

Science Booster 8

1

Crop Production

ANSWERS

PRACTICE TIME

- A. 1. (d) 2. (d) 3. (a) 4. (a) 5. (d)
- B. 1. (a) 2. (d) 3. (b) 4. (d) 5. (b)
- C. 1. Beans, peas and green gram are examples of **pulses**.
2. Growing fruits and vegetables is called **horticulture**.
3. Milk contains all vitamins except vitamin **C**.
4. **Fallowing** is leaving the field vacant for one or more seasons to regain its fertility.
5. **Drip** irrigation is used in areas where there is water shortage.
- D. 1. Ploughing and levelling.
2. Some oilseed crops are mustard, groundnut, sunflower, soyabean and coconut. Plantation crops are tea, coffee, cocoa and rubber.
3. Cultivator is used for ploughing a field by using a tractor.
4. By transplantation, only healthy seedlings are planted with sufficient spacing between them. This increases crop production.
5. Drip irrigation provides water drop by drop near the roots of plants. In this way, water is not wasted at all and plants get regular supply of water.
6. Silos are tall cylindrical containers for bulk storage of grains.
- E. 1. By using a seed drill, seeds are sown uniformly in the furrows only. This prevents the wastage of seeds, saves time and labour.
2. Manuring is done to regain the fertility of soil. It also improves soil texture and helps it retain moisture.
3. Fertilisers are easily absorbed and utilised immediately by the plants. They provide specific nutrients to the crop.
4. Moat, Rahat, Dhekli, Chain pump and Swinging basket are the traditional methods of irrigation.
5. During Green Revolution, new varieties of wheat were developed by cross breeding methods using high-yielding dwarf varieties of wheat from Mexico and Australia.

- F. 1. (a) The unhealthy seeds are separated from healthy seeds by soaking them in water. The healthier seeds settle down at the bottom and unhealthy seeds being hollow and lighter as they are eaten by pests, float on the surface of water.
- (b) (i) Manual or Broadcasting method of sowing involves scattering of seeds by hand. The scattered seeds are later covered with soil.
- (ii) Mechanical method of sowing involves sowing seeds using a seed drill. It makes furrows in the soil and allows the seeds to fall at regular distances in the furrows.
2. (a) Manures are organic substances formed by the decomposition of waste matter by microorganisms. They are not nutrient-specific but provide all the nutrients to the soil. They are absorbed by plants slowly.
- Fertilisers are synthetic chemical compounds manufactured in factories. They are nutrient-specific and are absorbed by plants quickly.
- (b) Use of fertilisers in excess is disadvantageous because they damage the crop and pollute the soil as well as nearby waterbodies on washing by rainwater.
- (c) Manure made from farm waste such as cattle dung and urine, straw, leaves, etc. is called farmyard manure.
3. Modern methods of irrigation are:
- **Furrow irrigation:** In this method, water runs in the field through furrows between two rows of the crop.
 - **Basin irrigation:** In this method, the entire field is made overflood with water.
 - **Sprinkler irrigation:** In this method, perpendicular pipes are laid at regular intervals in the field. They are joined to the main pipeline and have rotating nozzles at the top end. The water through rotating nozzles gets sprinkled over the crop plants.
 - **Drip irrigation:** In this method, water is provided to the plants drop-by-drop, near their roots.
- Advantages of using modern methods of irrigation**
- Modern methods of irrigation avoid wastage of water and help in water conservation.
 - These methods prevent loss of water by evaporation.
 - These methods ensure equal distribution of water to different parts of the field, especially where the land is uneven.
4. They are weeding. The removal of unwanted plants growing naturally with crop plants without harming them is called weeding.
- Yes, it is an important step in agriculture because weeds compete with crop plants and use most of the nutrients. This hampers the growth as well as yield of crop plants.
5. (a) Sprinkler irrigation
- (b) When soil is sandy or land is uneven and proper distribution of water is not possible.
- (c) It distributes water evenly, saves water and prevents water logging.
6. After harvesting, the grains can be eaten up by rodents and insects, and can also be attacked by fungus which can destroy them.
- On domestic level, grains are stored in small metallic containers mixing with powdered neem leaves and black pepper.
- On commercial level, seeds are stored in gunny bags, in silos and granaries. The stored area is sprayed regularly with chemicals to kill or repel pests without affecting the stored grains.

7. We get milk, honey, eggs and meat from animals.

- Milk is used to prepare many other food items such as curd, cheese, butter, ghee, sweets, etc.
- Honey is used to prepare a large number of Ayurvedic medicines.
- Eggs and meat are used to prepare different types of eatables.

G. 1. It is important to irrigate the crop field before sowing the seeds because seeds germinate in the presence of moisture.

2. If distance and depth are not maintained at the time of sowing of seeds, the seeds will not get sufficient amount of water and oxygen and after germination they will not be able to get sufficient amount of light and air to grow well.

3. Wheat (rabi crop) and groundnut (kharif crop). Leguminous crops replenish nitrogen in soil because these plants have nitrogen-fixing bacteria in their root nodules.

Yes, Birendra is doing right thing because crop rotation enriches the soil as nutrient used by one crop are replenished by another crop growing on the same land. For example, after growing wheat crop, growing a leguminous crop such as groundnut or soyabean can replenish the nitrogen content of soil by its nitrogen-fixing bacteria, *Rhizobium* which live in its root nodules.

Passage/Case-based Questions

1. Pesticides obtained from plants or animals are called biopesticides. These are pyrethrin obtained from *Chrysanthemum* plant and azadirachtin obtained from neem tree.
2. Biopesticides and biofertilisers are better than chemical pesticides and fertilisers because they do not cause environmental pollution.

H. 1. THRESHING 2. CROP, COMBINE 3. CROP ROTATION 4. IRRIGATION

5. WINNOWING 6. HARVESTING 7. EGGS 8. PLOUGH 9. WEEDING 10. MANURE

ANSWERS

CHECK POINT 1

1. Microbiology 2. Saprophytic fungi 3. Algae 4. Viruses

CHECK POINT 2

1. BCG 2. Pathogens 3. Female *Anopheles* 4. Mildew 5. Water

CHECK POINT 3

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

PRACTICE TIME

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

B. 1. (b) 2. (a) 3. (c) 4. (b)

C. 1. **Viruses** reproduce inside the living organisms only.

2. Ringworm is a **fungal** disease.

3. Tuberculosis is transmitted by **air**.

4. Malaria spreads by the bite of **female *Anopheles*** mosquito.

5. ***Rhizobium*** is a nitrogen-fixing bacterium that lives in the root nodules of legumes.

D. 1. Bacterium *Lactobacillus* 2. Yeast 3. *Clostridium botulinum* 4. Virus 5. *Mucor*

E. 1. Bacteria, Fungi, Algae, Protozoa and Viruses. Bacteria and Protozoa have only one-celled individuals.

2. Because they behave as living beings inside the living cells and as nonliving things outside the living cells.

3. This condition is called food poisoning. It happens because certain microbes grow and produce toxic substances on the cooked food kept for long or stored making it poisonous.

4. Diseases caused by microorganisms through air, water, food or physical contact are called communicable diseases. Pneumonia, common cold, malaria and polio are some communicable diseases.

F.1. (a) Microorganisms decompose dead plants and animals, and convert their organic compounds into simple inorganic substances. These substances get mixed with soil and improve its fertility. Thus, microorganisms prevent accumulation of waste and dead organic matter and hence, they help to clean our environment.

(b) Microorganisms such as cyanobacteria and *Rhizobium* fix free nitrogen of air into nitrogenous compounds. This enriches the soil with nitrates which are used by plants.

