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Infinity Science

Teacher's Manual

CLASS 7

Ottimo Publications

Infinity Science
Class – 7

Chapter – 1 Nutrition in Plants

Knowledge Check (Page 11)

1. autotrophic and heterotrophic
2. photosynthesis
3. Charles Barnes
4. Oxygen
5. Carbon dioxide

Knowledge Check (Page 13)

1. (b) Saprophyte
2. (c) Insectivorous plant
3. (d) Symbiosis
4. (e) Parasitic plant
5. (a) Insectivorous plant

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) Iodine
2. (c) Oxygen
3. (b) Sundew
4. (d) Stomata
5. (b) symbiotic plants

B. 1. chloroplast
2. Sunlight, water, carbon dioxide, and chlorophyll
3. Guard cells, stomata
4. leaves
5. Chlorophyll

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

D. 1. a. Green plants that prepare their own food are called autotrophic nutrition. Types of nutrition in which an organisms is dependent on another organism for food are called heterotrophic nutrition.

b. Organisms that feed on other organisms partially or completely to derive nutrition are called Parasitic plants. Some plants live in association with other organisms for their food and both are benefitted from each other are called symbiotic plants.

2. The raw materials required for photosynthesis are light, carbon dioxide, water and chlorophyll.
3. Boil the leaf to kill it, then place it in iodine solution. If starch is present, the leaf will turn blue-black.
4. Carbon dioxide + Water $\xrightarrow{\text{Sunlight and chlorophyll}}$ Carbohydrates + Oxygen
5. The leaves of the pitcher plant are modified to form a pitcher-like structure.

E. 1. Activity:

Aim: To demonstrate that light is essential for photosynthesis.

Materials required: A potted plant, black paper, iodine, Bunsen burner, beaker, test tube, alcohol, Petri dish.

Procedure:

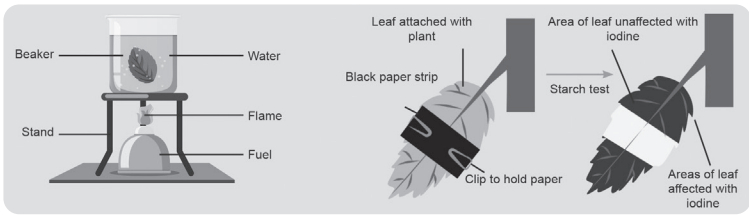
1. Take a potted plant and keep it in the dark for 72 hours so that the leaves become free from starch. (The presence of starch will be used to indicate the process of photosynthesis.)
2. Select a leaf from the plant and cover a portion on the both sides of the leaf with black paper. Keep the potted plant with the covered leaf in sunlight for a few hours.
3. After a few hours, pluck the leaf from the plant and remove the paper from both sides.
4. Heat a beaker on the Bunsen burner and boil the leaf in it.
5. Prepare a water bath by putting a test tube in a beaker placed on a Bunsen burner. Add alcohol in the test tube and place the boiled leaf in the water bath. After some time, because of the removal of chlorophyll, the leaf will become dull and white in colour.
6. Wash the leaf with water and place it in a Petri dish.
7. Add a few drops of iodine to the leaf and record your observations.

Observation:

The portion of the leaf that was covered with black paper does not change colour whereas the rest of the leaf changed its colour to bluish black.

Conclusion:

The covered portion of the leaf did not receive sunlight for photosynthesis and hence did not change its colour. The change in colour in the remaining portion of the leaf indicates the presence of starch. Thus, we can say sunlight is essential for photosynthesis.



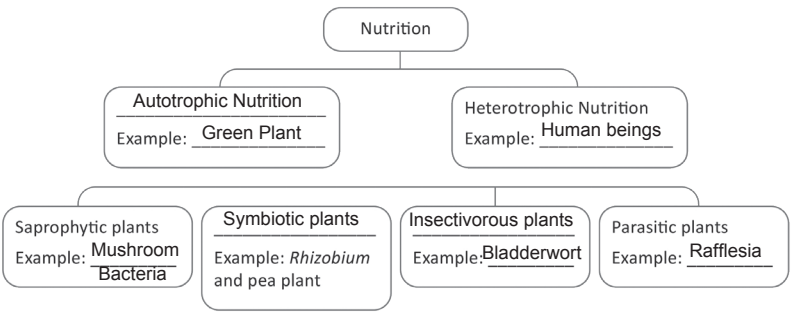
2. The mode of nutrition in which living organisms prepare their own food is called autotrophic nutrition. The word 'autotrophic' is made of two words—auto means self and trophe means nutrition. Organisms that exhibit this mode of nutrition are called autotrophs. Green plants are the most commonly known as autotrophs, as they synthesise their own food.
3. During the process of photosynthesis, the presence of chlorophyll enables the leaf to capture energy from the sun and combine it with the available carbon dioxide and water to produce carbohydrates, such as glucose, and oxygen. Oxygen, a by-product of photosynthesis, is inhaled by human beings and animals during respiration. They in turn exhale carbon dioxide which is absorbed by the plants and the process continues. The following equation summarises the process of photosynthesis.

$$\text{Carbon dioxide} + \text{Water} \xrightarrow{\text{Sunlight and chlorophyll}} \text{Carbohydrates} + \text{Oxygen}$$

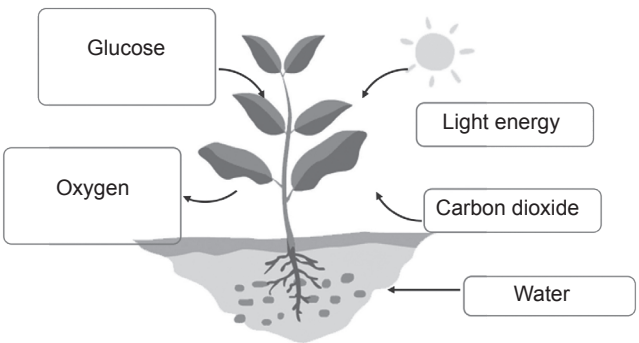
4. Animals and non-green plants cannot prepare food on their own and are hence directly or indirectly dependent on the green plants for food. This mode of nutrition when an organism is dependent on another organism for food is called heterotrophic nutrition. Its subtypes are:
   a. **Saprophytic plants:** Plants that feed on dead and decaying organic plant and animal matter are called saprophytes, and this mode of nutrition is called saprophytic nutrition. Fungi and bacteria are examples of saprophytes.
   b. **Insectivorous plants:** The plants that feed on insects by trapping and digesting them are called insectivorous plants. Pitcher plant, Venus flytrap, sundew and bladderwort are examples of insectivorous plants.
   c. **Parasitic plants:** Organisms that feed on other organisms partially or completely to derive nutrition are called parasites, and this mode of nutrition is called parasitic nutrition. Examples of parasitic plants are Mistletoe and Rafflesia.
   d. **Symbiotic plants:** Some plants such as lichens live in association with other organisms for their nutritional needs. In this relationship, both the organisms benefit from each other. This mode of nutrition is called symbiotic nutrition.

   Algae and fungus live in symbiosis with each other.
5. The symbiotic relationship is essentially useful to the farmers. We know that plants absorb all the nutrients from the soil. But the soil has limited available resources and, hence, farmers need to externally provide nutrition in the form of manure for plant growth. While nitrogen is the most abundant gas present in the air, it cannot be directly utilized by plants. Bacterium such as Rhizobium converts atmospheric nitrogen into a form usable by plants. Rhizobium being a heterotroph cannot make its own food and thus the plant provides it with nutrients required for its growth.

F.



G.



H. 1. (a) Both A and R are correct and R is the correct explanation of A.
2. (c) A is correct but R is incorrect.
3. (c) A is correct but R is incorrect.

I. i. Food helps in growth, development, excretion and reproduction. Food also helps in repairing of damaged body parts.
ii. Food components present in food, called nutrients.
iii. Carbohydrates, proteins, fats, vitamins and minerals are nutrients present in food.
iv. Plants make their own food through the process of photosynthesis. So, they are called autotrophs.

J. **Across**
2. SUN
3. CHLOROPHYLL
5. PHOTOSYNTHESIS
6. CARBON DIOXIDE

Down
1. INSECTIVOROUS
4. STOMATA

Think & Answer (HOTS)

1. Yes, insectivorous plants are considered carnivorous because they capture and digest insects to obtain nutrients, especially nitrogen, from them.
2. Humans are considered heterotrophs because they cannot produce their own food from simple substances like plants. Instead, humans depend on consuming other organisms (plants or animals) for food, even though they prepare it in the kitchen.

Life Skills

If Kanika kept her plants inside a room with little light, they may suffer from lack of sunlight, affecting their growth. To prevent this, the plants should be placed near a window or under artificial lights, and someone should water them in her absence.

Project

Do it Yourself

Chapter – 2 Nutrition in Animals

Knowledge Check (Page 22)

1. Herbivores, Carnivores, Omnivores, Decomposers, Insectivores
2. Ingestion, Digestion, Absorption, Assimilation, Egestion
3. Pseudopodia
4. Ingestion
5. Egestion

Knowledge Check (Page 28)

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

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (c) chyme 2. (b) Mouth 3. (b) Canines
4. (b) Fat 5. (d) Small intestine

B. 1. scavengers 2. pseudopodia 3. holozoic nutrition
4. Oesophagus 5. plaque

C. 1. Animals that feed on dead and decaying matter are called scavengers.

Tiny microorganisms, mainly bacteria and fungi, that break down the dead, organic matter into simpler compounds are called decomposers.

2. The intake of food in the body is called ingestion. Different animals use different parts of their body to ingest the food.

This is the last step of the nutrition process. It implies the removal of undigested food and other toxic substances from the body.

3. Temporary teeth start appearing from an age of six months and start falling by age six. There are 20 temporary teeth and, once fallen, are replaced by permanent teeth. The set of permanent teeth consists of 32 teeth, that is, 16 teeth in each jaw. They can be divided as four incisors, two canines, four premolars and six molars in each row.

4. **Incisors:** These are the front teeth that help in biting and cutting the food. There are eight incisors–four in the upper jaw and four in the lower jaw.

Canines: These are pointed teeth with sharp edges that assist in tearing the food. One canine is present after each side of incisors.

5. **Molars:** Flat teeth larger than the premolars, molars are placed on the back of the jaws. They are mainly used to chew the food.

Premolars: These flat teeth are placed after the canines and contribute in chewing and grinding the food.

D. 1. Food needs to be broken down into simpler molecules for absorption and use by the body.

2. Food needs to be broken down into simpler molecules for absorption and use by the body.

3. Mucus protects the stomach lining from acids and digestive enzymes.

4. A four-chambered stomach helps ruminants efficiently digest tough plant material.

E. 1. The liver produces bile, which helps in the digestion and absorption of fats in the small intestine.

2. The pancreas produces digestive enzymes (amylase, lipase, protease) and insulin, aiding in digestion and regulating blood sugar levels.

3. Assimilation is the process where the nutrients absorbed by the blood are transported to each cell of the body. Different nutrients perform different body functions

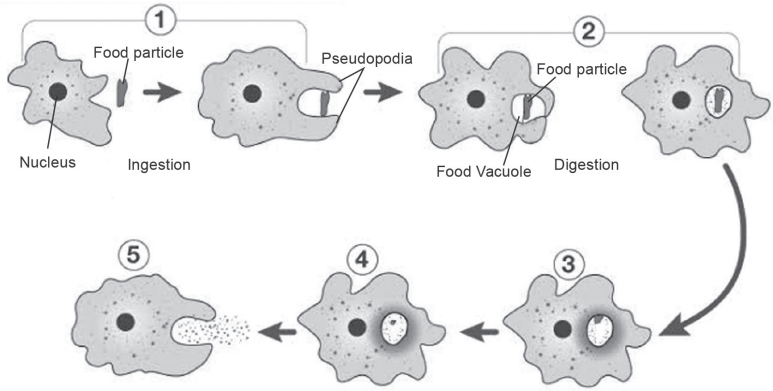
4. The removal of enamel layer causes tooth decay.

5. Saliva is the watery fluid that helps in the swallowing of food. It contains an enzyme that allows the digestion of carbohydrates present in the food.

6. The small intestine has many small finger-like projections called villi. These villi increase the surface area of the intestine. Each villus (singular of villi) has fine blood capillaries. And so, these villi absorb nutrients from the digested food and pass them into the blood capillaries.

F. 1. **Nutrition in Amoeba**

Amoeba is a free-living, unicellular organism. It is found in water or damp surroundings. Being unicellular, it performs all body functions in much simpler fashion than other animals. It undertakes holozoic nutrition. The nutrition which involves the engulfment of the whole food, or part of a plant or animal is called holozoic nutrition. In the case of Amoeba, the food is also microscopic. The process of nutrition starts by making pseudopodia, finger like projections or false feet of Amoeba which helps in locomotion.



The five steps of nutrition performed by Amoeba are discussed here.

Ingestion: As Amoeba approaches a food particle, it makes pseudopodia in the direction of food. Pseudopodia makes a cavity by enclosing the food. This cavity is called food vacuole that enters the Amoeba body as a whole.

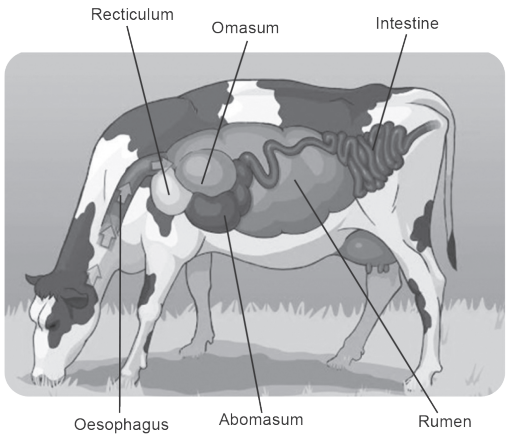
Digestion: The food particle inside the food vacuole is now digested by being broken down into simpler substances. This is done by releasing digestive juices in the food vacuole.

Absorption: The digested food is then distributed to the entire cell by the process of diffusion.

