests provide everything to the tribal people living in forests, i.e., food, water, shelter, medicines, firewood, etc.

2. Large-scale cutting of trees is called deforestation.

The main causes of deforestation are:
- Increased demand of fuelwood and wood for paper and timber.
- Increased demand of land for industries, houses, roads, railway tracks and other transport facilities.
- More land for agriculture to provide food for increasing human population.
- Increased mining activity.
- Lowering of watertable causes plants and trees to wilt and die.
- Overgrazing by cattle and sheep.

3. Animals depend on plants for:
- Food, which is a source of energy, is obtained by eating leaves, fruits, seeds, nuts, etc.
- Oxygen, which is needed for respiration, is released by plants during photosynthesis.
- Shade and protection is provided by large trees. Animals hide under the trees to protect themselves from bright sun or rains.

- **Shelter:** Birds live and make their nests on trees. The nests provide shelter and protection to their eggs and young ones. Wild animals hide themselves in dense bushes and tall grasses.

4. Deforestation leads to:
- Increase in overall temperature of the earth called global warming.
- Lesser rain causing desertification, i.e., spread of deserts.
- Increased soil erosion, i.e., loss of humus from soil.
- Unbalanced ecosystem leads to depleted groundwater, and disturbed oxygen (O_2) and carbon dioxide (CO_2) ratio in the atmosphere.
- Danger to wildlife.
- Loss of forest produce.
- Loss of biodiversity due to extinction of various forest plants and wild animals.

5.
- Large scale felling of the forest trees must be stopped.
- When trees are cut, more trees should be planted in their place.
- Overgrazing by cattle and other animals should be stopped.
- To develop new forests, more saplings should be planted every year during the rainy season.
- Forests must be protected from insects, pests and infections by treating them with insecticides and pesticides.
- Forest fires must be checked. People should avoid smoking or cooking in the forest area.
- Human activities leading to soil erosion must be stopped.
- Air, water and land should be conserved, i.e., pollution of air, water and land should be controlled so that trees and vegetation could survive.

F. 1. Large-scale felling of trees is known as deforestation, whereas conversion of green land into desert is called desertification.

2. Carnivores are the animals such as lion, tiger, etc. that prey upon herbivores, whereas scavengers are the animals that feed on the bodies of dead animals and left over food by the carnivores, for example, hyena, jackal, etc.

3. The sequence in which a producer (green plant) is eaten by a herbivore (primary consumer) and the herbivore is preyed upon by a carnivore (secondary consumer) is called food chain.

Food web is the interlinking of various food chains in which a consumer gets various sources of food. In case one food chain gets disturbed, the other food chain is always there to support the animal.

G. 1. Forests are called lungs of nature because green plants release oxygen during photosynthesis and take carbon dioxide from the air.

2. If decomposers are destroyed from the forest, the break down of dead and decaying complex organic matter of plants and animals into simple inorganic matter will not take place and there will be dead bodies all around in the forest.

3. Decaying matter appears warm and moist because microbes feed upon decaying matter and use it for getting energy. They respire anaerobically releasing water and heat.

H. Down: 1. FOREST **2.** CARNIVORES **3.** CONSUMERS **4.** CANOPY **6.** FOOD CHAIN

Across: 5. AFFORESTATION **7.** RECYCLE

19 Waste Water Story

ANSWERS

CHECK POINT 1

1. waste water **2.** sewage **3.** contaminants **4.** pollution

CHECK POINT 2

1. Potable water **2.** Sewage **3.** Water pollutants **4.** Septic system

PRACTICE TIME

A. 1. (b) **2.** (d) **3.** (c) **4.** (c) **5.** (c)

B. 1. (T) **2.** (F) **3.** (F) **4.** (T)

C. 1. Chlorine; ozone **2.** clarified water **3.** methane, hydrogen, carbon dioxide; hydrogen sulphide **4.** oils; fats

D. 1. The organic impurities present in sewage are human wastes, animal wastes, food wastes, soaps, detergents, pesticides, etc.

2. The organic solid matter collected at the bottom of the sedimentation tank is called sludge.

3. Biogas

4. The water containing waste from various sources is called sewage.

5. We use water for drinking, cleaning, bathing, washing, cooking, etc.

6. Typhoid, Cholera.

E. 1. The process of removing contaminants from waste water is called waste water treatment. It involves screening, sedimentation, aeration and disinfection of waste water.

2. It is important to treat the sewage before it is discharged because it contains lots of germs and impurities. If discharged untreated, it will affect aquatic life by killing many aquatic animals such as fish, tortoise, etc.

3. When sewage is passed through bar screens, impurities in the form of large objects like rags, wood pieces, sticks, stones, cans, polythene bags, etc. are left behind making the water suitable to be passed through equipments installed in water treatment plants.

4. Biogas is formed by the decomposition of sludge, collected at the bottom of sedimentation tank, by anaerobic bacteria.

5. The clarified water contains suspended organic impurities in the form of animal waste, soaps, detergents, etc. When clarified water is passed through aeration tank, these impurities are decomposed by aerobic bacteria releasing carbon dioxide. The water so obtained is safe to discharge into the rivers or lakes.

6.
- Used oils and fats should not be thrown in the drain as they may choke the pipes.
- Leaking sewage pipes should be repaired immediately because they can contaminate drinking water.

7. We can reduce water pollution at public places by not throwing plastic bags or rubbish or litter in the waterbodies.

F. 1. Harmful effects of untreated sewage are:
- Untreated sewage contains lots of harmful bacteria, parasites, fungi, viruses, etc. that can cause infections and diseases.
- It can lead to both surface water and groundwater pollution.
- It contains lots of toxic chemicals that can kill marine life.
- Sewage from leaking sewer pipes can enter drinking water pipes and contaminate them.
- Untreated sewage may cause blockages in drains and they encourage mosquito and fly breeding.
- It can lead to dirty and stinking surroundings.

2. When water is allowed to pass into sedimentation tank, organic solid matter like faeces sinks slowly to the bottom and materials like grease and oil float at the surface and are skimmed off. The organic solid matter collected at the bottom of the sedimentation tank is called sludge which is continuously removed by scrapers. The water now obtained is called clarified water and looks cleaner.

3. A septic system is a highly efficient underground waste water treatment system. It is an alternative method of sewage disposal where sewage treatment is not possible. Septic systems are less expensive than sewer systems. Septic system uses natural processes to treat the waste water. The two main parts of a septic system are a septic tank and a drain field. In a septic tank, anaerobic bacteria decompose the waste discharged into the tank.

4. The natural ways of sewage treatment are septic system and decomposition of sewage by aerobic and anaerobic microorganisms.

G. 1. Yes, overwatering the plants can lead to contamination of groundwater as fertilisers dissolved in water can reach into the ground causing contamination of groundwater.

2. Microorganisms present in waste material help in the treatment of sewage by decomposing its organic part into simpler form.

H. Across: 1. TYPHOID **3.** SEWAGE **5.** ANAEROBIC **7.** AEROBIC
Down: 2. POTABLE **4.** BIOGAS **6.** CHLORINE