2. Some communicable diseases such as common cold, flu, chickenpox, tuberculosis, etc., spread through air we breathe. The germs of these diseases come into air from a sick person by coughing and sneezing. Hence, covering mouth and nose while coughing and sneezing helps to prevent the spread of these diseases.

Communicable diseases spread by various ways as follows:

- By direct contact with a sick person – Influenza (flu), measles, chickenpox, etc.
- By air – Pneumonia, tuberculosis, common cold, ringworm, etc.
- By food/water – Cholera, typhoid, jaundice, food poisoning, etc.
- By mosquito bite – Malaria.

3. Conversion of atmospheric nitrogen into nitrogenous compounds by some biological agent is called biological nitrogen fixation. Microbes associated with nitrogen fixation are *Rhizobium*, *Azotobacter*, *Clostridium*, *Anabaena* and *Nostoc*.

4. Louis Pasteur discovered the occurrence of microorganisms in air. He also discovered the process of pasteurisation. This process is used to make the milk bacteria-free. The pasteurised milk does not spoil for a longer time.

5. A – Viruses. They are regarded as connecting link between living and nonliving things. (HIV causes AIDS in human beings.)

B – Fungi. It is used for commercial production of alcohol and wine, and in baking industry.

C – Bacteria. It fixes atmospheric nitrogen.

D – Bacteria. It converts milk into curd.

E – Protozoa. It causes amoebic dysentery.

- G. 1. Yes, yeast is a living organism. Yeast produces carbon dioxide gas by fermenting the sugar present in dough. This carbon dioxide gas makes the batter puffy and spongy.

Yeast is also used to make bread, biscuits, dhokla, bhatura, etc.

2. Corona virus causes COVID-19 disease. This affects the lungs and chokes them leading to death.

3. In air-tight packets, microbes cannot grow because there is no air to breathe, and hence dry fruits remain safe from the attack of microbes.

Passage/Case-based Questions

1. Food sold by street vendors is called street food.

2. Food poisoning is a disorder of digestive system which arises due to consuming food spoiled by microorganisms. It causes vomiting, headache and diarrhoea.

3. We should avoid street food because it is unhealthy as it is prepared in unhygienic conditions.

H. 1. BACTERIA 2. PRESERVATION 3. ALGAE 4. VIRUS

- K. (a) Common cold/cough is a viral disease. It is caused by rhinovirus.

(b) Transfer of disease from an infected person to a healthy person occurs through direct contact, air, contaminated food and water, mosquito bite, etc.

(c) Sita is an obedient person.

ANSWERS

CHECK POINT 1

1. Water, sunlight and soil 2. Air and sunlight 3. Coal gas and Natural gas 4. Coal gas
5. Carbon, hydrogen, oxygen, nitrogen and sulphur

CHECK POINT 2

1. Sedimentary rocks 2. Petroleum refining 3. Paraffin wax 4. Methane 5. Global warming

PRACTICE TIME

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

B. 1. (a) 2. (a) 3. (b) 4. (d)

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

D. 1. Air, water and sunlight.

2. The process of slow conversion of dead trees and plants into coal is called carbonisation.

3. The components of coal gas are hydrogen, methane, carbon monoxide and other gases.

4. Carbon dioxide.

5. The main component of natural gas is methane.

E. 1. The resources which are present in a limited amount in nature, cannot be continually replenished and are likely to be exhausted by various human activities are called exhaustible natural resources. Petroleum, coal, natural gas, minerals and forests are some exhaustible natural resources.

2. Carbonisation, Anthracite, bituminous, lignite

3. Coke is a solid substance obtained by destructive distillation of coal. It is greyish-black in colour with a rough texture. It is prepared by heating coal in the absence of air. As a result, the volatile impurities and moisture get removed. The solid left behind is coke. Coke contains 98% carbon.

4. The natural gas stored under high pressure is called CNG (Compressed Natural Gas). It is used as fuel to run autorickshaws, buses, cars, taxis, etc. for bringing down the pollution.

5. Fossil fuels such as coal, petroleum and natural gas are exhaustible natural resources. They are found in limited amount in nature, cannot be continually replenished and are likely to be exhausted by various human activities. This is the reason we should save fossil fuels.

F. 1. The resources which are present in a limited amount in nature, cannot be continually replenished and are likely to be exhausted by various human activities are called exhaustible

natural resources, e.g., petroleum, coal, natural gas, etc. On the other hand, the resources which are present in an unlimited amount in nature, can be continually replenished and are not likely to be exhausted by various human activities are called inexhaustible natural resources, e.g., air, sunlight, water and soil.

2. Coal was formed about three hundred million years ago by the process of carbonisation. Our earth was covered with dense forests and swamps. The trees and plants of dense forests died, and fell down on the wet and swampy floor of the forest and began to sink into the soil. More and more dead plants, gravel and soil deposited over them. The heat and pressure from the top layers gradually turned the remains of plants into coal.
3. Coal tar is a dark-black oily liquid obtained by destructive distillation of coal. It has very unpleasant smell. It is used to make inks, dyes, detergents, insecticides, artificial fibres, etc. Previously, it was used for metalling the roads.
4. Various constituents of petroleum with one use of each are as follows:
 - (a) **Petroleum gas:** It is used in the production of carbon black.
 - (b) **Petrol:** It is used as fuel in vehicles.
 - (c) **Diesel:** It is used as fuel for buses, cars, ships, trucks, etc.
 - (d) **Kerosene:** It is used as a fuel for stoves and lamps.
 - (e) **Fuel oil:** It is used in power plants to generate electricity.
 - (f) **Paraffin wax:** It is used for making shoe polish, grease, candles and ointments.

5. Coal is a black or brownish-black, hard and combustible substance.

Different types of coal depending on the amount of carbon present in it are anthracite (90%), bituminous or black coal (60%) and lignite (40%).

Coal is used as a fuel to cook food, for generating electricity in thermal power plants and as a source of energy in various industries like cement, paper, steel, iron, etc.

- G. 1. A clean fuel does not produce smoke and ash. This protects us from many lung and eye diseases. Therefore, it is advised to use a clean domestic fuel.
2. Cars having yellow number plates are used for commercial purposes. Cars having white number plates are meant for personal use and these run on fossil fuel such as diesel, petrol and CNG. Cars having green number plates are electric cars.
Electric cars having green number plates are good for environment because these do not cause pollution.
 3. X–Coal Y–Coke Z–Coal tar
Yes, Y (coke) is a better fuel as it does not produce pollutants.

Passage/Case-based Questions

1. Coal produces carbon monoxide, sulphur dioxide, nitrogen dioxide gases and a lot of smoke which pollute the environment and lead to global warming and acid rain.
2. Alternative sources of energy include solar energy, wind energy, hydro energy, etc.
3. We should use fossil fuels only when it is unavoidable, necessary and no other source is available for use.

- H. 1. COKE 2. WIND 3. CARBONISATION, COAL GAS 4. ANTHRACITE 5. METHANE
6. KEROSENE

ANSWERS

CHECK POINT 1

1. noncombustible 2. oxygen 3. combustible 4. ignition

CHECK POINT 2

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

CHECK POINT 3

1. flames 2. 1200°C 3. nonluminous 4. Melting

PRACTICE TIME

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

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

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

D. 1. Spontaneous combustion.

2. Noncombustible substances.

3. Carbon monoxide is released by burning coal.

4. Rapid combustion.

5. Blue zone–Nonluminous zone

Yellow zone–Luminous zone

E. 1. I will prefer dry leaves because these have lower ignition temperature.

2. (a) Incomplete combustion of a fuel produces yellow flame having a low temperature and leaves behind a black soot. It also produces harmful gases like carbon monoxide, nitrogen dioxide, etc.