Assimilation: The absorbed nutrients release energy which the Amoeba uses for its body functions like growth, repair and reproduction.

Egestion: The undigested food must be removed from the body. For this reason, another food vacuole is formed and is directed to the boundary to release it outside.

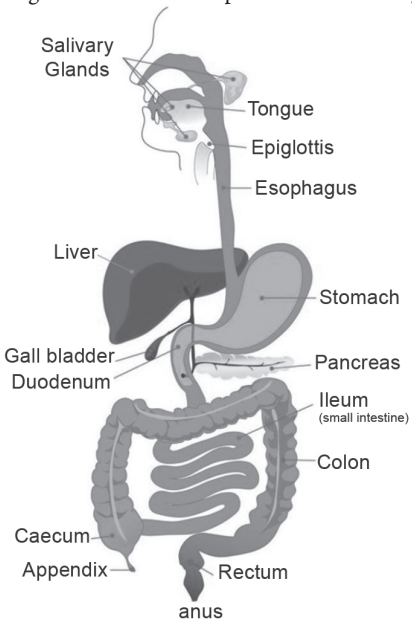
2. The food is moved to the oesophagus which covers around a distance of two to three feet to reach the stomach. Rumen is the first and the largest chamber of the stomach where the chewed food is stored. The food in the rumen is partially digested and is called cud. The cud is brought back to the mouth to be rechewed and reswallowed. This process is called cudchewing.



The millions of bacteria and protozoa present in the rumen break the complex carbohydrate cellulose present in the grass and hay into simpler substances. The cud then moves to the second chamber of the stomach called the reticulum. Reticulum comprises food mixed with saliva and separates it into layers of solid and liquid. The liquid is passed to the next chamber, omasum, where water and minerals are absorbed into the blood stream. The solid food is passed to the abomasum. Abomasum is also called the true stomach because most of the digestion is completed here. The HCl acid is produced in the abomasums and it also receives digestive enzymes from pancreas and liver.

3. **Nutrition in Humans**

In comparison to Amoeba, the process of nutrition in human beings is way more complex. Humans, too, perform holozoic nutrition where the food is eaten in the solid form. It means that most of the food we eat is insoluble and cannot be directly used by bodies. The food that humans eat passes through certain organs. This connect of organs that work together to digest the food into simpler units is called digestive system.



Human Digestive System

Nutrition takes place in a long tube called the gut or the alimentary canal. It is around 7.5 metres long in adults. It incorporates the mouth, oesophagus (food pipe), stomach, small intestine, large intestine, rectum and anus. Other organs such as salivary glands, liver, gall bladder and pancreas also participate in the process of digestion. The digestive tract and other associated organs together form the digestive system.

4. Based on their function, teeth are of four types:

Incisors: These are the front teeth that help in biting and cutting the food. There are eight incisors–four in the upper jaw and four in the lower jaw.

Canines: These are pointed teeth with sharp edges that assist in tearing the food. One canine is present after each side of incisors.

Premolars: These flat teeth are placed after the canines and contribute in chewing and grinding the food.

Molars: Flat teeth larger than the premolars, molars are placed on the back of the jaws. They are mainly used to chew the food.

G. 1. (a) Both A and R are correct and R is the correct explanation of A.
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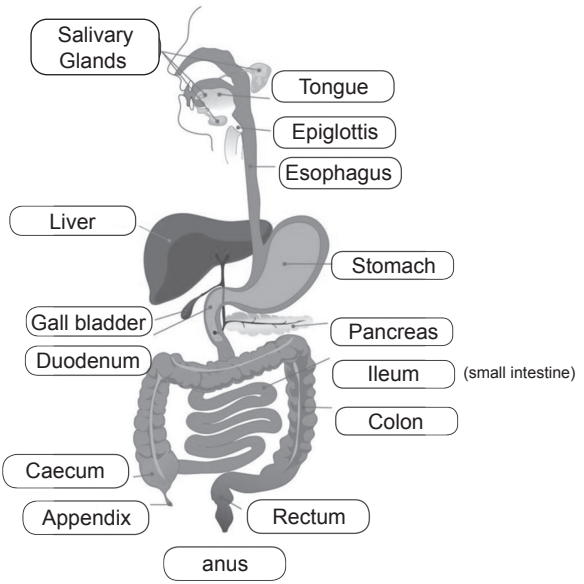
H.



Human Digestive System

I. i. ruminat
ii. grass, hay
iii. humans
iv. ruminants

J. **Across**
1. LIVER
4. DIGESTION
5. ANUS
6. SALIVA

Down
2. RUMINANTS
3. INGESTION

Think & Answer (HOTS)

1. After digestion and absorption, the body takes in the useful nutrients, and the leftover undigested and waste materials need to be removed to prevent harmful buildup in the body, maintain balance, and avoid toxins.
2. Talking while eating can lead to swallowing air, which can cause indigestion and discomfort. It also distracts the body from properly chewing food, making digestion less efficient.
3. Pulses will take more time to digest than rice. This is because pulses are rich in proteins and fiber, which take longer to break down and absorb. Rice, being a carbohydrate, is digested more quickly compared to pulses.

Life Skills

Yes, I agree with Karan. Brushing teeth twice daily is important to prevent tooth decay, especially after eating sweets.

Suggestions:

1. Brush twice daily.
2. Floss regularly.
3. Limit sugary foods.
4. Drink water after eating sweets.
5. Visit the dentist regularly.

Project

Do it Yourself

Chapter – 3 Heat

Knowledge Check (Page 38)

1. a. kelvin
2. thermistor
3. alcohol

Knowledge Check (Page 44)

1. Conduction, Convection, Radiation
2. Convection
3. Radiation
4. Conduction
5. Insulators

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (c) chyme 2. (b) Mouth 3. (b) Canines
4. (b) Fat 5. (d) Small intestine

B. 1. heat 2. Mercury 3. Thermos flask
4. Radiation 5. Clinical 6. heat, system
7. convection

C. 1. liquid and gas
2. alcohol in the bulb
3. do not allow heat to flow through them
4. joule (J)

D. 1. **Mercury Thermometer:**

- It is sensitive to heat and expands even at a very less change in temperature.
- It is a shiny and opaque liquid, so, its level in the thermometer is identifiable.
- It has a freezing point of –39°C and boiling point of 356.58°C.
- It does not stick to glass.

Alcohol Thermometer:

- It is cheaper than mercury.
- It is not as harmful as mercury.
- It can measure temperature as low as –115°C.

Digital Thermometer:

This thermometer uses a special device called thermistor instead of using mercury or alcohol. Thermistor is highly sensitive to temperature. The current passing through it varies with temperature. The amount of current determines the temperature of the body. The thermistor is usually connected with an LCD (Liquid Crystal Display) to display the value of temperature.

2. Comparison among conduction, convection and radiation

Conduction	Convection	Radiation
The process of transfer of heat from hotter part of the body to cooler part of the body.	The process of heat transfer in which heat is carried from the hotter region to its colder region by actual movement of hot particles.	The transfer of heat from the heat source to the cold body without affecting the medium through which heat energy travels.
It is a slow process	It is also a slow process.	It propagates at the speed of light.
It occurs in solids through molecular collision, without actual flow of matter. It is fastest in solids.	It occurs in liquids and gases by actual flow of matter.	It can take place at large distances and does not heat the intervening medium.

3. **Sea breeze:** In coastal regions, the land is hotter than the sea during the day. Thus, breeze usually blows from sea to land. This flow of breeze from sea to land in the day time is called sea breeze.

   Land breeze: At night, land cools down faster than the sea. Thus, breeze moves from cold land towards the warm sea. This flow of breeze from land to sea is called land breeze as breeze is felt blowing from the land towards the sea.

4. **Conductor:** Substances that let the heat energy to flow through them are called conductors of heat.

   Insulator: The substances that do not allow the flow of heat through them are called insulators of heat.

   Insulators are also termed as bad conductors of heat as they do not pass the flow of heat. Most metals are conductors of heat. The other end of the metal body becomes hot when one end is heated.

E. 1. Mercury is sensitive to heat and expands even at a very less change in temperature.
2. Thermistor
3. Heat is measured using temperature scales with instruments like thermometers.
4. Igloos trap heat from the occupants and use the insulating properties of snow, which has air pockets that reduce heat loss.
5. The range of a mercury thermometer is typically from –39°C to 356°C.
6. To convert Celsius to Fahrenheit: $F = 9/5 \times C + 32F$
7. Heat from the sun reaches the Earth through radiation in the form of electromagnetic waves.
8. An alcohol thermometer uses alcohol instead of mercury. It is useful for measuring low temperatures because alcohol has a lower freezing point.

F. 1. Most thermometers contain mercury in the bulb. They consist of a thin narrow tube of uniform cross-section. One end of the tube is filled with mercury whereas the other end is sealed. The mercury in the thermometer's bulb works on the contraction and expansion principle. It expands and travels in the tube when it comes in contact with a warm body.

2. **Conduction:**
   i. Cooking on Metal Pans: Heat transfers from the stove to the pan.
   ii. Ironing Clothes: Heat from the iron transfers to the clothes.

Insulation:

i. Building Insulation: Materials like fiberglass reduce heat loss or gain.

ii. Winter Clothing: Insulated clothes (like jackets) trap body heat.

3. Thermos flask is designed in a way that does not allow loss or gain of heat by the materials stored in it. Hence, it is made to store hot or cold liquid for a long time by preventing loss or gain of heat from outside to inside and vice-versa.

   A hot body loses heat through conduction, convention and radiation whereas, a cold body gains heat through any or all the mentioned ways. This loss or gain of heat is minimized in the thermos flask. Inside the thermos flask is a double glass-flask. The inner walls of the flask are silvered like a mirror. The walls are made of vacuum by removing all the air from the space. This vacuum does not let loss or gain of heat to occur. Since the transfer of heat through the walls of the thermos is almost blocked, the material remains at the same temperature for a long time.

4. Room heaters are always kept at the bottom of the room so that hot air from the heater can move up and spread around.

   Exhaust fans in the kitchen, washroom and the meeting rooms are designed to place at the top of the room to drain out the hot rising air.

   Smoke is released from the room through chimneys as smoke being hot, rises and escapes through the chimney.

5. In radiation, heat travels in a straight line from the hot body to the cold body. All objects emit heat or can be said to radiate but the amount of radiation depends on the temperature of the object. Higher the temperature, more will be the radiation. Burning coal, burning fuel, redstars and heated iron, all are radiating objects. They release heat emitted from these objects. This heat is also called radiant heat. We get light and heat from the sun.

6. **Mercury Thermometer:**

   - Advantages: Accurate, wide temperature range.
   - Disadvantages: Toxic, fragile, limited to temperatures above -39°C.

   Alcohol Thermometer:

   - Advantages: Safer (non-toxic), works at lower temperatures.
   - Disadvantages: Limited temperature range, less accurate than mercury thermometers.

G. 1. **Sea breeze:** In coastal regions, the land is hotter than the sea during the day. Thus, breeze usually blows from sea to land. This flow of breeze from sea to land in the day time is called sea breeze.

   Land breeze: At night, land cools down faster than the sea. Thus, breeze moves from cold land towards the warm sea. This flow of breeze from land to sea is called land breeze as breeze is felt blowing from the land towards the sea.

2. The process of transfer of heat from hotter part of the body to the cooler part of the body is called conduction.

   The process of heat transfer in which heat is carried from the hotter region of a substance to its colder region by actual movement of hot particles is called convection.

   The heat from the sun or fire makes us feel warm and comfortable. This transfer of heat is called radiation.

H. 1. (a) Both A and R are correct and R is the correct explanation of A.

2. (a) Both A and R are correct and R is the correct explanation of A.

3. (c) A is correct but R is incorrect.

I. i. To keep ourselves warm.
ii. True
iii. Heat is a form of energy that makes an object hot, warm or cold. Heat cannot be seen but can be sensed.
iv. molecules

Think & Answer (HOTS)

1. Mud houses and thatched roofs remain cool because mud and thatch are good insulators that prevent heat transfer and allow air circulation.
2. Room heaters are placed on the floor because warm air rises, while air conditioners are placed on top so cool air can sink and spread evenly.

Life Skills

To efficiently use the sun's heat and reduce pollution:

i. Solar Water Heating: Use solar panels to heat water instead of burning coal.
ii. Solar Power: Install solar panels to generate electricity, reducing reliance on coal.
iii. Solar Cookers: Use sunlight to cook food, eliminating coal burning.
iv. Solar Heating for Buildings: Use solar thermal systems for space heating.
v. Concentrated Solar Power: Use mirrors to focus sunlight and generate electricity.
vi. Solar Dryers: Dry agricultural products using solar energy.

Project

Do it Yourself

Chapter – 4 Acids, Bases and Salts

Knowledge Check (Page 51)

a. sulphuric acid, hydrochloric acid
b. Lemon, orange
c. Hydrochloric acid, Nitric acid
d. Vinegar, Bee sting

Knowledge Check (Page 53)

a. Hydrochloric acid (HCl) and Nitric acid (HNO_3)
b. Citric acid, Acetic acid
c. Sulphuric acid, Hydrochloric acid
d. Sulphuric acid (H_2SO_4), Nitric Acid (HNO_3)

Knowledge Check (Page 54)

a. Sodium hydroxide(NaOH)
b. Magnesium hydroxide($Mg(OH)_2$)
c. Calcium hydroxide($Ca(OH)_2$)

Knowledge Check (Page 58)

Colour: Blue to Red, Pink to Purple, Purple to Green, Yellow to Red, Colourless to Pink

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) H_2SO_4 2. (a) Washing soda 3. (d) Potash alum
4. (d) Acetic acid 5. (c) salt 6. (a) Limestone

B. 1. Sodium hydroxide 2. Bases 3. Acids
4. red 5. red 6. green
7. Sodium chloride

C. 1. Milk 2. Lemon 3. Vinegar
4. Bee 5. Tamarind

D. 1. Carbonic acid 2. Aqua regia
3. Hydrochloric acid 4. Magnesium hydroxide
5. Calcium carbonate 6. Potassium alum

E. 1. Acids can cause burns, damage tissues, and corrode metals temperature of the body. Acids are used in food (like citric acid in citrus fruits), medicine (like ascorbic acid).

2. Acids are sour in taste.

   Acids are corrosive in nature. Strong acids can cause burning of clothes, skin and other delicate items. They have potential of damaging metallic objects like iron and aluminium.

3. Bases are bitter in taste.

   Bases feel slippery and soapy.

4. Acids release H+ ions in solution and turn blue litmus paper red.

   Bases release OH– ions in solution and turn red litmus paper blue.

5. The scale that is used to measure the strength of an acid or base is called pH scale.

   A pH below 7 indicates an acidic solution, a pH of 7 indicates a neutral solution, and a pH above 7 indicates a basic (alkaline) solution.

6. The scale that is used to measure the strength of an acid or base is called pH scale. This scale has values from 0 to 14 and 7 is for neutral. Range 0 to 7 shows the strength of an acid where lesser the value, more concentrated or strong is the acid. Range 7 to 14 demonstrates the basic nature where more the value, higher is the strength of the base.

7. • Salt is an odourless crystal that is soluble in water.
   • Salt is salty in taste.
   • Salts are usually solid or exist in solid state at room temperature.

F. 1. **Soil treatment:** Acid rain makes the soil acidic and excessive use of fertilizers make the soil very basic.

   Insect bites: When bees sting or ants bite, they release formic acid in our body. Formic acid is responsible for the irritation, inflammation, redness and swelling.

   • Protection of teeth: The food in our mouth turns into acid by the action of bacteria present in the mouth.
   • Disposal of factory effluent: Factory usually releases acidic water in the rivers and other waterbodies.

2. Indicators that we find in the nature are called natural indicators. Let us learn about some of the natural indicators.

   Turmeric: Turmeric is a natural indicator that is commonly used in cooking.

   Red and blue litmus: Litmus paper is the most commonly used indicator in laboratories to test both acids and bases.

China rose indicator: China rose is a red-coloured flower. When we put its petals in warm water and leave it stranded for some time, the petals diffuse red colour in the water.

3. **Calcium hydroxide [$Ca(OH_2)$]:** Calcium hydroxide is generally called as slaked lime. Some of the major uses of slaked lime are:
   - It is the substitute of cement in low-cost constructions.
   - It is used to whitewash homes.

   Sodium hydroxide (NaOH): Sodium hydroxide is generally called as caustic soda. Some of the main uses of caustic soda are:
   - It is used in the manufacturing of soaps and detergents.
   - It is used to unblock drains.

   Magnesium hydroxide [$Mg(OH)_2$]: Magnesium hydroxide is also called milk of magnesia. The main uses of milk of magnesia are:
   - It is prescribed by the doctor to cure stomach acidity. Its consumption helps maintain the acidic level of the stomach.
4. Hydrochloric Acid (HCl)
   - It is used in the purification of common salt.
   - It is used as a bleaching agent in textile industries.

   Sulphuric Acid (H_2SO_4)
   - It is used in car batteries.
   - It is used for the manufacturing of dyes, paints, drugs and fertilisers.

   Nitric Acid (HNO_3)
   - It is used for the manufacturing of fertilisers and explosives.
   - It is used in the making of artificial silk called rayon.
5. - Limestone (calcium carbonate–$CaCO_3$) is used in the making of cement and lime. It is also used in the extraction of iron.
   - Washing soda (sodium carbonate–Na_2CO_3. $10H_2O$) is used in detergents and in the making of glasses.
   - Phitkari (potash alum) is used for the purification of water.
   - Silver nitrate ($AgNO_3$) is used in making the uppercoat of photographic films.
   - Baking soda (sodium bicarbonate– $NaHCO_3$) is used as a part of drugs and bakery items

G. 1. It is used in car batteries.

   It is used for the manufacturing of dyes, paints, drugs and fertilizers.
2. It is used in the manufacturing of vinegar. Vinegar is widely used in the making of pickles, sauces, ketchups and many more to keep food safe from microbes. The acidic effect of vinegar either kills the microbes or slows down their growth.

   It is used as a cleaning agent in products that are manufactured for cleaning windows, floors, etc.
3. It is used in the purification of common salt.

   It is used as a bleaching agent in textile industries.
4. It is used in the manufacturing of soaps and detergents.

   It is used in the manufacturing of paper and drugs.
5. It is the substitute of cement in low-cost constructions.

   It is used to whitewash homes.

H. 1. (a) Both A and R are correct and R is the correct explanation of A.
2. (a) Both A and R are correct and R is the correct explanation of A.
3. (b) Both A and R are correct and R is the incorrect explanation of A.

I. i. Hydrochloric ii. nitric
iii. concentrated iv. laboratory

Think & Answer (HOTS)

1. To recover from Vitamin C deficiency, Hari should include ascorbic acid (Vitamin C) in his diet. Good sources of Vitamin C include citrus fruits like oranges, lemons, and grapefruits, as well as kiwi, strawberries, and bell peppers.
2. a. The acid secreted by the stomach is hydrochloric acid (HCl).
   b. To treat stomach acidity, antacids such as magnesium hydroxide, aluminium hydroxide, or sodium bicarbonate can be given. These medicines neutralise the excess acid in the stomach.
   c. The medicine given (antacids) is basic (alkaline) in nature, as it neutralises the excess acidic content in the stomach.

Life Skills

Ways to Reduce Air Pollution and Acid Rain:

1. Use Cleaner Energy: Promote solar, wind, and hydropower instead of fossil fuels.
2. Reduce Vehicle Emissions: Use public transport, carpool, and switch to electric vehicles.
3. Control Industrial Emissions: Adopt cleaner technologies and install pollution filters in industries.
4. Plant More Trees: Increase green spaces to absorb CO_2 and pollutants.
5. Use Eco-friendly Farming Practices: Reduce the use of chemical fertilisers and pesticides.
6. Preserve Monuments: Use acid-resistant materials to protect historical sites.

How You Can Contribute:

1. Use Public Transport: Carpool or take buses/trains to reduce emissions.
2. Switch to Energy-efficient Appliances: Use LED lights and energy-saving devices.
3. Reduce, Reuse, Recycle: Minimise waste and recycle materials.
4. Plant Trees: Contribute to improving air quality by planting greenery.
5. Save Water and Energy: Turn off unused lights and appliances.
6. Support Eco-friendly Policies: Advocate for stricter pollution control regulations.

Project

Do it Yourself

Chapter – 5 Physical and Chemical Changes

Knowledge Check (Page 67)

Plucking a flower: PR, Cracking an egg: PI, Crumbling a sheet: PR, Packing a bag: PR, Wearing clothes: PR, Wetting clothes: PR, Cutting trees: PI, Breaking a glass: PI

Knowledge Check (Page 70)

a. True b. False c. True d. False e. True

Knowledge Check (Page 73)

(a) Exothermic
(b) Endothermic
(c) Painting
(d) Sodium acetate
(e) Sodium bicarbonate

Knowledge Check (Page 75)

(a) SATURATED
(b) SUPER SATURATED
(c) CRYSTAL
(d) CRYSTALLISATIONS

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) Blooming of flower
2. (d) Plucking of flower
3. (d) Fermenting of milk
4. (d) All of these
5. (d) Physical reversible

B. 1. C 2. C 3. P 4. P
5. P 6. P 7. P

C. 1. Chemical 2. Rusting 3. Zinc 4. Crystalline
5. endothermic

D. 1. Physical change: A change wherein no new substance is formed.
Chemical change: A change wherein a new substance with different chemical properties is formed.
2. Endothermic reaction: A reaction in which heat is absorbed.
Exothermic reaction: A reaction in which heat energy is released.
3. The water that does not taste salty is called freshwater. Seawater contains a lot salt and minerals.
4. A solution in which no new substance can be formed is called a saturated solution.
On dissolving the solution, sugar remains dissolved in the solution for a while. This is the supersaturated solution.

E. 1. When fruits or vegetables are peeled off or cut and kept uncovered for a while, the exposed parts tend to change their colour to brown. This happens because the pulp of fruits and vegetables releases some chemicals that react with the oxygen present in the air.
2. No new substance is formed.
The physical state may change but the properties remain the same.
3. A chemical reaction is a process in which one or more substances (reactants) are transformed into new substances (products) with different chemical properties.
4. All these reactants and products in a chemical reaction are represented through a chemical equation. So, the chemical equation is a representation of a chemical change.
5. Precipitate is the insoluble solid that settles at the bottom of a liquid. For example, when silver nitrate solution is mixed with sodium chloride solution, precipitate silver chloride is formed.
6. Seawater contains a lot salt and minerals. The large amount of salt makes it salty.
7. Salt can be obtained from seawater through the process of evaporation.

F. 1. Some of the characteristics of chemical changes are discussed here:
i. Change in colour
ii. Precipitation
iii. Absorption or release of heat
iv. Endothermic reaction
v. Exothermic reaction

2. The physical change that can be brought back to its original structure is called physical reversible change. Examples: States of water, dissolution of sugar and water.
3. The physical change that can never be brought back into its original form is called physical irreversible change. Examples: Wooden pieces cannot change back into a single unit of wood, Breaking of raw eggs never return its original form
4. Rusting happens due to the reaction that occurs between iron and air moisture.
   Some of the ways to prevent rusting are: Painting, Greasing, Galvanisation, Alloying
5. To make some sugar crystals:
   Materials required: 100 mL water, sugar, beaker, burner, stirrer and a string.
   Procedure:
   - Take some water in the beaker and add some sugar in it.
   - Using a stirrer, dissolve all the sugar. Add little more and stir it again.
   - Repeat the above procedure till the sugar stops dissolving.
   - Now, heat the solution. Add more sugar dissolve it with the help of the stirrer.
   - Keep adding the sugar until it stops dissolving.
   - Now, carefully suspend a string in the hot sugar–water solution.
   - Keep the set up undisturbed to allow it cool down to room temperature.
   - Record the observation

   Conclusion: Once the sugar solution reaches the room temperature, sugar molecules start crystallizing around the string. After some time, big and well-formed sugar crystals are formed around the string.
6. Both vinegar and baking soda are the common ingredients used in our food and found in our kitchens. Baking soda is sodium bicarbonate ($NaHCO_3$) and vinegar is dilute acetic acid (CH_3COOH). When these two substances are used together in cooking, they react with each other. The brisk effervescence observed is the sign of a chemical change and the formation of a new substance.

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$$

The reaction evolves a colourless gas that, when passed through lime water, turns milky and white precipitate settles at the bottom. The reaction between lime water and carbon dioxide is:

$$[Ca(OH)_2]\ (aq) + CO_2 \longrightarrow CaCO_3\ (s) + H_2O\ (l)$$

G. 1. $2Mg + O_2 \longrightarrow 2MgO + Light$
2. $AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$
3. $NaHCO_3 + CH_3COOH \longrightarrow CH_3COONa + H_2O + CO_2$
4. $4Fe + 2H_2O + 3O_2 \longrightarrow 2Fe_2O_32H_2O$
5. $CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$

H. 1. (c) A is correct but R is incorrect.
2. (a) Both A and R are correct and R is the correct explanation of A.
3. (a) Both A and R are correct and R is the correct explanation of A.

I. i. salts, minerals ii. Salt
iii. ponds, evaporate iv. Freshwater

Think & Answer (HOTS)

If an iron nail is taken to the Moon, it won't rust because there is no oxygen or moisture on the Moon. Rusting requires both, and since these are absent, the nail will remain unchanged.

Life Skills

Here are some quick tips for cleaning gold and silver jewellery:

For Gold:

i. Soapy Water: Soak in warm soapy water and scrub with a soft brush.
ii. Baking Soda Paste: Mix baking soda and water, rub gently, rinse.
iii. Lemon Juice & Baking Soda: Make a paste, apply, scrub lightly, rinse.

For Silver:

i. Toothpaste: Rub non-gel toothpaste on silver, then rinse and dry.
ii. Baking Soda & Water: Make a paste, scrub gently, rinse.
iii. Aluminum Foil & Baking Soda: Soak in a baking soda solution for tarnish removal.
iv. Silver Polishing Cloth: Use a special cloth to buff and shine silver.

These methods are simple and effective for keeping jewellery clean!

Project

Do it Yourself

Chapter – 6 Respiration in Organisms

Knowledge Check (Page 83)

a. Skin b. Spiracles c. Gills
d. Lungs and Skin e. Gills

Knowledge Check (Page 84)

a. Trachea b. Nose/Nasal Cavity c. Lungs
d. Diaphragm

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) lungs 2. (c) lungs 3. (a) operculum
4. (b) Cockroach 5. (d) alveoli

B. 1. trachea 2. out 3. Less
4. Carbon dioxide and alcohol
5. Breakdown

C. 1. Lungs 2. Root hairs
3. Lungs 4. Cellular respiration

D. 1. Most organisms require oxygen to respire. The process of respiration that requires or takes place in the presence of oxygen is called aerobic respiration. This happens in the cells. The breakdown of glucose in the presence of oxygen gives carbon dioxide, water and energy. A lot of energy is released in aerobic respiration.

$$\text{Glucose} + \text{Oxygen} \longrightarrow \text{Carbon dioxide} + \text{Water} + \text{Energy}$$

2. The process of respiration that takes place in the absence of oxygen is called anaerobic respiration. The breakdown of glucose releases lactic acid and energy. The amount of energy released in this case is very less in comparison to aerobic respiration.

$$\text{Glucose} \longrightarrow \text{Lactic acid} + \text{Energy}$$

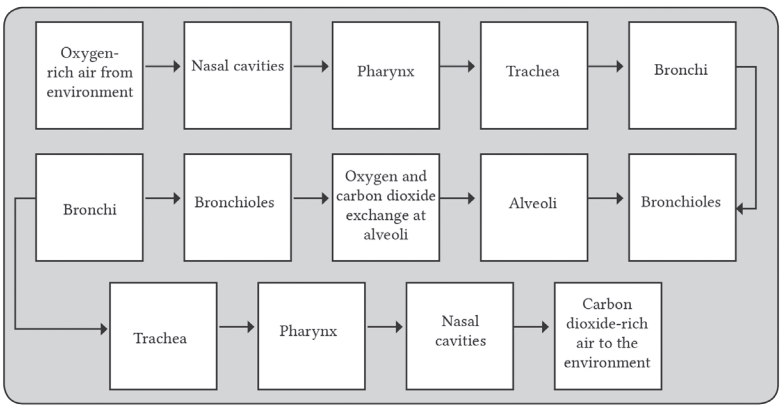
3. After a vigorous exercise, when our muscles do not get plenty of oxygen then our muscles cells also respire anaerobically. The pain we experience after running or heavy exercising is due to the formation of lactic acid on account of anaerobic respiration. The pain vanishes as soon as our body flushes the accumulated lactic acid from that part. Breathing deeply and fast can help in the getting rid of this pain and irritation.