(b) Carbon dioxide is a nonsupporter of burning. It displaces or takes away oxygen from the surrounding area by preventing the supply of oxygen to the combustible substance. This extinguishes the fire.

3. All substances do not produce flame on burning because only those substances which vaporise during burning give off flames. For example, candle burns with a flame.

4. The characteristics of middle zone of a candle flame are:

(a) The flame of this zone is luminous (yellowish in colour).

(b) The temperature of this zone is about 1200°C.

F. 1. 'Water controls the fire' can be shown experimentally as follows:

Take some water in a paper cup and heat it over a flame. The paper cup does not catch fire

because the water in the cup takes the heat and keeps the temperature of the paper below its ignition temperature.

2. (a) The substances that vaporise during the process of burning, give off flames, e.g., a candle and a magnesium ribbon burn with a flame, etc.
(b) When wax vapour does not burn completely as oxygen is not available in plenty, the flame produced is luminous. On the other hand, when oxygen is available in plenty, the flame produced is nonluminous.
3. The quantity of heat produced by the complete combustion of 1 kg of a fuel is called its calorific value. It is expressed in kilojoule per kilogram (kJ/kg).
4. Burning of fuels affects the environment in many ways. So, we should try to use some alternative sources of energy such as wind energy, solar energy, cleaner fuels like biogas and CNG.
5. Air is necessary for combustion to take place. It can be proved by following activity:
 - **Procedure:** Fix two candles on a table and light them with the help of a burning matchstick. Cover one of them with a glass jar and watch for some time.
 - **Observation:** The candle covered with the glass jar gets extinguished after some time while the uncovered candle continues to burn.
 - **Conclusion:** The uncovered candle continues to burn as it gets sufficient supply of air (oxygen). On the other hand, the candle covered with the glass jar keeps on burning as long as it gets air. When the air present inside the jar is used up, the candle goes off. Hence, it shows that air is necessary for combustion to take place.

If enough oxygen is not present for a fuel to burn, the process of combustion remains incomplete. As a result, the fuel gives out a yellow flame having a low temperature and leaves behind a black soot.

- G. 1. Water is a good conductor of electricity. As a result, the person putting out fire with water, caused by electric wiring, gets shock. So, we are advised not to use water to put out fire caused by electric wiring.
2. Air contains oxygen and oxygen supports the process of burning. That is why she is blowing air around the coal or wood to burn it.
 3. The paper cone having no water in it will burn easily. It is because water filled in paper cone keeps the paper below its ignition temperature, and hence, paper cone containing water does not burn easily.

Passage/Case-based Questions

1. Conditions essential for combustion to occur are as follows:

- (a) Presence of a combustible substance.
- (b) Attainment of ignition temperature.
- (c) Presence of supporter of combustion, i.e., air (oxygen).

2. The wrapping of a blanket cuts off the oxygen (air) supply due to which fire gets extinguished.

H. COMBUSTIBLE, OXYGEN, FUEL, FIREBRIGADE, FLAME, IGNITION, SOOT, BLANKET, LUMINOUS

- K. (a) No, because oil being lighter than water will come up on the surface of water, and would keep burning.
(b) Keshav shows self-sustainable nature while his mother shows caring and scientific nature.

ANSWERS

CHECK POINT 1

1. Biodiversity 2. Desertification 3. Afforestation 4. Flora

CHECK POINT 2

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

PRACTICE TIME

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

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

C. 1. Odisha 2. Asiatic Lion 3. poaching 4. fauna 5. deforestation

D. 1. World Conservation Union (WCU). 2. Uttarakhand

3. Core zone, Buffer zone and Manipulation zone 4. Dodo 5. Forests

E. 1. (a) To maintain balance in nature through food chains and food web.

(b) To regulate climate changes, changes in rainfall pattern, wind speed, proper cycling of nutrients and preservation of soil fertility.

2. Deforestation changes the physical property of soil. The water holding capacity of the soil is reduced which makes the topsoil dry. The dry topsoil is blown away by strong winds. This gradually changes a fertile land into a desert.

3. Biosphere reserves help in maintaining the biodiversity as well as the culture of that area. Hence, they are the best way of wildlife conservation.

4. Habitat loss, hunting, deforestation and overgrazing, introduction of exotic species, climate change, human greed and pollution are the causes of wildlife depletion.

5. (a) The plants found typically in a particular area are called the flora of that area, whereas the animals found in a particular place are called fauna of that place.

(b) Species of plants and animals which are lost forever are called extinct species, whereas the species of plants and animals whose members are greatly reduced or are near extinction are called endangered species.

F. 1. Conservation of biodiversity is essential because:

- Biodiversity maintains a balance in nature or in the ecosystem through food chains and food webs.
- Biodiversity regulates climate, rainfall and wind speed.
- Wild animals and plants provide a variety of commodities.
- Wildlife is needed for breeding programmes in agriculture, horticulture, sericulture, apiculture, etc.

- It helps in cycling of nutrients and preservation of soil fertility.
2. Various factors which lead to extinction and depletion of biodiversity are:
- Habitat loss due to increase in human population.
 - Deforestation and overgrazing by increased population of cattle.
 - Pollution of air, water and soil due to various human activities.
 - Introduction of exotic species which may cause extinction of some native species.
 - Climate change due to change in temperature and rainfall patterns.
 - Hunting of wild animals for wildlife products such as horn, hoof, skin, etc.
3. Deforestation leads to:
- Global warming due to increased level of carbon dioxide in nature.
 - Climate change due to decrease in rainfall and increase in temperature and wind speed.
 - Desertification due to reduction in water-holding capacity of the soil.
 - Droughts due to disturbed water cycle, reduced rains and lowered water table.
 - Soil erosion and floods due to decreased water-holding capacity of soil.
 - Loss of wildlife due to loss of natural habitats of wild animals and plants.
 - Depletion of resources displaces tribal people who depend on forests for their livelihood.
 - **Man-made causes of deforestation:** Human beings are felling trees for:
 - ▶ Getting land for cultivation of crops, vegetables and fruits.
 - ▶ Clearing the land for building houses, factories, roads and for mining.
 - ▶ Obtaining wood for making furniture, paper, and for fuel.
 - **Natural causes of deforestation:** These are forest fires, severe droughts, floods, earthquakes, landslides, pests, and viral and fungal diseases of plants.
4. The objectives of Wildlife Protection Act are as follows:
- Prohibition of hunting of the listed threatened species.
 - Setting up and management of national parks, sanctuaries and biosphere reserves.
 - Control and management of captive breeding.
 - Protection of specific plants and natural habitats of animals.
- Wildlife products such as skin, fur, horns, tusks, etc., are traded illegally.
5. Breeding wild animals in captivity is called captive breeding. It has saved many species of wild animals from extinction. These species are Muskdeer in Garhwal hills, Asiatic Lion in Gir Forest and Gharial in Nandankanan Zoological Park.
- Some wildlife breeding projects in India are Project Tiger, Gir Lion Project, Crocodile Breeding Project, Himalayan Muskdeer Project and Rhino Conservation Project, etc.
- G. 1. Large scale exploitation of forests has made this area barren which altered the climatic pattern of Cherrapunji.
2. Zone 1 – Core zone
 Zone 2 – Buffer zone
 Zone 3 – Manipulation or Transition zone
- (a) Human settlements can be found in Zone 3 (Manipulation zone).
 (b) No. Tourism is allowed only in Buffer zone and Manipulation zone.
- J. (a) Timber, gum, medicines, hide, horns, turks, etc., are obtained from forests and wildlife.
 (b) We can conserve forests and wildlife by
- Prohibiting felling of trees and hunting of wild animals.