   Some bacteria and yeast respire anaerobically. They produce ethyl alcohol and carbon dioxide instead of forming lactic acid.

$$\text{Glucose} \longrightarrow \text{Ethyl alcohol} + \text{Carbon dioxide} + \text{Energy}$$

E. 1. They perform respiration through their cell membrane by the diffusion of gases.
2. It is called aerobic because it requires oxygen to produce energy.
3. The diaphragm helps in breathing by contracting (inhalation) and relaxing (exhalation).
4. Plant roots respire through pores in their cells, absorbing oxygen from the soil.
5. The covering is called the operculum, which protects the gills and helps in water flow for gas exchange.
6. Yeasts respire anaerobically (fermentation) producing ethanol and carbon dioxide.

F. 1.



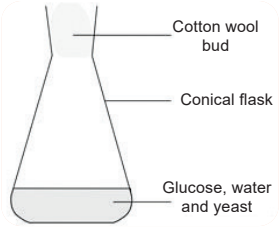
Movement of Oxygen and Carbon Dioxide In and Out of the Respiratory System

2. Plants mainly respire through stomata. Stomata are the tiny pores present on the lower surface of the leaves. Air can freely move in and out through these pores. Stomata takes in air and the exchange of air takes place inside the plant cells.
3. **Aim:** To prove that ethyl alcohol is produced in anaerobic respiration.

   Materials required: A conical flask, glucose, baker's yeast, cotton and water.

   Procedure:
   - Take a conical flask and make glucose solution in it using glucose and water.
   - Add a small amount of baker's yeast in the solution.
   - Cover the mouth of the flask using cotton or cork.
   - Keep the flask undisturbed for two days.
   - Open the flask and record the observation.

   Conclusion: The solution will start smelling like alcohol and froth starts developing on the surface of the solution.



4. Lungs are the respiration organs in humans. We breathe in oxygen-rich air and breathe out carbon dioxide with the help of lungs. They are present inside the chest cavity formed by the ribcage. Apart from protection, ribs also support lungs and help them pump air. From the bottom, lungs are supported by a dome-shaped muscle called diaphragm. The contraction and relaxation of diaphragm help lungs breathe in and out air, respectively. The oxygen-rich air is inhaled in the body through a pair of nostrils. Nostrils have tiny hair and a mucus layer to filter dirt, dust and other foreign particles entering the body. From the nostrils, the air passes to the nasal cavity and enters the larynx. Larynx is further attached to the tube-like structure called trachea or windpipe. Trachea is made up of certain ring-like structures which are further divided into two bronchi, one in each lung. Inside the lungs, the bronchi are divided into many thinner tubes called bronchioles. Each bronchiole has tiny air sacs called alveoli. Alveoli are densely packed with capillaries and are the actual site of exchange of gases. The inhaled oxygen-rich air is absorbed by the blood flowing in the blood capillaries inside these airbags. The carbon dioxide is passed by the capillaries to the alveoli and is further removed from the lungs during exhalation.
5. (a) Differences between aerobic and anaerobic respiration

Aerobic Respiration	**Anaerobic Respiration**
1. in the presence of oxygen.	1. happens in the absence of oxygen.
2. releases a lot of energy.	2. releases less energy.
3. releases carbon dioxide and water.	3. releases lactic acid.
4. happens in humans all day and night.	4. happens in human muscles only when oxygen is not adequately available.

(b) Differences between Breathing and Respiration

Breathing	**Respiration**
1. The process of inhalation and exhalation is called breathing.	1. The process of breaking down of glucose to release energy is called respiration.
2. It is a physical process.	2. It is a chemical process Aquatic.
3. It does not require any enzyme.	3. It requires enzyme.
4. It happens outside the cells.	4. It happens inside the cells.
5. This process does not release any energy.	5. This process releases energy.

(c) **Inhalation:** During inhalation, the diaphragm, present just below the lungs, contracts and flattens. This increases the volume of the chest cavity and decreases the air pressure inside the lungs. This decrease in pressure and increase in the volume facilitates the rush of air inside the lungs.

Exhalation: During exhalation, the diaphragm relaxes and regains its original dome-like shape. This activity reduces the volume and increases the air pressure which leads to an outward flow of air from the lungs.

G. 1. Skin 2. Skin 3. Gills 4. Lungs 5. Spiracles

Lungs	Spiracles	Moist skin	Gills
Humans	Grasshopper	Earthworm	Fish
Birds	Cockroaches	Leech	Frog
Rats	Houseflies	Salamander	Crabs
Lions	Mosquitoes	Toads	Mollusc
Elephants	Sharks	Frogs	Flatworm

H. 1. (c) A is correct but R is incorrect.
2. (c) A is correct but R is incorrect.
3. (a) Both A and R are correct and R is the correct explanation of A.

I. i. Respiration occurs in all living cells. It is a fundamental process by which energy is released.
ii. a. Breakdown of glucose and release of energy in the cell.
b. It involves two processes namely external and internal respiration.
iii. External respiration is also called breathing.
iv. We take in oxygen and give out carbon dioxide during breathing. This is called inhalation.

J. **Across**
4. STOMATA
5. EXHALATION

Down
1. DIAPHRAGM
2. INHALATION
3. ANAEROBATION
4. SPIRACLES

Think & Answer (HOTS)

1. **Out of breath:** Due to anaerobic respiration, which produces lactic acid when oxygen supply is insufficient.
Legs hurt: Caused by lactic acid buildup and tiny muscle tears from intense exercise.
2. Our body burns more calories to maintain body heat, increasing energy needs and hunger.

Life Skills

Impacts of Air Pollution on the Respiratory System:

i. Respiratory Diseases: Causes asthma, bronchitis, and COPD.
ii. Reduced Lung Function: Damages lung tissue and reduces lung capacity.
iii. Increased Infections: Weakens the immune system, making the body prone to infections.
iv. Allergic Reactions: Triggers allergies and breathing difficulties.
v. Premature Lung Aging: Accelerates the aging of lungs.

Ways to Reduce Air Pollution:

i. Use public transport or carpool to reduce emissions.
ii. Use air purifiers indoors.
iii. Plant trees to improve air quality.
iv. Regulate industrial emissions.
v. Avoid smoking and its harmful effects.
vi. Shift to clean energy sources.
vii. Wear masks during poor air quality days.

These steps can help reduce the harmful effects of air pollution on our respiratory system.

Project

Do it Yourself

Chapter – 7 Transportation in Animals and Plants

Warm Up (Page 91)

Slowest, Slowest, Fastest, Fastest

Knowledge Check (Page 96)

a. vein b. capillary c. arteries
d. heart e. pulse

Knowledge Check (Page 101)

a. False b. False c. True
d. True e. True

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (d) Heart 2. (c) lungs
3. (b) WBCs 4. (a) RBCs
5. (d) Nephron

B. 1. Haemoglobin 2. Pulmonary
3. Contraction, relaxation 4. xylem
5. phloem 6. sweat glands
7. nephron

C. 1. Platelets 2. Xylem
3. Urea 4. Carbon dioxide
5. Haemoglobin

D. From the body → Right Auricle → Right Ventricle → Pulmonary Artery → Lungs → Pulmonary Vein → Left Auricle → Left Ventricle → To the body

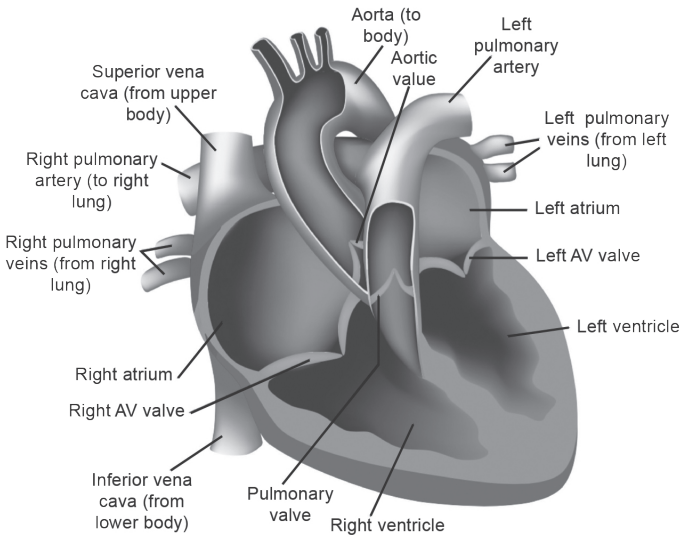
E. 1. The transport of substances in the body is done by the circulatory system.
2. Capillaries are thin-walled blood vessels that serve as the main site of exchange of materials in the body.
3. Xylem and phloem
4. Transpiration helps in transportation of absorbed minerals to all parts of the plant.
5. Plants transport prepared food to all parts through phloem.

F. 1. Red blood corpuscles (RBCs): Responsible for transportation of oxygen in the body.
White blood corpuscles (WBCs): WBCs destroy foreign particles and disease-causing microbes. Thus, they help in fighting diseases.
Blood platelets: They are responsible for clotting or coagulation of blood.

2. The complex network of blood vessels facilitates blood flow all across the body. The three main types of blood vessels are arteries, veins and capillaries.
Arteries: Carry oxygenated blood from the heart to the body
Veins: Carry oxygenated blood from the lungs to the heart.
Capillaries: Exchange nutrients, waste and gases from all parts of the body through diffusion.

3. Kidney failure: A condition where the kidneys can no longer filter waste and excess fluids from the blood. Patients of kidney failure treated with dialysis, a process that artificially filters the blood, or a kidney transplant from a donor.

4.



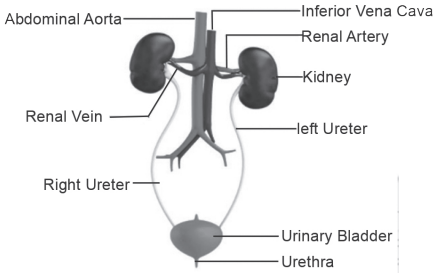
Structure of Heart

5. **Excretion in Humans**

Urea is the major waste product that is produced in the human body. Urea, with some other unwanted salts dissolved in water, form a yellowish liquid called urine. Urine gets collected in the excretory system and is passed out of the body.

The human excretory system is a specialised system with the following components:

- A pair of kidneys: Kidneys filter the blood that passes through them. During filtration, they separate the urea and other unwanted salts from the blood. Urea is very toxic for human body and it needs to be filtered continuously.
- A pair of ureters: It passes urine from the kidney into the urinary bladder.
- Urinary bladder: It stores urine until it is excreted from the body. Once the urinary bladder is full, humans feel the need to urinate.
- Urethra: It passes urine out of the body.



The human Excretory System

6. **Transportation:** In unicellular organisms, transport of materials happens across the cell membrane through diffusion and osmosis.

   Excretion: Waste products are removed through diffusion directly across the cell membrane into the surrounding environment.

7. a. Differences between arteries and veins

Arteries	Veins
They have thick and elastic walls.	They have thin walls.
All arteries except the pulmonary artery carry oxygen-rich blood.	All veins except the pulmonary vein carry carbon dioxide-rich blood.
They carry blood away from the heart.	Veins carry blood towards the heart.
They are placed deeply under the skin.	Veins are placed very closer to skin and can also be seen on parts such as wrists.
They do not have valves.	They have valves.

   b. **Red Blood Corpuscles:** Red Blood Corpuscles are disc-shaped cells. They are red in colour as they contain a special pigment called haemoglobin. It binds with oxygen and thus is mainly responsible for transportation of oxygen in the body. Haemoglobin also transports some amount of carbon dioxide as it is capable of binding with carbon dioxide too.

   White blood corpuscles: White blood corpuscles exist in different shapes. WBCs destroy foreign particles and disease-causing microbes. Thus, they help in fighting diseases. WBCs form the immune system of the body. They are bigger in size than the RBCs but they lack haemoglobin. Hence, they do not supply oxygen to any part of the body.

   c. **Heart:** The heart is an organ that pumps blood to all parts of the body through a network of blood vessels. It is a muscle which is located slightly left from the chest. It lies between the two lungs and above the diaphragm. It is made of cardiac muscles.

   Kidney failure: Proper functioning of kidneys is crucial for good health. Kidneys may be damaged due to infection or injury. They always work in pairs but the working of even one kidney is sufficient for a person to lead a healthy life. A damaged kidney cannot remove urea and other unwanted salts efficiently from the blood. Another function of kidneys is to maintain the salt and ion balance in the blood. However,

in case of kidney malfunction, highly toxic wastes and urea get accumulated which has the potential to damage other body organs and may also lead to death. Under such situations, the life of a person can be saved in two ways–dialysis or a kidney transplant.

d. **Xylem:** During the day, water evaporates continuously from the leaves by the process of transpiration. This continuous loss of water from the leaves creates a suction force that helps in pulling the water upwards the from roots through the stem, branches and up to the leaves. Along with water, the flow of minerals also takes place from the roots to the upper parts of the plant through the xylem vessels. This is a unidirectional flow as nothing from the leaves flows back in the xylem vessels.