- By protecting natural habitats of plants and animals.
 - By reducing pollution of air, water and soil.
 - By preventing forest fires.
- (c) The Wildlife Protection Society of India, World Wildlife Fund, Wildlife Conservation Society, etc., are working against poaching of animals.
- (d) Humans show caring and loving attitude towards nature.

Passage/Case-based Questions

1. Deforestation is done to create space for agriculture, building roads and houses, factories and for industrial development.
2. Deforestation can lead to global warming, soil erosion, desertification, climate change, loss of wildlife, etc.

ANSWERS

CHECK POINT 1

1. Sperm 2. Ova 3. Uterus 4. Embryo 5. Placenta

CHECK POINT 2

1. Mammals 2. oviparous 3. fish 4. metamorphosis 5. caterpillar

CHECK POINT 3

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

PRACTICE TIME

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

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

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

D. 1. Fertilisation

2. Oviduct

3. Both type of fertilisation, i.e., external and internal fertilisation.

4. The larvae of frog are called tadpoles and that of butterfly are called caterpillars.

5. The attachment of zygote in the uterine wall is called implantation.

E. 1. The animals which lay eggs are called oviparous animals. For example, insects (butterfly), birds (hen), etc. On the other hand, the animals which give birth to babies are called viviparous animals. For example, mammals—cow, man, etc.

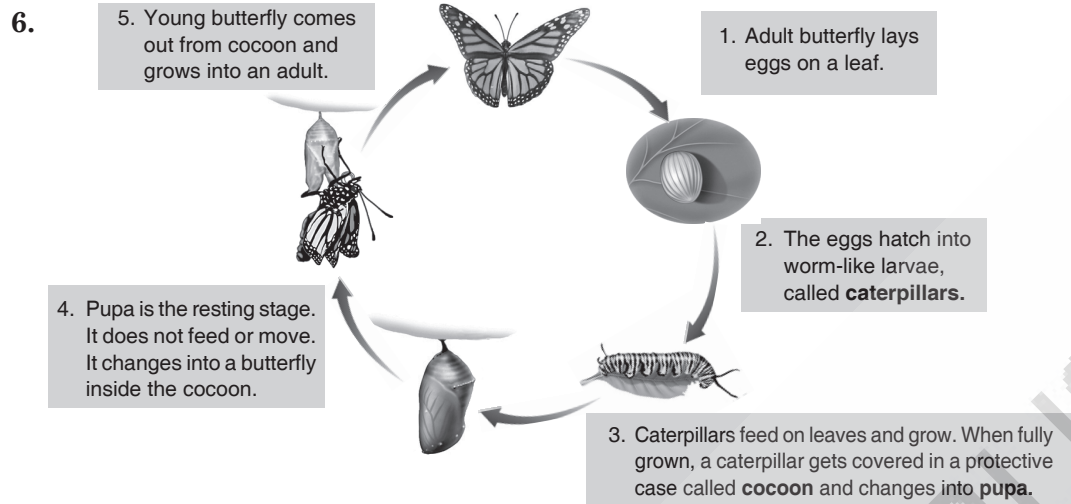
2. Tadpole lives in water and feeds on aquatic plants. It respire through gills and has a tail to swim. On the other hand, adult frog lives mostly on land, feeds on insects and respire through lungs. Also, it does not have any tail.

3. Implantation of embryo into the uterus wall causes pregnancy. It lasts for 280 days.

4. The mode of reproduction by which an organism produces genetically identical individuals of its own kind is called asexual reproduction.

In asexual reproduction, second parent is not needed. The offspring produced are identical to each other and to the parent. They are called clones.

5. The change in form and structure of a larva to become the adult is called metamorphosis. For example, transformation of tadpole larva of frog into adult through marked changes is metamorphosis.



- F. 1. The development of embryo in humans takes place in the uterus of female. The embryo attaches with the wall of uterus through placenta. It obtains nutrients and oxygen from mother's blood through placenta and continues to grow and develop all its body parts.

At two-month stage, it starts resembling the human form and is now called foetus. The development and growth of foetus is completed by the end of 280 days and mother gives birth to a baby.

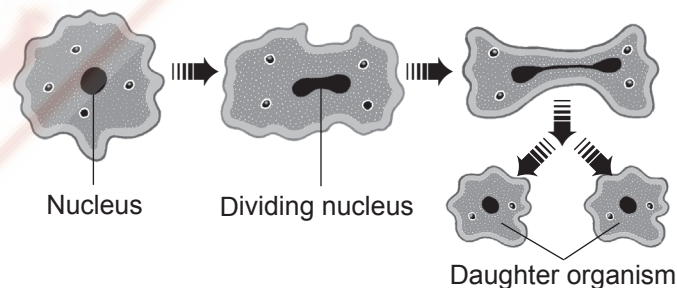
2. The fusion of a sperm nucleus with the nucleus of ovum that result in the formation of zygote is called fertilisation.

Fertilisation is of two types: External fertilisation and internal fertilisation.

The fertilisation plays a significant role in the process of sexual reproduction. The new individual, which develops by the fusion of male and female gametes, inherits characters from both the parents and resembles the mother in certain features and the father in some other features.

3. Binary fission is a mode of asexual reproduction which occurs in unicellular organisms such as bacteria, *Amoeba* and *Paramecium*.

In binary fission, the nucleus of the parent cell divides into two daughter nuclei which is followed by division of the parent cell. The each half receives one daughter nucleus and forms a daughter organism.



4. In frog, fertilisation is external and takes place in water. On the other hand, in hen, fertilisation is internal and occurs when the egg is inside the body of hen.

5. (a) A human sperm
(b) 1– Head of sperm 2–Nucleus 3–Middle piece 4–Tail
6. (a) 1–Uterine wall 2–Cervix 3–Oviduct 4–Placenta 5–Foetus
(b) Part 4 (Placenta) provides oxygen and nutrients to the foetus from the mother's blood.
- G. 1. (a) In case (I), fertilisation is internal while in case (II), fertilisation is external.
(b) Yes, in case (II), many eggs may be destroyed or eaten by other animals. So, laying multiple eggs ensures continuation of race.
2. In external fertilisation, the male releases sperm on the spawn of eggs laid by female animal. In this way, sperm find their way for external fertilisation to occur.

Passage/Case-based Questions

1. Female foeticide means killing or abortion of a female foetus.
2. Female foeticide should be banned to maintain sex ratio in human population.

H. Across:

1. FERTILISATION 4. UTERUS 6. BINARY FISSION 7. EMBRYO 9. GAMETOGENESIS

Down:

2. OVULATION 3. FALLOPIAN TUBE 5. OVARIES 8. BUDDING

K.(a) Fertilisation occurs by the union of male and female gametes.

(b) The embryo develops into a new individual.

The placenta provides nutrition to the developing embryo and removes wastes from the embryo.

(c) Raghav is a kind and helpful person.

ANSWERS

CHECK POINT 1

1. 11–13 years 2. Throat region of boys 3. Adolescence 4. Pituitary gland 5. Endocrine glands

CHECK POINT 2

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

PRACTICE TIME

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

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

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

D. 1. Hormones 2. Junk food 3. Pituitary glands 4. Puberty 5. Adrenal gland 6. Testosterone

E. 1. During adolescence, the muscles grow, shoulders become broad and waistline becomes wider in boys whereas in girls, their pelvic region becomes broad and development of breasts takes place.

2. The external features in the body of males and females which help to distinguish a male from a female are called secondary sexual characters.

3. A cyclic period of 28 days in which the uterus of female undergoes periodic changes involving discharge of broken blood capillaries and lining of uterus, is called menstrual cycle.

4. Personal hygiene at adolescence is important because during this period, the increased activity of sweat glands makes the body smelly and increases the growth of bacteria and fungus in underarms and groin areas.

5. Iodine is an important mineral required by the thyroid gland to produce thyroxine hormone. Lack of iodine in food causes thyroid gland to enlarge in size resulting in swelling in the neck region, which is termed as goitre.

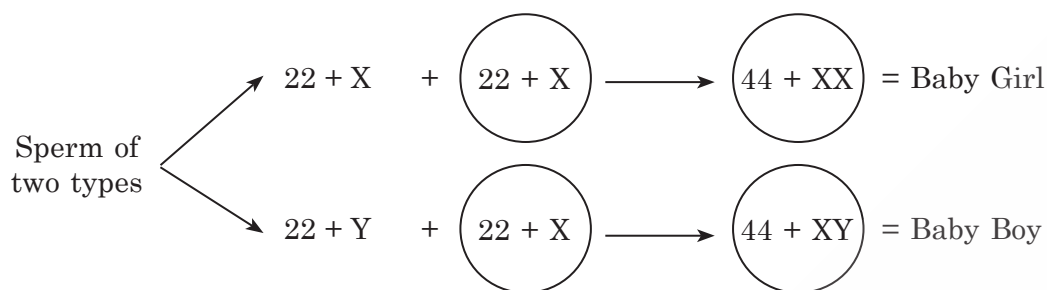
6. The pituitary hormone FSH stimulates testes to release testosterone in males and ovaries to release estrogen in females. The testosterone and estrogen produce secondary sexual characters in the body of boys and girls respectively.

F. 1. The sex of a child is determined at the time of fertilisation.

The sperm carries either X or Y sex chromosome, whereas ovum carries only X type of sex chromosome. Now, if the

- Sperm carrying X chromosome fuses with the ovum, the resulting zygote will have XX sex chromosomes and the child will be a female child.

- Sperm carrying Y chromosome fuses with the ovum, the resulting zygote will have XY sex chromosomes and the child will be a male child.



2. (a) Endocrine glands are called ductless glands because they do not have any ducts and pour their secretions directly into the blood.
(b) (i) Insulin (ii) Thyroxine (iii) Growth hormone (iv) Progesterone
3. (a) Adolescence is the period of intense growth of the body. Any disease during this period leads to retarded growth. Therefore, to keep the body healthy, an adolescent needs a balanced diet which includes right amount of carbohydrates, fats, proteins, minerals and vitamins to provide complete nutrition to the body.
(b) An adolescent should avoid junk food to prevent diabetes, obesity, cardiac problems and deficiency diseases.

- G. 1.** It is the genes which determine the specific characters of an individual. As the offspring inherit genes from both the parents, they resemble the mother in certain characters and the father in some other characters.
2. During adolescent period, the sweat glands and sebaceous glands become more active, especially on the face. This leads to acnes and pimples.
 3. No, woman is not responsible for the birth of a girl child but the father is responsible for it. If the sperm containing X chromosome fertilises the egg, a girl child is born and if the sperm containing Y chromosome fertilises the egg, a boy child is born.

Passage/Case-based Questions

1. Testosterone
2. The period between childhood and adulthood, during which growth and physical differentiation occurs in boys and girls is called adolescent period.

- H. 1. TESTIS 2. TADPOLE 3. SPERM 4. MENOPAUSE 5. OVA 6. INSULIN 7. OVARY**
8. LARYNX 9. PITUITARY 10. DIABETES 11. ACNE 12. IODINE 13. ESTROGEN

ANSWERS

CHECK POINT 1

1. force 2. stop 3. increases 4. interaction

CHECK POINT 2

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

CHECK POINT 3

1. Pressure 2. depth 3. Pressure increases 4. Pressure gauge 5. newton per square metre

PRACTICE TIME

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

- B. 1. (b) 2. (a) 3. (c) 4. (b)

- C. 1. (c) 2. (d) 3. (a) 4. (b)

- D. 1. Force

2. When two equal forces act in opposite direction, the object will move in the direction of bigger force.

3. Contact force. 4. Gravitational force. 5. Atmospheric pressure.

- E. 1. A force can pull or push the thing on which it is applied. It can change the shape of the object, increase or decrease speed of a moving object or stop a moving object.

2. When the object is in direct or indirect contact with the source of the force, the force applied on the object is called contact force. Muscular force, mechanical force and friction are examples of contact force.

The force acting on an object without touching it is known as noncontact force. Magnetic force, gravitational force and electrostatic force are examples of noncontact force.

3. When the area of contact increases, the pressure is decreased. Hence, the bases of the pillars of flyovers and bridges are made broad to make the pressure bearable to the ground.

4. The pressure exerted by the liquid increases with increase in the depth of the liquid and decreases with decrease in the depth of the liquid.

5. People having high blood pressure feel uncomfortable because of an imbalance between the pressure of body fluids and the atmospheric pressure at higher altitudes.

- F. 1. Force is caused by the interaction of two objects. For example, a man pulling a hand cart, a man pushing a cart and a football player kicking a football.

2. We use the muscular force of animals in many ways as follows:

- (a) Elephants are made to drag heavy loads tied to them through strings or chains.
- (b) Horse, camel and bullocks are used to pull carts.
- (c) Mules and donkeys are made to carry loads and people from one place to another in hilly areas.

3. 'Liquids exert pressure on the wall of a container' can be shown by the following experiment:

Procedure: Take a plastic bottle and fix a glass tube near the bottom of it by heating the tube and quickly inserting it into the bottle. Seal the joint with molten wax. Cover the mouth of the glass tube with a balloon. Fill the bottle up to half with water. Observe the volume of the balloon. Pour some more water into the bottle and again observe the volume of the balloon.

Observation: The volume of the balloon increases on pouring more water into the bottle.

Conclusion: Water (liquid) exerts pressure on the balloon and makes it grow in size.

4. Some applications of atmospheric pressure are:

- (a) It helps us suck liquids through a straw.
- (b) It helps a person in paratropping or using a parachute while falling down from an aircraft against the gravitational force.
- (c) The changes in the atmospheric pressure on the surface of the earth help in weather prediction.

G. 1. At the given stage, both the teams are applying equal force in opposite direction.

2. Tyres of heavy trucks are made broader because this increases the area of contact and the force due to heavy weight of the truck is distributed over a wide range of area and hence the pressure on the road is reduced.

3. A parachute helps a person land safely because it blocks the air acting in upward direction and slows the rate of falling of the person while landing.

Passage/Case-based Questions

- 1. The man lying on a bed of nails was not hurt because the pressure exerted due to his weight got distributed over all the nails equally.
- 2. Iron nails have pointed ends to increase pressure on the surface and pierce it easily.

H. 1. MAGNETIC 2. MUSCULAR 3. MECHANICAL 4. FRICTION 5. GRAVITY
6. ELECTROSTATICS 7. ATMOSPHERE

ANSWERS

CHECK POINT 1

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

CHECK POINT 2

1. Friction 2. Lubricant 3. Ball bearing 4. Talcum powder 5. Polishing

CHECK POINT 3

1. fluids 2. friction 3. streamlined

PRACTICE TIME

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

B. 1. (a) 2. (b) 3. (a) 4. (d)

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

D. 1. Skiing

2. Friction is caused due to the adhesion of the two surfaces in contact.

3. The force required to continue moving or sliding an object is sliding friction.

4. Spring balance.

5. Machine oil and grease.

E. 1. Friction pulls the objects in a direction opposite to the motion and slows them down, for example, a ball rolling on a floor slows down after moving some distance.