The xylem vessels are hollow tube-like structures joint end-to-end in the roots. The xylem vessels of a plant usually lie at the centre of the root and are surrounded by several other cells. Thus, they are not in direct contact with water particles present in the soil. Tiny root hairs absorb water for the root. The large number of root hairs increases the surface area of the root in contact with the soil water that enhances water absorption.

Phloem: The food prepared in the leaves needs to be transported to all the parts of the plant. This task is fulfilled by the phloem. It is thinner than xylem. It carries the glucose produced by leaves through the process of photosynthesis. It delivers glucose to wherever it is needed in the plant.

Therefore, the movement of food in the phloem can be upward, downward or lateral. This is a bidirectional flow.

G. 1. (a) Both A and R are correct and R is the correct explanation of A.
2. (a) Both A and R are correct and R is the correct explanation of A.
3. (c) A is correct but R is incorrect

H. (i) (a) blood (ii) (c) urea (iii) (c) infection (iv) (c) both of them

I.

Across	**Down**
4. URETHRA	1. HEART BEAT
6. TRANSPIRATION	2. PLATELETS
	3. GUM
	5. BLOOD

Think & Answer (HOTS)

1. Tiny droplets on the inner surface of the polythene bag: This happens due to transpiration. The plant releases water vapor, which condenses into droplets on the bag's surface as the vapour cools.
2. Skin as an excretory organ: True. The skin excretes waste through sweat, which contains water, salts, and urea.

Life Skills

I can ask my grandparents if they have high blood pressure, low blood pressure, or blood sugar issues, and how they manage it. To help, I can assist with healthy meals, encourage exercise, and remind them to take their medications.

Project

Do it Yourself

Chapter – 8 Reproduction in Plants

Knowledge Check (Page 109)

a. Sporangium
b. Yeast
c. Hydra
d. Sexual reproduction

Knowledge Check (Page 110)

a. leaves
b. rhizome
c. Clove
d. Gladiolus and garlic
e. tuber

Knowledge Check (Page 115)

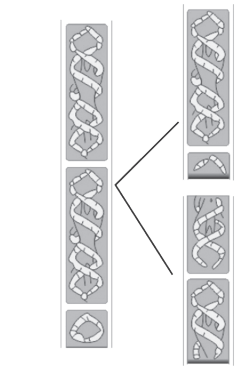
a. Pollen grains
b. Hermaphrodite
c. Stamen
d. Stigma, Style, Ovary

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) Zygote
2. (a) Ovule
3. (d) Leaves
4. (c) Stem
5. (c) Ferns

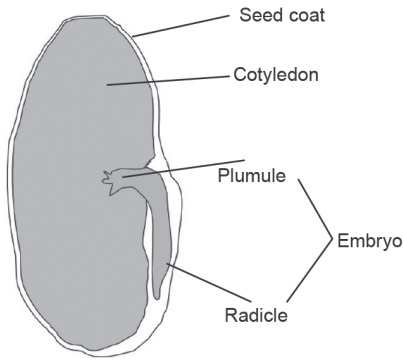
B. 1. asexual
2. wind
3. seed coat
4. Stamen
5. Pistil
6. Scion and rootstock

C. 1.



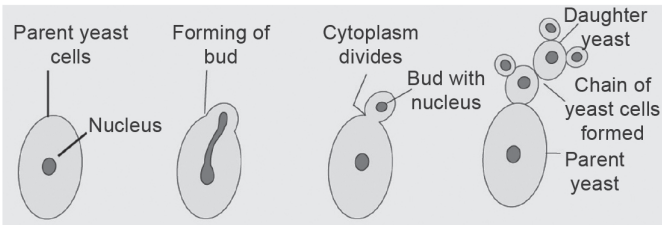
Fragmention in Spirogyra

3.



Structure of a seed

2.



Budding in Yeast

D. 1. Self-Pollination: The transfer of pollen grains from the anther to the stigma of the same flower.

Cross-pollination: In this pollination, the pollen grains of one flower land on the stigma of another flower.

2. Tuber: A swollen underground stem that stores nutrients and serves as a means of vegetative reproduction. Example: Potato.

Rhizome: Underground stems of ginger and turmeric are called rhizomes. Example: Ginger.

3. Unisexual flowers: Flowers which have either male or female parts.

Bisexual flowers: Flowers which consist of both male and female parts.

4. Fertilisation: The fusion of male and female gamete to form a zygote.

Germination: Sprouting of seeds to produce new plants.

E. 1. Light, small, and often have wings or hair to aid in dispersal.

2. Grafting involves joining the scion (a part of one plant) to the rootstock (part of another plant) to grow as one.

3. Male: Anther, filament (stamen); Female: Stigma, style, ovary (pistil); Other: Petals, sepals.

4. Tissue culture is the method of growing plant cells or tissues in a sterile environment to produce new plants.

5. Asexual reproduction in plants using parts like roots, stems, or leaves.

Types: Cutting, layering, grafting, and budding.

6. i. Growing of plants need less care.

ii. Plants grow fast and without a lot of efforts.

F. 1. The process of fusion of male and female gamete to form a zygote is called fertilisation. The male gamete is present inside the pollen grains. The pollen grain leave the anther and reach the ovary. The female gamete is found inside the ovule. During fertilisation, when the pollen grains fall on the stigma, a pollen tube is formed. It grows and reaches the ovule. There, the male gametes are released, one of which fuses with the female gamete and a zygote is formed.

2. After the process of fertilisation, the following changes take place:
   - The ovary develops into fruit.
   - The ovule develops into seed. The zygote that is formed by the fusion of male and female gamete divides to form an embryo.
   - The petals and sepals wither out.

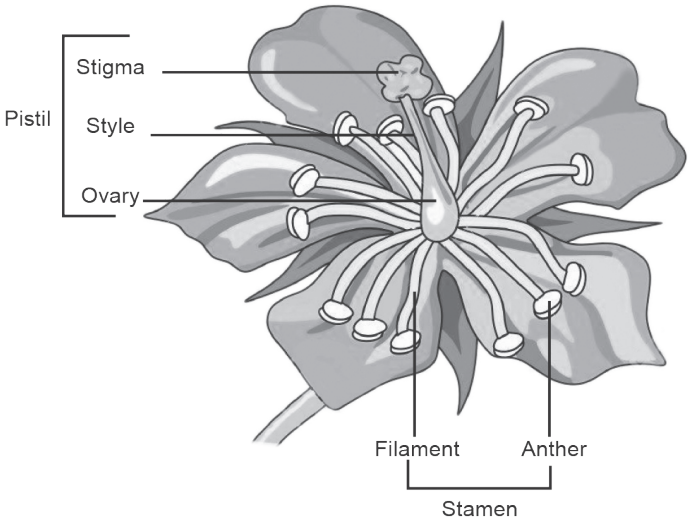
3. The male part of the flower is called stamen. It consists of anther and filament. Anther contains small yellowish dust-like structures called pollen grains.

The female part of the flower is called pistil. It consists of stigma, style and ovary. Ovary contains ovules.

4. During favourable conditions, the seeds sprout and produce new plants. This process of sprouting of seeds to produce new plants is called germination. In order to germinate, a plant needs air, moisture and a certain temperature. Seeds contain stored food. Seeds absorb water and convert the stored food into soluble form.

5. Thus, the dissemination of seeds over a wide area through various agents like wind, water, seed explosion and animals is called seed dispersal. Methods include wind, water, animals, and seed explosion.

G. 1. & 2.



H. 1. (a) Both A and R are correct and R is the correct explanation of A.
2. (c) A is correct but R is incorrect.
3. (a) Both A and R are correct and R is the correct explanation of A.

I. (i) A gamete is found inside the pollen grains.
(ii) B gamete is found inside the ovule.
(iii) The fusion of A gamete with B gamete forms a zygote.
(iv) This process is called fertilisation.

J.

Across	**Down**
4. POLLINATION	1. FERTILISATION
5. GAMETE	2. ONION
6. GERMINATION	3. STAMEN
	4. PISTIL

Think & Answer (HOTS)

1. Artificial vegetative reproduction allows rapid plant growth, ensures uniformity, and preserves desirable traits. It is commonly used for crop improvement and faster plant propagation.
2. Overcrowding would lead to competition for resources like water, sunlight, and nutrients. This could result in poor growth, weaker plants, and lower survival rates.

Life Skills

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Chapter – 9 Motion and Time

Warm Up (Page 121)

i. Linear motion
ii. Linear motion
iii. Linear motion
iv. Circular motion
v. Circular motion
vi. Simple pendulum motion

Knowledge Check (Page 123)

1. Speed = Total distance covered/Total time taken
   = 96 × 1000/3600
   = 96 × 5/18
   = 26.67 m/s
   So, the speed of the car is 26.67 m/s.
2. Speed = Total distance covered/Total time taken
   = 240 km/4 hours
   = 60 km/h
   Thus, the speed of the train is 60 km/h.

Knowledge Check (Page 130)

a. second
b. sundial
c. water clock
d. rest
e. not changing

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (c) Day
2. (b) 7.2 m/s
3. (a) Metre
4. (b) Clock
5. (b) Pendulum

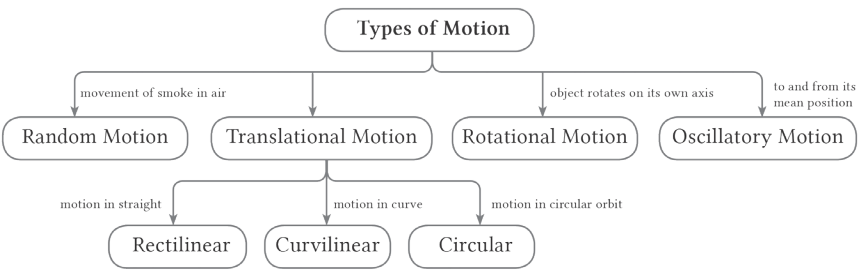
B. 1. Hourglass
2. Vehicles
3. Odometer
4. Calendar
5. Time period

C. 1. Distance = Speed × Time = 5 km/h × 3 hours = 15 km
The car travels 15 km in 3 hours.

2. 2.4 km = 2400 m
Time = Speed/Distance
= 2400 metres/2 m/s = 1200 s = 20 minutes
The time taken by Sunil to reach the school is 20 minutes.

3. Distance = 2 m/s × 900 seconds = 1800 metres = 1.8 km
The distance between Salma's house and the school is 1.8 km.

D.



E. 1. The time taken by a pendulum to complete one oscillation is called Time-period.
Example: In a simple pendulum, the time taken to complete one full swing from one extreme to the other and back is called the time period.

2. Uniform motion: A body is said to be in uniform motion when it moves in a straight line, covering equal distances in equal intervals of time.
Non-uniform motion: A body is said to be in non-uniform motion when the distance travelled by the body at fixed intervals of time is not the same.

3. Oscillatory motion is the repetitive back-and-forth movement of an object around a fixed point.
Example: The motion of a pendulum in a clock.

4. The distance covered by a body in a unit of time is called speed. Its SI unit is metres per second (m/s).

5. The time between one sunrise and the next was called a day. Similarly, a month was measured from one new moon to the next. A year was fixed as the time taken by the earth to complete one revolution of the sun.

6. Time period (T) = Time taken for one oscillation = Time taken for 5 oscillations/5
T = 15 seconds/5=3 seconds
Time period of the pendulum = 3 seconds.

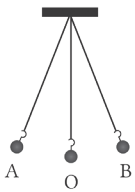
F. 1. The distance covered by an object in a unit of time is called the speed of the object. For example, if a car covers a distance of 100 kilometres in an hour. A bus covers a distance of 50 kilometres in one hour. Then the speed of the car is more than the speed of the bus. Since the speed of most objects is not constant, the speed is an average speed.

Speed = Total distance covered/ Total time taken

2. In the morning, a shadow points to the west as the sun rises in the east. It gradually gets shorter and moves towards the north. In the afternoon, the shadow points eastwards, steadily lengthening as the sun moves towards sunset in the west. A sundial takes advantage of this by using a device called a gnomon to cast a shadow, with a dial and markings allowing you to measure the time. A sundial also depends upon your position on the earth. It can only be used at a certain longitude and latitude. You cannot move away from your latitude. Although you can move along it, you will need to add or subtract four minutes for each degree moved, depending upon the direction.

3. Simple Pendulum: One of the most well-known periodic motions is that of a simple pendulum. A simple pendulum consists of a small metallic ball or a piece of stone suspended from a rigid stand by a thread. The metallic ball is called the bob of the pendulum.
Figure (a) shows the pendulum at rest in its mean position. When the bob of the pendulum is released after taking it slightly to one side, it begins to move to and fro, as shown in figure (b). The to and fro motion of a simple pendulum is an example of a periodic or an oscillatory motion.

A simple pendulum



Different positions of the bob of an oscillating simple pendulum

The pendulum is said to have completed one oscillation when its bob, starting from its mean position O, moves to A, to B and back to O. The pendulum also completes one oscillation when its bob moves from one extreme position A to the other extreme position B and comes back to A. The time taken by the pendulum to complete one oscillation is called its time period.

4. A speedometer is an instrument that indicates the speed of a vehicle, usually combined with a device known as an odometer that records the distance travelled.

   Meters can be seen on the dashboards of cars, buses and other vehicles. Figure shows the dashboard of a car. Note that one of the meters has km/h written at one corner. This is called a speedometer. It records the speed directly in km/h. There is another meter that measures the distance moved by the vehicle. This meter is known as an odometer.
5. The principle behind water clocks is inward- or outward regulated flow of water. It is a timekeeping device. During the inward-regulated flow method, a bowl marked with lines is filled with water. The flow of water is regulated. The lines are marked in order to track the flow of water which indicates the time.
6. Motion and time are relative because they depend on the observer's frame of reference.

   Motion: An object may appear to be moving to one observer but stationary to another, depending on their relative positions.

   Time: Time can pass differently for observers moving at different speeds or in different gravitational fields. For example, time moves slower for someone traveling at high speeds (time dilation) or near a massive object like a planet (gravitational time dilation).