2. Yes, friction is advantageous as well.

- The friction helps to hold the objects in place. We can write or walk on a surface because of friction.

- It helps us to hold the objects.

- It transforms the energy of a moving body into heat and sound energy.

3. We need to increase friction sometimes in order to have a good grip over slippery surface by making the surface rough.

4. The system of metal balls in a slot or socket is called ball bearing. It is used to minimise the friction between rotating or revolving parts of a machine.

5. Ships have streamlined shape. Streamlined shape reduces friction due to water and ships can flow past easily and smoothly. Aeroplanes also have streamlined shape.

F. 1. The factors that affect friction are:

- (a) Nature of the two surfaces in contact. Friction is more on rough surfaces than on smooth ones. For example, a ball rolling on a tiled floor travels longer distance than on a cemented floor due to lesser friction between the tiled floor and the ball.
- (b) Mass of the sliding object. The object which has more mass, develops more friction. For example, more force is required to push or pull a box having more mass than a same type of box having less mass.

2. Kabaddi players rub their hands with soil to make them rough so as to have a good grip on the player of other team. Friction helps us pick up a glass of water to drink water, walk on smooth surfaces, pushing and pulling things, fix a nail in the wall and to sit on the benches or chair in the classroom.

3. The friction of bookshelf with the floor can be reduced by putting rollers under the shelf. This will help to shift the self easily.

4. 'Fluids exert friction on a body' can be shown by following activity:

Procedure: Take a coin and keep it on a tabletop. Hit it with your finger. Now, spill half a teaspoon of water on the tabletop and put the coin over it. Hit it again.

Observation: The coin moves smoothly on dry tabletop and goes to a longer distance. When water is spilled on the tabletop, the coin moves slowly and goes to a short distance.

Conclusion: This activity shows that water exerts friction on a body that moves through it.

G. 1. The handles of motorcycles are covered with a rubber sheet having spikes on it for increasing friction between palm and handles to provide a good grip to the driver.

2. A drop of water sticks to the surface of the glass because of friction working between the glass surface and water.

3. By rubbing hands together, heat generates due to friction between palms and they become warm.

4. (i)–(b), (ii)–(d), (iii)–(a), (iv)–(c)

H. 1. FLUID 2. STREAMLINE 3. SPRING BALANCE 4. DRAG 5. ROUGH 6. BIRDS
7. ADHESION 8. LUBRICANT

J. 1. Roughness of surfaces in contact as well as mass of the sliding object affect the friction.

2. Monu will help the labourer more because his method will reduce the friction.

3. Sonu and Monu are helpful and kind person.

ANSWERS

CHECK POINT 1

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

CHECK POINT 2

1. Material medium 2. Gases 3. 340 m/s 4. Outer Ear 5. Auditory nerve

CHECK POINT 3

1. hertz (Hz) 2. second (s) 3. Musical sounds 4. decibel (dB) 5. 20,000 Hz
6. Noise

PRACTICE TIME

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

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

C. 1. sound 2. vibrating 3. percussion 4. larynx 5. ultrasounds

D. 1. Tabla, Dholak

2. We hear echo due to reflection of sound.

3. Vocal cords

4. Speed of sound in air is approximately 340 m/s.

5. Frequency

E. 1. The instruments in which air (wind) is blown in from the mouth of the player to produce sound are called wind instruments. Trumpet, shehnai, flute, bugle, are some wind instruments.

2.	String Instruments	Percussion Instruments
	1. In these instruments, generally metal strings of specific metal and thickness are made to vibrate, in order to produce the sounds.	1. In these instruments, a specific hollow shape is closed by a stretched skin of animal. This skin is beaten with a stick or hand, in order to make it vibrate which, in turn, vibrates the air inside the instrument to produce sound.
	2. Sounds of different musical notes are produced by controlling the thickness and tightness of the strings.	2. These instruments are used to provide the beats or the rhythms to the music. Beats or rhythms are controlled by tightness of stretched skin and striking strength with hands or sticks.

3. The maximum displacement of the particle or object from its mean position to its either side is defined as its amplitude. The SI unit for measuring the amplitude is metre.
 4. (a)–(iii), (b)–(iv), (c)–(i), (d)–(ii)
 5. The audible limit of human ear is from 20 Hz to 20,000 Hz.
 6. A sound becomes noise when it starts irritating our ears.
- F.**
1. Echolocation is the phenomenon of locating objects by the reflection of sound waves. The sound waves are reflected back from the objects which come in their path and are perceived by the ear. This helps in locating the direction and distance of the objects.
 2. Sound waves can travel through liquids. It can be shown experimentally as follows:
Procedure: Take a bucket full of water and a key bunch with at least 3–4 keys. Sit in such a position that you can bend your head to almost your ear touching the water level in the bucket. Hold the key bunch in one of your hands and take it inside the water in the bucket, making sure that your hand or key bunch doesn't touch the sides or the bottom of the bucket. Now, bend down your head so that one of your ears is just touching the water in the bucket. Gently, shake the key bunch inside water.
Observation and Conclusion: The sound of keys is clearly heard. Thus, it is clear that sound waves can travel through water (liquid).
 3. Noise pollution is the unwanted and displeasing human created sound that disrupts the environment.
 The noise pollution affects both health and behaviour. It can cause annoyance and aggression, hypertension, high stress levels, hearing loss, sleep disturbance and tinnitus. Tinnitus can lead to forgetfulness, severe depression and at times panic attacks. High noise pollution can cause cardiovascular disorders.
 The noise pollution can be controlled by following ways:
 - The speed of vehicles should be limited.
 - The heavy duty vehicles on roads should be limited.
 - The traffic rules should be followed strictly.
 - The loudness of the audio entertainment systems, the speakers during religious and family functions should be kept as low as possible.
 4. The loudness of a sound represents the amplitude of a sound wave. A sound wave with a small amplitude produces a low-volume sound or less loud sound, whereas a sound wave with a large amplitude produces a high volume sound or more loud sound.
 The pitch represents the shrillness or hoarseness of the sound. The pitch of a sound depends directly on its frequency. The low frequency sounds have low pitch, and are hoarse and blunt. On the other hand, high frequency sounds have high pitch, and are sharp and shrill.
 5. Number of oscillations (n) = 50 and $t = 10$ s, $T = ?$
 Time period, (T) = $\frac{t}{n} = \frac{10}{50} = 0.2$ s
 and Frequency, $\nu = \frac{1}{T} = \frac{1}{0.2} = 5$ Hz
 6. Number of vibrations made in 1 s = 400, i.e., frequency, $\nu = 400$
 \therefore Time period $T = \frac{1}{\nu} = \frac{1}{400} = 0.0025$ s
 7. (a) 1—Pinna, 2—Auditory canal, 3—Eardrum, 4—Auditory nerve
 (b) The outer ear called pinna collects sound waves.

- (c) The part labelled 3, i.e., eardrum passes the sound waves to the small bones.
(d) Auditory nerve carries the vibrations converted into nerve impulses to the brain.
- G. 1. The speed of sound in air (340 m/s) is very much less than the speed of light in air (3×10^8 m/s). Due to this fact, we always see the lightning much before hearing the thunder.
2. There is no material medium (air) on the moon to propagate sound. Hence, we cannot hear any sound on the surface of moon.
3. We speak because of the vibrations in the vocal cords present inside the voice box. If there were no voice box, we would not be able to speak in such a manner.
4. (i)–(a), (ii)–(c), (iii)–(b), (iv)–(e), (v)–(d)

Passage/Case-based Questions

1. Harmful effects of noise pollution include annoyance, aggression, hypertension, stress, hearing loss, sleep disturbance, etc.
 2. Noise pollution can be reduced by controlling the number of vehicles on the roads, keeping the sound level of loudspeakers low and making strict laws to control noise pollution.
 3. Listening to loud music is not good for health as it causes many problems. One can lose hearing ability due to high volume sounds.
- G. 1. TRUMPET 2. INFRASOUND 3. DECIBEL 4. MEDIUM 5. AUDITORY 6. EARDRUM
7. METRE 8. PITCH

ANSWERS

CHECK POINT 1

1. poor 2. weak 3. minerals 4. metals 5. magnetic

CHECK POINT 2

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

PRACTICE TIME

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

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

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

D. 1. good 2. magnetic 3. positive 4. voltameter 5. scratched

E. 1. Tap water is a good conductor of electricity because it contains salts in it.

2. LED (Light Emitting Diode)

3. Electrolysis.

4. Electroplating.

5. Chemical effect of electric current is used in electroplating.

F. 1. An LED is a light giving device which can glow even at weak current flowing through an electric circuit.

2. Things like taps, spoons, forks, sinks, watches, belt buckles, etc., are electroplated.

3. Electroplating is done to protect the metal from corrosion and to produce an attractive finish on it.

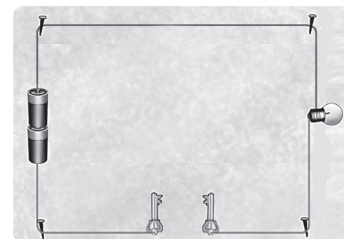
4. The amount of metal deposited during electroplating depends upon (i) the time for which the current is passed through the electrolyte and (ii) the amount of current which passes through the electrolyte.

5. Chromium metal has a shiny appearance. It does not corrode and get scratched. Also, chrome-plated objects have a good lustrous shine and give a good appearance

G. 1. A conduction tester is a device which is used to test the electrical conductivity of an object.

A conduction tester can be made as follows:

Procedure: Take a square sheet (30 cm × 30 cm) of a thermocol, and fix four nails, a little inside the corners of it. Take three connecting wires and rub their free ends with a piece of sandpaper. Connect the dry cells, the bulb and the keys using wires.



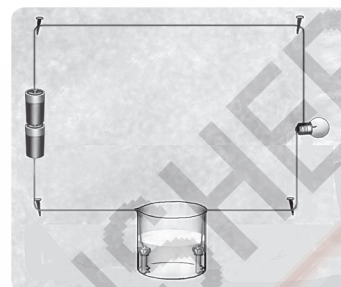
When the object to be tested is placed on the metal keys or metal keys are dipped in the liquid to be tested, the bulb starts glowing if the material conducts electric current through it, otherwise, the bulb does not glow.

2. Electrolysis is widely used in chemical and commercial industries for the following purposes:
 - (a) Refining of impure metals into pure ones.
 - (b) Extraction of metals from their ores.
 - (c) Electroplating.

3. The electrical conductivity of water can be tested by following activity:

Make a conductivity tester using a battery of two dry cells, two metallic keys and a torch bulb connected with the metallic connecting wires. The two keys are connected to the two free ends of the wire.

Now, take water in a small beaker. Dip the ends of the tester keys in the beaker containing water.

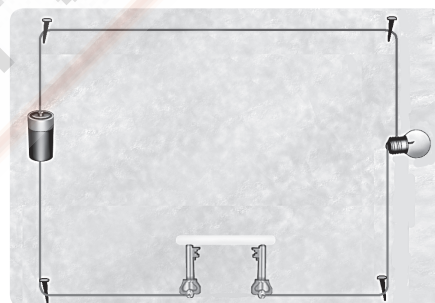


Observation: On dipping the tester keys in water, the bulb glows. This shows that water conducts electricity. Hence, it is a good conductor of electricity.

4. Lina should connect iron spoon to the negative terminal of the battery. In the other electrode, she should use a thick silver rod or wire turned into a coil.

On passing electric current through electrolyte for suitable time, the iron spoon will get plated with silver.

5. (a) A tester set up to check the conductivity of given materials is shown in the adjacent figure.
- (b) Bulb, connecting wires, dry cell and keys.
- (c) Bulb is shown glowing which is wrong because a chalk piece is bad conductor of electricity, i.e., it does not pass electricity through it.
- (d) **Hint:** Draw the same diagram with bulb not glowing.



- H. 1. Pure water does not conduct electricity. By adding salt, fruit or vegetable juice to pure water, it can be made good conductor of electricity.
2. Due to chemical effects of current, there occur some chemical reactions in electrolyte that result in colour change.
3. I–Battery, II–Cathode, III–Anode
4. III–ELECTRICITY, I–VINEGAR, II–HONEY

Passage/Case-based Questions

1. Tap water is a good conductor of electricity. Hence, any leakage of current can give electric shock and may also be fatal.
2. An electric shock is a sudden painful feeling due to direct contact with electric current.

- I. 1. MAGNETIC FIELD 2. BAKELITE 3. ELECTROPLATING 4. CATHODE 5. LED
6. ELECTROLYTE

ANSWERS

CHECK POINT 1

1. Negative (Electron) 2. Positive 3. Electric current 4. Electroscope
5. Lightning conductor

CHECK POINT 2

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

PRACTICE TIME

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

B. 1. (a) 2. (b) 3. (b) 4. (d)

C. 1. coulomb 2. electroscope 3. earthing 4. static 5. inner core

D. 1. Lightning

2. Benjamin Franklin was an American scientist, who conducted his famous Kite and Key Experiment in 1752 and proved that lightning is nothing but a huge electric spark taking place between clouds.

3. The two types of charges are negative and positive charges.

4. Electroscope is used to detect the presence of charge on an object.

5. Central and Western Himalayas, Kashmir, Rann of Kutch, North-East India and Indo-Gangetic plain.

E. 1. When two objects are rubbed against each other, both of them get charged due to loss or gain of electrons. The two acquire equal and opposite charges because the number of electrons lost by one object is captured by the other.

2. A lightning conductor is a device used to protect buildings against the damage caused by lightning, by providing the charges an alternative and easy path to flow down to the earth.

3. An earthquake is caused by the disturbance deep inside the earth's crust. The tectonic plates are in continuous motion. When they brush past one another or a plate goes under another due to collision, they cause disturbance in the earth's crust. This disturbance sets up an earthquake on the surface of the earth.

4. There are four major layers of the earth. Starting from the centre, these layers are named as inner core, outer core, mantle and the crust.

5. The intensity of an earthquake is measured on a Richter scale. The magnitude of the intensity of an earthquake is measured in whole numbers and decimal numbers on this scale. Every whole number has a value equivalent to 10 times the previous whole number. That is, the power of an earthquake of a magnitude 3 on Richter scale is 10 times that of a magnitude 2 on the same scale. Thus, an increase of measure 1 on the Richter scale is practically 10-fold increase in the magnitude (power) of an earthquake.

- F. 1. When we touch the metal wire of electroscope with the charged straw, the charge flows through the metal wire to the aluminium strip, as the straw has high level of charge and the metal wire has low (no) charge on it. The two halves of aluminium strip acquire same type of charge from the straw and they separate apart due to repulsion caused by similar charges. The aluminium strip is now charged.

When we touch the metal wire with our hand, charge from the foil strip (high level) flows to the zero level charge on our hand, and therefore, the repulsion experienced by the two halves of strip is vanished.

2. The clouds get charged when water and ice particles move rapidly inside them. As the particles move, they become oppositely charged and separate. The positively charged particles move to the upper part of the cloud and the negatively charged particles rest at the lower part of the cloud. The negative particles at the bottom of the cloud grow bigger and bigger, and get attracted to the positive charges on the ground.