G. a. If an object is not moving, a horizontal line is shown on a distance-time graph.

   Time is increasing to the right, but its distance does not change. The object is not moving. Therefore, we say it is at rest.

   b. If an object is moving at a constant speed, it means it has the same increase in distance in a given time.

   Time is increasing to the right, and distance is increasing constantly with time. The object moves at a constant speed.

   Constant speed is shown by a straight line on the graph.

H. 1. (c) A is correct but R is incorrect.
   2. (a) Both A and R are correct and R is the correct explanation of A.
   3. (c) A is correct but R is incorrect.

I. (i) An object 'X' covers a distance in less time. Object 'Y' covers a same distance in more time. The object 'X' is faster moving object.

   (ii) Object 'Y' covers a same distance in more time. Object 'Y' is a slower moving object.

   (iii) Motion is a change in the position of an object at a given time with respect to a stationary object.

   (iv) An object 'X' covers a distance in less time. Object 'Y' covers a same distance in more time. Thus, we can say that 'X' has a faster motion and 'Y' has a slower motion.

Think & Answer (HOTS)

Do it Yourself

Life Skills

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Chapter – 10 Electric Current and its Effects

Knowledge Check (Page 140)

1. (d) Battery
2. (c) Aluminium
3. (b) Rubber
4. (a) Tin
5. (d) Heating

Knowledge Check (Page 144)

(a) True (b) False (c) False (d) True (e) False

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) Solenoid
2. (b) Fuse
3. (b) By obstructing current through the circuit
4. (d) Soft iron
5. (d) All of these

B. 1. tungsten 2. MCB 3. heating, magnetic
4. circuit 5. Conductors

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

D. 1. Conductors: Conductors are materials which have very low resistance (almost negligible). Therefore they do not oppose, rather allow almost all the current to flow through them. Example: copper, aluminium and iron.
Insulators: Insulators have infinite high resistance and thus strongly oppose any flow of current through them. Therefore, no current can flow through them. Example: rubber, cloth and plastic .

2. Electric bulb has a thin, highly coiled tungsten wire. The tungsten wire is made up of high resistance material, called filament.
The electric bell works on the principle of magnetic effect of electric current. It consists of an iron core on which the wire is wound as a coil.

3. A switch to connect or break the circuit. When the switch is closed and current flows through the circuit, it is called closed circuit. When the switch is open and current is not allowed to pass through the circuit, it is called open circuit.

4. The flow of current through a wire makes it behave like a magnet.
An electromagnet is a coil wound on a magnetic material like a soft iron bar. The electromagnet behaves like a bar magnet as long as the current is flowing through it.

E. 1. A switch to connect or break the circuit. When the switch is closed and current flows through the circuit, it is called closed circuit.

2. The effects of electric current are:
   1. Magnetic effect
   2. Heating effect
   3. Chemical effect
   4. Lighting effect

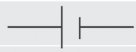
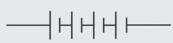
3. **Conductors:** Copper, Aluminium
Insulators: Rubber, Wood

4. **Lighting:** Electric current powers bulbs and lamps.
   Heating: Electric current is used in electric heaters and cooking appliances.
5 Tungsten is used in an electric bulb because it has a high melting point and can withstand the heat produced when current passes through it.
6. Tin and copper alloy
7. In case of a fuse, the electric fuse is damaged and needs to be replaced whereas MCB is just switched off and can be reused for a long time.
8. Electric heater
   Iron
   Toaster

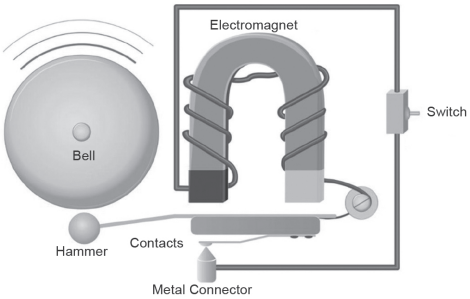
F. 1. The minimum components required to make a simple circuit are:
- A source of electrical potential difference such as a cell or battery.
- A conducting wire to allow the passage of current.
- An electrical resistance such as a bulb that converts electrical energy into some other forms of energy.

2. The continuous and closed path of an electric current is called an electric circuit. The current stops flowing or the electric appliance stops working if the circuit is broken.
   The minimum components required to make a simple circuit are:
- A source of electrical potential difference such as a cell or battery.
- A conducting wire to allow the passage of current.
- An electrical resistance such as a bulb that converts electrical energy into some other forms of energy.
- A switch to connect or break the circuit. When the switch is closed and current flows through the circuit, it is called closed circuit. When the switch is open and current is not allowed to pass through the circuit, it is called open circuit.

Symbols of Electrical Components: Presenting a circuit with a number of components becomes a difficult task. So, to represent a circuit on paper, we use certain symbols. Some of the common circuit symbols are:

Component of electrical circuit	Symbol
Connecting wires	
Switch in the 'OFF' position	
Bulb	
Cell	
Switch in the 'ON' position	
Battery	

3. **Electric Bell:**
   The electric bell works on the principle of magnetic effect of electric current. It consists of an iron core on which the wire is wound as a coil. One of the free ends of the coil is connected to one terminal of the battery and the other end is connected to a steel rod. The steel rod acts like a spring for the hammer touching the screw contact. The other terminal of the battery is connected to the screw contact with a switch in the middle.



Electric bell

Working of an Electric Bell:

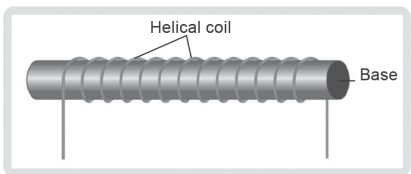
When the switch is turned on, electric current flows through the coil and the iron core acts as an electromagnet. It generates a magnetic field that attracts the iron strip towards it. The striker strikes the gong that acts like a bell. When the striking arm strikes the gong, the contact is broken and current stops flowing through the circuit. This causes the electromagnet to lose its magnetic field. The connected spring arm returns the striker to its original rest position. The contact is restored and current flows through the circuit except when the main switch is still pressed. The process is repeated from the beginning.

4. An electric fuse is a safety device used in an electric circuit. It works on the principle of the heating effect of current. It prevents damage to the circuit if very high current suddenly passes through it. The fuse wire is made of special metallic material that melts spontaneously when excess amount of current is passed through it. The melting of wire creates a gap in the circuit and makes it an open circuit. The open circuit does not allow passage of current hence, the damage is prevented.
5. When electric current is passed through a conductor, a part of electrical energy is converted into heat. This is called the heating effect of electric current.

   The amount of heat produced when an electric current flows through a material depends upon the following factors.
   - Resistance of the material
   - Amount of current flowing through it
   - Duration of flow of current
6. The strength of magnetic field due to current in a conductor can be increased by wounding the wire into a coil. A solenoid behaves like bar magnet as soon as current flows through it. The strength of the magnetic field of solenoid can be increased either by increasing the number of turns in the coil or by increasing the current in the coil or both.

   Aim: To make a solenoid.

   Materials required: Insulated conducting wire, a pencil, dry cell, switch and compass needle.



Procedure:

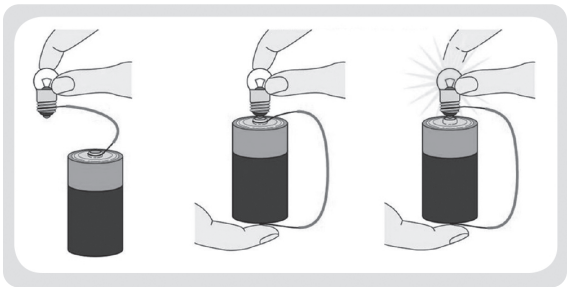
- Wind almost 10 turns of wire around the pencil to make a coil.
- Connect the coil to a dry cell and allow the current to pass through the coil.
- Bring the compass needle near it and observe the deflection produced in it.
- Switch it off to stop the passage of current through it.
- Now, increase the number of coils to 20 by wounding the wire around the pencil.
- Repeat the procedure and observe the deflection produced.

Conclusion: The deflection in the needle increased after increasing the number of turns.

7. Electromagnets are used in devices like electric bells, MRI machines, cranes for lifting heavy materials, speakers, and transformers for electrical power distribution.
8. Activity:

Aim: To compare the behaviour of electromagnets in the presence and absence of current.

Materials required: An electromagnet, iron fillings, conducting wire, cardboard and a cell.



Procedure:

- Take an electromagnet. Connect its free ends with the terminals of the cell.
- Spread some iron fillings on the cardboard.
- Bring the electromagnet near the iron fillings.
- Record the observation.
- Now, remove the cell from the electromagnet.
- Record the observation.

Conclusion: When the electromagnet was connected with the cell, the iron fillings were attracted towards it. On limiting the supply of electric current by removing the cell, the iron fillings dropped down on the cardboard. This activity proves the magnetic effect of electric current.

G. 1. Bell 2. Switch in the OFF position 3. Bulb
4. Cell 5. Switch in the ON position 6. Battery

H. 1. (a) Both A and R are correct and R is the correct explanation of A.
2. (c) A is correct but R is incorrect.
3. (c) A is correct but R is incorrect.

I. (i) Bulb, AC, geyser, refrigerator, television and computer
(ii) Switch is the device that makes and breaks the supply of current.
(iii) It makes a link between electric appliances and the source of electricity.
(iv) It will become OFF.

Think & Answer (HOTS)

1. To find the direction of the magnetic field around a current-carrying wire, you can use the right-hand thumb rule. Here's how it works:
   - Right-Hand Thumb Rule: Hold the wire in your right hand such that your thumb points in the direction of the current. Then, your fingers will curl in the direction of the magnetic field around the wire.
   - This means the magnetic field forms concentric circles around the wire, and the direction of the field can be determined by the curl of your fingers.
2. Increasing the number of turns around the soft iron core increases the strength of the magnetic field because each loop of wire contributes to the total magnetic field.
   Reducing the number of turns decreases the strength of the magnetic field because fewer loops generate a weaker magnetic field.
   Measuring the strength: The strength of the magnetic field can be measured using a compass or a galvanometer. A stronger field will cause a compass needle to deflect more, and a galvanometer will show a higher current if connected to a coil.

Life Skills

Do it Yourself

Project

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Chapter – 11 Light

Knowledge Check (Page 156)

(a) rectilinear propagation
(b) virtual image
(c) normal
(d) concave, convex

Knowledge Check (Page 159)

(a) concave
(b) concave
(c) near
(d) virtual, erect, and diminished
(e) seven

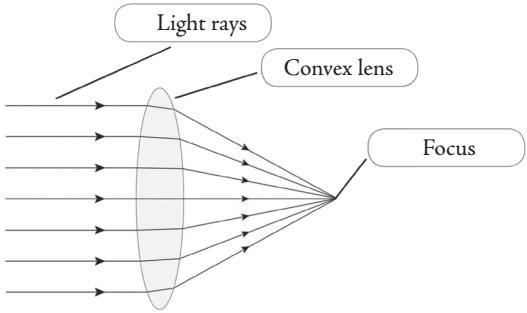
Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) it reflects
   2. (a) Concave mirror
   3. (d) All of these
   4. (a) straight
   5. (b) incident ray

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

C. a. ii b. iii c. iv d. v e. i

D.



E. 1. The right-hand side of an object appears on the left-hand side of the image and vice-versa. This phenomenon is called lateral inversion of the object.

2. i. Convex lens is used to read very small print.

   ii. Convex lens are used in various instruments like cameras, telescopes, binoculars and microscopes.

3. i. Concave lens is used to treat short-sightedness, an eye-vision defect.

   ii. Concave lens are also used in projectors to diverge the incident rays.

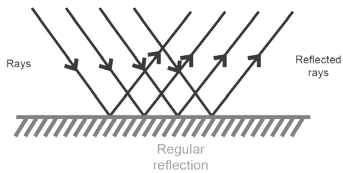
5. The line connecting the centres of the two spheres from which the lens is formed is called principal axis.

6. When a narrow beam of white light (sunlight or torchlight) falls on one surface of the prism, it splits into its constituent colours and escapes from the other surface. This phenomenon is called dispersion of light.

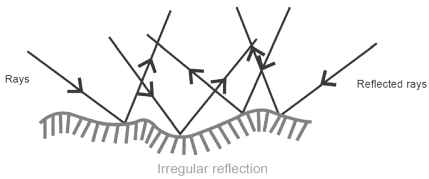
7. This happens because of the effect of the image.

F. 1. When light rays fall on an object, some part of the light bounces off and the rest either passes through or is absorbed by the object. This bouncing off of light rays is called refection of light.

Regular and Irregular Reflection:

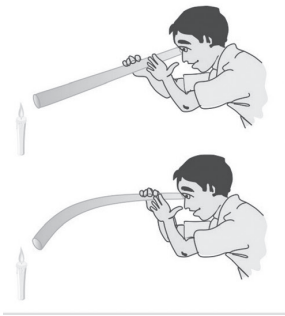


When a parallel beam of light strikes on a highly smooth and polished surface, it is reflected as a parallel beam of light. Such a reflection is known as **regular reflection**. The reflection which takes place from still water or oil, mirrors, highly polished metals or furniture is regular reflection. Regular reflection helps in the formation of an image. As a consequence, we can see our face in a mirror.



When a parallel beam of light strikes on a rough surface, it is reflected in different directions. Such a reflection is known as **irregular reflection**. It is sometimes called diffused reflection. The reflection taking place from stones, walls, trees and other non-reflecting objects around us is irregular reflection. Irregular reflection serves to spread the light over a large area. Hence, we can see objects around us.

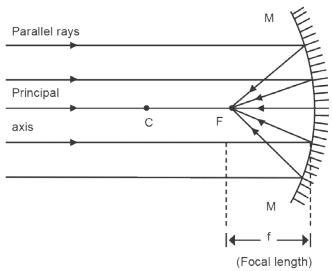
2. **Aim:** To demonstrate that light propagates in a straight line.



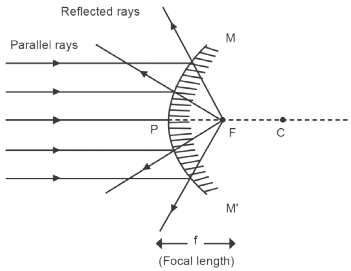
Procedure:

- Take a flexible plastic pipe. Keep it straight and look at a glowing bulb through it. You can see the bulb because there is a straight path available through the pipe from the light source to your eyes.
- Now bend the pipe from the middle. Can you still see the bulb through the bent pipe?

3. Differences between concave and convex mirror:



Concave mirror



Convex mirror

Concave	Convex
The reflecting surface curves inwards.	The reflecting surface curves outwards.
The rays of light reflected from the curved surface meet at a single point, the principal focus.	The rays of light reflected from the curved surface appears to diverge from the principal focus.

4. Convex Lens (Converging Lens):

i. Direct parallel rays from a distant object towards the lens.

ii. The rays will converge at a point; this is the focal point.

iii. Measure the distance between the lens and the focal point to get the focal length.

Concave Lens (Diverging Lens):

i. Direct parallel rays towards the concave lens.

ii. The rays will diverge, and their extensions meet at a virtual focal point.

iii. Measure the distance from the lens to the virtual focal point.

In both cases, the focal length is the distance from the center of the lens to the focal point.

5. A mirror whose reflecting surface curves outwards is called a convex mirror.

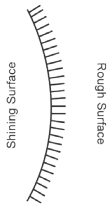
A mirror whose reflecting surface curves inwards is called a concave mirror.

This implies that the outer surface of a spoon acts as a convex mirror, while its inner surface acts as a concave mirror.

All the rays of light reflected from the curved surface of a concave mirror meet at a single point. This point is called the **principal focus** or **focus**. In case of a convex mirror, the rays of light appear to diverge from the principal focus.

Spoons

Convex mirror



Concave mirror

6. a. Differences between concave and convex mirror

Concave	Convex
The reflecting surface curves inwards.	The reflecting surface curves outwards.
The rays of light reflected from the curved surface meet at a single point, the principal focus.	The rays of light reflected from the curved surface appears to diverge from the principal focus.

b. Differences between real and virtual images

Real Image	Virtual image
Real image can be obtained on screen.	Virtual image cannot be obtained on a screen.
This image is inverted.	This image is erect.
This is formed on same side of the mirror.	This is always formed behind the mirror.

c. **Incident ray:** A ray of light striking a mirror surface.

Reflected ray: A ray of light which is reflected off the mirror surface.

G. a. Convex mirror

b. Concave lens

c. Convex lens

H. 1. (a) Both A and R are correct and R is the correct explanation of A.

2. (c) A is correct but R is incorrect.

3. (d) Both A and R are correct.

I. (i) Your face is "object" and what you see in the mirror is its "Image".
(ii) The image that can be obtained on the screen is called real image.
(iii) The image that cannot be obtained on a screen is known as virtual image.
(iv) When light from your face falls on the mirror, the mirror reflects this light.

Think & Answer (HOTS)

1. Yes, the rider will face inconvenience. A plane mirror will give an upright, virtual image that is smaller than the actual object, making it difficult for the rider to see a larger and clearer view of the surroundings. This can be dangerous as the rider will not get a proper view of vehicles or obstacles behind the scooter.
2. No, it is not possible to form an enlarged and erect image of an object on a screen. An enlarged and erect image can be formed by a concave lens or concave mirror, but this image will always be virtual and cannot be displayed on a screen. Only real images can be projected onto a screen, and they are usually inverted (not erect).
3. The shopkeeper should use a convex mirror.
   - **Reason:** A convex mirror has a wide field of view, which allows it to show a larger area. This type of mirror forms a virtual, diminished image, but it helps the shopkeeper view nearly the entire shop, making it useful for security or surveillance purposes.

Life Skills

Yes, promoting the use of solar panels is a great way to save the environment. Solar energy is renewable, environment-friendly, and does not produce harmful waste or emissions. By using solar panels, we can reduce our reliance on fossil fuels, lower carbon footprints, and save on electricity costs in the long run. It's a sustainable solution that helps protect the planet for future generations.

Project

Do it Yourself

Chapter – 12 Forests: Our Lifeline

Warm up (165)

Plastic, spices, log, oxygen, gum, castors, medicine

Knowledge Check (Page 169)

a. Canopy b. Habitat c. Transpiration
d. Carbon dioxide e. Understorey

Knowledge Check (Page 172)

a. False b. True c. True d. False e. False

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) consumer
2. (c) Four
3. (d) Grass, goat, tiger
4. (b) Canopy
5. (d) All of the above

B. 1. canopy 2. canopy 3. humus
4. Food web 5. Plants, producers

C. 1. tiger 2. cotton 3. giraffe 4. Bacteria

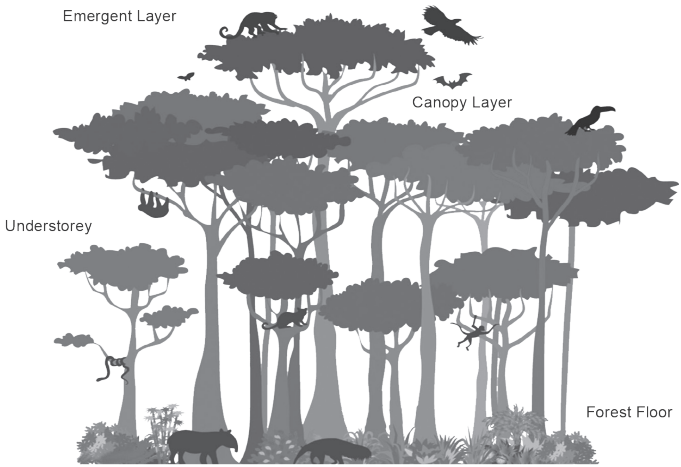
D. 1. c 2. d 3. f 4. a
5. b 6. e

E. 1. Deforestation is the removal of trees and forests to make way for other land uses.
2. Forests absorb carbon dioxide and release oxygen, helping to purify the air.
3. The dense canopy blocks sunlight from reaching the ground.
4. Forests provide oxygen, prevent soil erosion, support wildlife, and supply resources like wood and medicine.
5. Planting Trees on Barren Land: Planting trees in empty or degraded areas to restore the ecosystem.

   Planting Trees on Barren Land: Planting trees in empty or degraded areas to restore the ecosystem.

F. 1. Importance of forests: We get a variety of wood from the forest such as sheesham, rosewood, teak and sal. Wood is used to make furniture, construct homes an make almirahs. Wood is also used as fuel. Wood is a source of fuel in households for cooking food and keeping the house warm. It is used in the production of paper.

2.

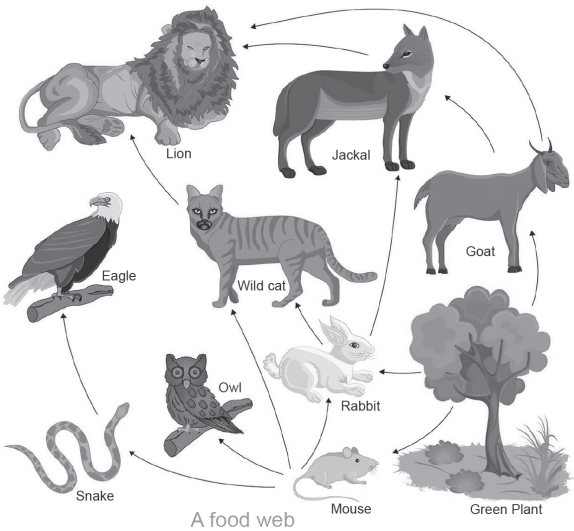


Rainforest Structure

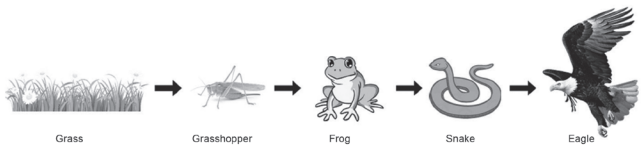
3. Causes of Deforestation:
   i. Increase in population
   ii. Construction of dams
   iii. Wood for industries
   iv. Forest fires

   Effects of Deforestation:
   i. Change in rainfall pattern
   ii. Causes soil erosion
   iii. Pollution
   iv. Global warming

4.



A food web



5. The different types of forests in India are:
   i. Tropical rainforest: They are found in north-eastern Himalayas and Western Ghats.
   ii. Tropical deciduous forest: They are found in the northern and southern parts of India.
   iii. Temperate coniferous forest: They are found in the higher ranges of Himalayas.
   iv. Temperate broadleaf forest: They are found in the western Himalayan region.
6. i. Source of Wood ii. Maintains Balance of Gases
   iii. Maintains Water Cycle iv. Prevents Soil Erosion
   v. Maintains Temperature vi. Prevents Global Warming

G. 1. The complex presentation of interconnected food chains is called a food web.
2. Let us assume that all the lions from the above food web disappear. Then, the count of all the animals that lions eat like deer, jackrabbit, ringtail, will increase. Many of these animals depend on grass or small plants for food. So, overpopulation of deer in the forest will lead to insufficient grass in the nature. Consequently, the deer will starve to death. This implies that the absence of lions adversely affects both the deer and the grass.
3. A food chain begins with green plants that produce their food themselves and are thus called producers.
4. The flow of energy is represented by the food chain.

H. 1. (a) Both A and R are correct and R is the correct explanation of A.
2. (a) Both A and R are correct and R is the correct explanation of A.
3. (c) A is correct but R is incorrect.

I. (i) also home (ii) green
(iii) plants (iv) air and water

J. **Across** **Down**
5. DEFORESTATION 1. AFFORESTATION
6. FOOD WEB 2. UNDERSTOREY
7. CANOPY 3. EMERGENT
4. PRODUCERS

Think & Answer (HOTS)

1. In the forest, everything has a purpose. When plants and animals die, they decompose and turn into nutrients that help new plants grow. Dead leaves and trees break down and give food to the soil, making it rich and healthy. So, in the forest, nothing is wasted – everything is reused to support new life.
2. Recycling paper helps save trees because less wood is needed to make new paper. When we recycle, fewer trees are cut down, which helps protect forests. Recycling also uses less energy and water, making it better for the environment. So, recycling paper helps to conserve forests and reduce deforestation.

Life Skills

Do it Yourself

Project

Do it Yourself

Chapter – 13 Wastewater Management

Warm up (177)

No, water is not fit for consumption. It is polluted.

Knowledge Check (Page 180)

(a) Metabolism (b) Saponification
(c) Sludge (d) Disinfection

Knowledge Check (Page 183)

a. 2 to 3 b. Biogas
c. Vermicomposting d. Cholera and Typhoid

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) Screening 2. (d) All of the above
3. (d) Sludge 4. (d) Aeration tank
5. (d) All of the above

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

C. 1. screening 2. screening 3. jaundice

D. 1. Septic tank: A large, concrete tank is built under the ground with inlet and outlet pipes attached to it. The inlet pipes carry wastewater from the households, the sludge settles at the bottom and excess water flows out through the outlet pipes.

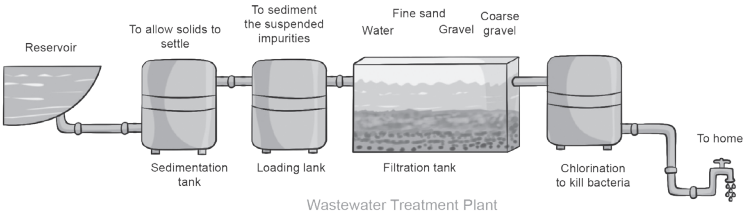
2. Incineration: The burning of substance into ash is called incineration.
3. At times, the underground drain pipes are broken or wastewater overflows through the drain pipes resulting in sewage spills.
4. Dewatering: The water from the sludge can be drained using various machines. The dried sludge can be further mixed with other materials to transform it from a good fertiliser to manure.
5. Vermi-composting Toilets: The toilet that uses earthworms for the disposal of human excreta is called a vermi-composting toilet.

E. 1. Industries make water dirty by discharging harmful chemicals, waste, and pollutants like heavy metals, oils, and solvents into water bodies.
2. Eutrophication is the enrichment of water bodies with excess nutrients, causing rapid algae growth. This depletes oxygen in the water, harming aquatic life and disrupting ecosystems.
3. Maintaining cleanliness at public places is important to prevent the spread of diseases, maintain hygiene, and create a pleasant environment.
4. Ways to make sludge usable include composting, converting it into biogas, or using it as a fertiliser after proper treatment.
5. **Aeration:** Exposing water to circulating air.
6. Waterborne diseases are illnesses caused by consuming contaminated water. Three examples are cholera, typhoid, and dysentery.

F. 1. Whenever we use water at home, it is discharged and accumulated in the drains. This accumulated water forms sewage. The sewage goes through a network of interlinked system of pipes called the sewage system.
2. Sources of Wastewater:
   - Agricultural wastewater: Waste generated by agricultural activities like pesticides, herbicides, fertilisers, horticulture, breeding of livestock, garden and nurseries are sources of agricultural waste.
   - Industrial wastewater: The waste produced due to industries is a great source of wastewater.
   - Medical waste: The waste from hospitals contains certain disease-carrying germs.
   - Mining waste: Wastewater can be generated due to mining as well.
   - Construction-site waste: Large amount of wastewater is generated at construction sites.
   - Domestic waste: Wastewater from households contains soap and detergent, dirt, body waste, waste food and toilet waste.
3. Clean water is one of the fundamental requirements of life. We need clean water for various purposes in life such as drinking, cooking food, growing crops and bathing. After using it once, it becomes unfit to reuse. All the water that becomes dirty, that is, unfit for use is called **wastewater**.

   Wastewater Treatment Plant:

   The large plant where wastewater is cleaned before being sent to the nearest water bodies or reused is called **wastewater treatment plant**. The sewage treatment involves physical, chemical and biological processes to make the water fit for reuse. All these basic treatments are done through four main stages namely screening, primary treatment, secondary treatment and tertiary treatment.



Wastewater Treatment Plant

4. Alternate ways to dispose sewage
   - Septic Tank: Rural areas or small villages that still do not have wastewater treatment plants can use low-cost septic tanks to manage waste.
   - Biogas Plant: Another effective method of wastewater disposal is a biogas plant.
   - Vermi-composting Toilets: The toilet that uses earthworms for the disposal of human excreta is called a vermi-composting toilet.
5. To control sewage water, manholes are made on the drain pipes. These are usually holes, covered with a concrete lid spacious, enough for a person to enter in the pipe and fix the sewage problems.
6. We can always contribute to maintain proper sanitation of public places by the following ways:
   i. Do not litter at public places. If you do not find a dustbin, carry your waste materials home but do not throw waste on the road.
   ii. Never urinate on roadside. Always use public toilets on the roads or in the public areas.
   iii. Keep the drains covered. In case of sewage overflow, inform the municipal corporation of the area to resolve the problem

G. (a) Industrial wastewater is the water that is contaminated by chemicals, heavy metals, and other pollutants as a result of industrial processes.
   (b) Types of wastes produced include chemicals, oils, heavy metals, plastics, and organic matter.
   (c) Industrial wastes affect the aquatic animals by poisoning them, disrupting their reproductive systems, and causing oxygen depletion, which can lead to suffocation and death.

H. 1. (a) Both A and R are correct and R is the correct explanation of A.
   2. (c) A is correct but R is incorrect.
   3. (c) A is correct but R is incorrect.

I. (i) True (ii) False (iii) True (iv) False

Think & Answer (HOTS)

1. Fish die due to agricultural waste because excess nutrients cause algal blooms, which deplete oxygen, suffocating fish.
2. Sludge is useful as a fertiliser or for biogas production. It is processed through composting, vermicomposting, or anaerobic digestion.

Life Skills

Do it Yourself

Project

Do it Yourself

Assessment Paper 1

A. 1. (b) insectivorous
2. (c) rumen
3. (d) hair
4. (a) bacteria
5. (d) Radiation
6. (b) Aqua regia
7. (b) Boiling of egg
8. (a) Horizon A
9. (b) Cold
10. (d) Cockroach

B. 1. anaerobically
2. Horizon B
3. Citric
4. Mercury
5. sericulture

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

D. 1.

Parasite	Symbionts
A parasite is an organism that lives on or in another organism (host) and derives nutrients at the host's expense.	Symbionts are organisms that live in close association with another organism, benefiting both.
Example: *Tapeworm* in humans.	Example: *Lichens* (algae + fungus).
Parasites often harm their host.	Symbionts benefit both organisms.

2.

Wool	Silk
Wool is a natural fiber obtained from the fleece of sheep.	Silk is a natural fiber produced by the larvae of silkworms.
Wool is warm, soft, and used in making sweaters, coats, etc.	Silk is smooth, shiny, and used in making fine garments.
Wool is more durable and insulating.	Silk is lighter, more delicate, and luxurious.

3.

Acid	Base
Acids are substances that release hydrogen ions (H^+) in solution.	Bases are substances that release hydroxide ions (OH^-) in solution.
Example: *Hydrochloric acid* (HCl).	Example: *Sodium hydroxide* (NaOH).
Acids have a sour taste and turn blue litmus red.	Bases have a bitter taste and turn red litmus blue.

4.

Topsoil	Subsoil
Topsoil is the uppermost layer of soil, rich in organic material and nutrients.	Subsoil is the layer beneath the topsoil, containing less organic material and more minerals.
It is darker in colour due to organic content.	It is lighter in colour, usually yellow or reddish.
It is most fertile and supports plant growth.	It provides minerals but is less fertile.

5.

Aerobic Respiration	Anaerobic Respiration
Aerobic respiration occurs in the presence of oxygen.	Anaerobic respiration occurs in the absence of oxygen.
It produces more energy (ATP) per molecule of glucose.	It produces less energy (ATP) per molecule of glucose.
Example: Respiration in humans.	Example: Fermentation in yeast.

E. 1. Plants respire through their roots by absorbing oxygen from the soil. This oxygen is used in cellular respiration, which produces energy for the plant's growth and development.

2. Soil pollution refers to the contamination of soil with harmful substances that affect plant growth and the environment. Two major sources of soil pollution are:
   i. Industrial waste disposal.
   ii. Pesticides and chemical fertilisers.

3. Characteristics of a chemical change include:
   i. Production of a new substance.
   ii. Change in color, temperature, or energy.
   iii. Formation of a gas or precipitate.
   iv. Irreversibility in most cases.

4. Properties of salt include:
   i. It is crystalline and solid at room temperature.
   ii. It dissolves easily in water.
   iii. It has a salty taste.
   iv. It conducts electricity when dissolved in water.

5. An indicator is a substance that changes color in response to a change in pH, used to determine whether a solution is acidic or basic.

6. The handles of cooking utensils are made of plastic or wood because they are poor conductors of heat, preventing burns or discomfort while handling hot utensils.

7. Occupational hazards in the wool industry include:
   i. Inhalation of wool dust leading to respiratory issues.
   ii. Risk of skin irritation or infection due to direct contact with wool fibers.

8. Assimilation is the process by which the absorbed nutrients (like glucose and amino acids) are incorporated into the body's tissues for growth, repair, and energy production.

9. The stomach of ruminants has four parts: rumen, reticulum, omasum, and abomasum.
   - Rumen: Ferments and breaks down plant material.
   - Reticulum: Helps in regurgitating food for re-chewing (cud).
   - Omasum: Absorbs water and nutrients.
   - Abomasum: Acts like a true stomach, where digestion of proteins occurs.

10. Saprophytes are organisms that obtain their nutrients by decomposing dead organic matter. Examples include fungi like mushrooms and bacteria like bacterial decomposers.

F. 1. Humans respire through the process of aerobic respiration, where oxygen is inhaled into the lungs, absorbed into the blood, and transported to cells. Inside the cells, oxygen reacts with glucose to produce energy (ATP), carbon dioxide, and water. The carbon dioxide is carried back to the lungs and exhaled.

- **Process:**
  i. Inhalation of oxygen through the nose or mouth.
  ii. Oxygen travels through the trachea, bronchi, and bronchioles into the alveoli of the lungs.
  iii. Oxygen diffuses into the bloodstream and is carried to cells.
  iv. In the cells, glucose is metabolized using oxygen in the mitochondria, releasing energy.
  v. Carbon dioxide is a waste product and is transported back to the lungs for exhalation.

2. Rusting is the corrosion of iron in the presence of moisture and oxygen. To prevent rusting, the following methods can be used:
   i. Galvanisation: Coating iron with a thin layer of zinc to protect it from exposure to air and water.
   ii. Painting: Applying paint or coating to prevent moisture and air from reaching the metal.
   iii. Oil or Grease Coating: Covering the iron with oil or grease to prevent contact with air and moisture.
   iv. Electroplating: Coating the metal with a non-corrosive metal like chromium.
   v. Using alloys: Mixing iron with other metals to form alloys like stainless steel, which is resistant to rusting.
3. Polar Bear:
   - Thick Fur: Provides insulation against the cold.
   - Fat Layer: A thick layer of fat beneath the skin helps conserve heat.
   - White Fur: Helps camouflage with the snow and ice.
   - Large Paws: Aid in walking on snow and ice.

   Penguin:
   - Streamlined Body: Helps them swim efficiently in cold water.
   - Thick Plumage: Provides insulation against the cold.
   - Blubber: Layer of fat under the skin helps retain body heat.
   - Wings: Modified for swimming instead of flying.
4. Neutralisation is the process in which an acid reacts with a base to form salt and water.
   - Example 1: Hydrochloric acid (HCl) reacts with sodium hydroxide (NaOH) to form sodium chloride (NaCl) and water (H_2O).
   - Example 2: Sulphuric acid (H_2SO_4) reacts with potassium hydroxide (KOH) to form potassium sulphate (K_2SO_4) and water (H_2O).
5. The lifecycle of the silkworm consists of four stages:
   i. Egg: The female moth lays eggs, which hatch into larvae.
   ii. Larva (Caterpillar): The silkworm larvae feed on mulberry leaves and grow rapidly.
   iii. Pupa (Cocoon): The larvae spin a cocoon made of silk fibers and undergo transformation into pupae.
   iv. Adult (Moth): The moth emerges from the cocoon, mates, and lays starting the cycle again. Its lifespan is short, and it plays roles in pollination and as a food source.

Assessment Paper 2

A. 1. d. urethra
2. c. Ginger
3. c. s/m
4. b. Fuse
5. b. direction
6. d. convex
7. b. Floods
8. d. All of these
9. b. Sludge
10. a. Tornado

B. 1. Capillaries 2. Speed 3. electromagnetism
4. Inverted 5. cycle

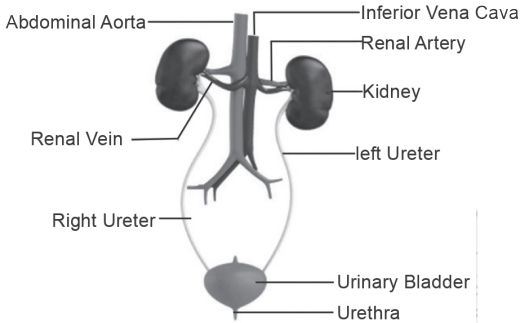
C. 1. False 2. True 3. False
4. False 5. False

D. 1. Arteries: Blood vessels that carry oxygenated blood away from the heart to various parts of the body (except the pulmonary artery).
Veins: Blood vessels that carry deoxygenated blood back to the heart from the body (except the pulmonary veins).
2. Self-pollination: The transfer of pollen from the male part to the female part of the same flower or plant.
Cross-pollination: The transfer of pollen from the male part of one flower to the female part of a different flower, typically on another plant.
3. Uniform motion: Motion in which an object covers equal distances in equal intervals of time.
Non-uniform motion: Motion in which an object covers unequal distances in equal intervals of time.
4. Concave mirror: A mirror with an inward-curved reflecting surface that converges light rays to a focal point.
Concave lens: A lens with an inward-curved surface that diverges light rays away from a focal point.
5. Biodegradable waste: Waste that can be decomposed by natural processes or organisms, such as food scraps, paper, and plant material.
Non-biodegradable waste: Waste that cannot be decomposed naturally, such as plastics, metals, and glass.

E. 1. The cardiac cycle refers to the sequence of events that occurs when the heart beats, consisting of the contraction (systole) and relaxation (diastole) of the heart muscles, resulting in blood being pumped out and filling the heart chambers.
2. Vegetative reproduction is a type of asexual reproduction in plants where new individuals are produced from vegetative parts like stems, roots, or leaves.
Types:
i. Budding (e.g., in potato) ii. Cutting (e.g., in rose)
iii. Layering (e.g., in jasmine) iv. Grafting (e.g., in fruit trees)
3. 28 km/h = 28×1000/3600 = 7.78 m/s
Distance = Speed × Time
= 7.78 m/s×10 s = 77.8 metres
Sneha will cover 77.8 m in 10 seconds.
4. Speed is the distance travelled per unit time, typically measured in metres per second (m/s) or kilometres per hour (km/h). It is a scalar quantity, meaning it only has magnitude and no direction.

5. A closed circuit is a complete electrical circuit through which current can flow. It involves a power source, conductors (wires), and a load (such as a bulb) connected in a loop with no breaks.
6. Thunderstorms are storms characterised by heavy rain, strong winds, thunder, and lightning. They occur when warm, moist air rises rapidly and condenses, creating strong updrafts and downdrafts, leading to stormy conditions.
7. A convex mirror always forms a virtual, erect, and diminished image. The image is formed behind the mirror, and the rays diverge after reflecting off its surface. It is smaller than the actual object.
8. Precipitation refers to any form of water, such as rain, snow, sleet, or hail, that falls from the atmosphere to the Earth's surface. It is a key part of the water cycle.
9. Decomposers are organisms like bacteria and fungi that break down dead plants and animals. Their function in the food chain is to recycle nutrients by decomposing organic matter into simpler substances, enriching the soil and supporting plant growth.
10. A sewage spill refers to the accidental release or leakage of untreated or partially treated wastewater into the environment. It can lead to contamination of water bodies and pose health risks.

F. 1. The human excretory system is a specialised system with the following components:
   - A pair of kidneys: Kidneys filter the blood that passes through them. During filtration, they separate the urea and other unwanted salts from the blood. Urea is very toxic for human body and it needs to be filtered continuously.
   - A pair of ureters: It passes urine from the kidney into the urinary bladder.
   - Urinary bladder: It stores urine until it is excreted from the body. Once the urinary bladder is full, humans feel the need to urinate.
   - Urethra: It passes urine out of the body.



The human Excretory System

2. Fertilisation in flowering plants occurs when pollen grains from the male anther are transferred to the female stigma. The pollen grain forms a tube that grows down the style to the ovary, where it meets the ovule. The male gamete (sperm cell) fuses with the female gamete (egg cell), resulting in the formation of a zygote, which eventually develops into a seed.
3. An electromagnet is a type of magnet created by passing an electric current through a wire wound around a magnetic material (e.g., iron). The magnetic field produced can be turned on and off by controlling the current.

Uses:

i. In electric motors: Electromagnets are used to convert electrical energy into mechanical energy.

ii. In scrapyards: Electromagnets are used to lift and move heavy metal objects.

4. Rainwater harvesting is the process of collecting and storing rainwater for future use. It involves capturing rainwater from rooftops or other surfaces and storing it in tanks or underground reservoirs. This water can be used for irrigation, drinking, or other household needs, helping to conserve water and reduce dependence on conventional water sources.
5. Forests play a vital role in maintaining ecological balance. They:
   i. Produce oxygen and absorb carbon dioxide, helping to mitigate climate change.
   ii. Provide habitat for a diverse range of plants and animals.
   iii. Prevent soil erosion and regulate water cycles.
   iv. Supply raw materials for humans, such as timber and medicinal plants.
   v. Contribute to the overall health of the planet by maintaining biodiversity and supporting the environment.