The positive charge on the earth's surface develops only due to the negative charge on the lower part of the cloud. When attraction between the opposite charges becomes strong, electricity (electrons) flows from the clouds to the ground. This causes spark (lightning) in the sky. Lightning lasts only for a fraction of a second, but is energy-filled and very hot.

3. A lightning conductor consists of a long metal rod, fixed with a side wall of the building to be protected such that its upper end protrudes much above the top of the building. The upper end of the rod is made into the shape of a *trishul* or is fragmented into large number of pointed rods. The lower end of the rod runs deep inside the earth, where it is joined with an already buried huge copper plate. When lightning strikes, the upper pointed ends of the lightning conductor quickly absorb the charges, the long metal rod gives them an easy path to flow down to earth and the copper plate helps in a quick distribution of charge. In this way, the building is saved from the damage.

4. A seismograph is an instrument which detects and records seismic waves generated by the earthquake. A seismograph consists of a rod of a pendulum suspended from a stand, whose lower end is attached with a pen. When an earthquake occurs, the rod or the pendulum vibrates and so does the pen. A roll of a long and thin strip of paper, rolled on a drum is allowed to move under the vibrating pen, so that the pen leaves the marks of the vibration on the strip of the paper. The study of the recorded vibrations helps to map the earthquake completely.

5. If trapped in a collapsed building, one should

- (a) protect his/her airway against dust and debris by breathing through a dust mask kept in a nearby drawer or a clean cotton cloth.
- (b) check injuries and control any bleeding and try to find a source of light, if possible.
- (c) try to make his/her location known to the rescuers by tapping on a solid object.
- (d) save the energy and breathe. Delay shouting for help until hear or feel rescuers very nearby.
- (e) the collapsed walls make triangular spaces after falling. These triangular spaces are the safest places to protect oneself, until a help reaches.

6. (a) Lightning conductor.

- (b) It is a safety device that saves the building from lightning.

- (c) The earth behaves as a huge reservoir of charge opposite to that of the cloud. When the lightning occurs, the charge flows to the earth and gets neutralised that is why Y-shaped structure is connected to the ground.

- G. 1. The upper end of a lightning conductor is fragmented into several pointed strips so that when lightning strikes, these strips absorb the charges quickly.
2. When two objects are rubbed against each other, they get charged due to loss or gain of electrons. Due to this reason, static electricity is generated by the friction of sweater and the body. When this charge discharges, it produces crackling sound.
3. Electrical appliances have an earthing wire to discharge any leakage of current by earthing and save the user from an electric shock.
4. Precautions to be taken during lightning when outdoors:
- Seek cover indoors as quickly as possible.
 - Do not stand near or under a pole, tree, etc.
 - Keep away from metal objects like poles, fences, benches, etc.
 - Crouch low, with your head bent in between your arms and legs close together.

Passage/Case-based Questions

1. Lightning and thunder actually occur at the same time but we see lightning sparks before hearing the sound of thunder because speed of light is much more than the speed of sound.
2. To avoid accidents due to lightning, we should get indoors immediately and should stay away from doors, windows, plumbing, etc. If outside home, we should not stand under a tree or near a pole and also should not use umbrella.
- H. 1. ATTRACT 2. EPICENTRE 3. EARTHQUAKE 4. REPEL 5. ELECTROSCOPE
6. COULOMB 7. RICHTER
- K. 1. If stuck indoors during an earthquake, follow drop, cover and hold protocol. Cover your head with a pillow and hide under a sturdy structure such as a table. Stand in a corner, preferably in the centre of the house.
2. An earthquake is caused due to the collision of tectonic plates inside the earth's crust.
3. The values shown by Ms. Sunita are preparedness and awareness.

ANSWERS

CHECK POINT 1

1. plane 2. a straight line 3. giving their own light 4. equal
5. falling of rays of light on a rough and uneven surface.

CHECK POINT 2

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

CHECK POINT 3

1. Cornea 2. Ciliary muscles 3. Retina 4. 25 cm 5. Owl 6. Braille

PRACTICE TIME

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

- B. 1. (a) 2. (b) 3. (d) 4. (a)

- C. 1. (T) 2. (T) 3. (T) 4. (T) 5. (F)

- D. 1. Diffused reflection 2. Periscope 3. No, Braille script 4. Plane mirror 5. Optic nerve
6. Lateral inversion

- E. 1. The objects which shine by giving their own light are called luminous objects. The examples of luminous objects are the sun, stars, fire, candle flame, bulb, tube light, etc.

The objects which shine by reflecting the light falling on them are called illuminated objects. For example, the moon shines due to reflecting the light falling from the sun.

2. (a) 40° because the angle of incidence is equal to the angle of reflection.
(b) The incident ray, the reflected ray and the normal always lie in the same plane.

3.

Regular Reflection	Irregular Reflection
1. When a beam of light falls on a smooth and highly polished surface, almost entire light gets reflected in the same medium in a definite direction. This kind of reflection is called regular reflection.	1. When a beam of light falls on a rough and uneven surface, the light gets reflected in different directions, i.e., light rays do not follow uniformity of direction. This kind of reflection is known as irregular or diffused reflection.
2. We can see our image formed by a mirror due to the phenomenon of regular reflection.	2. In case of diffused reflection from rough surfaces, either there is no image formed or a blurred (hazy) image is formed.
3. Regular reflection creates glare and we cannot see the things clearly and comfortably.	3. We are able to see things comfortably because of irregular reflection.

4. When light passes through a thick glass piece, it gets splitted into its constituent seven colours which are seen as a rainbow. The splitting of light into its seven colours after passing through a glass piece is called dispersion of light.
5. She is suffering from hypermetropia. It can be corrected by using spectacles with suitable convex lenses.

F. 1. The characteristics of light are:

- (a) Light is a form of energy.
- (b) Light is one of the fastest travelling forms of energy. It travels with a speed of 3,00,000 kilometres per second in vacuum and almost with the same speed in air.
- (c) Light needs no medium to travel, i.e., it can travel in vacuum also.
- (d) Light travels in a straight line.
- (e) Light, as it comes from the sun, consists of seven different colours, namely, Violet, Indigo, Blue, Green, Yellow, Orange and Red. The sequence of this colour band is known as VIBGYOR.

2. The laws of reflection can be verified as follows:

Procedure: Place a white sheet of paper on a drawing board. Take a plane mirror, put it vertically and draw a line MN along the margin of the mirror. Fix two pins A and B at a gap of a few cm apart. They should appear in one line in the mirror.

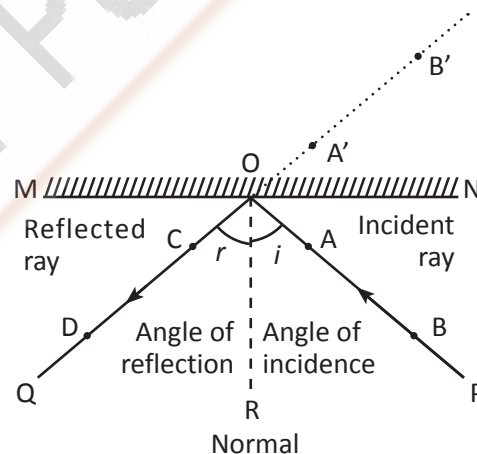
Now, by looking at the reflection of these two pins, fix two pins C and D on the other side in such a way that images of all four pins appear in a straight line.

Remove the pins and draw a straight line along the path of AB and CD. The point where these two lines meet, mark it as O. Draw a perpendicular OR. This is called normal.

The angle formed by the incident ray (OP) and the normal is called angle of incidence (i) and angle formed by the normal and reflected ray (OQ) is called angle of reflection (r).

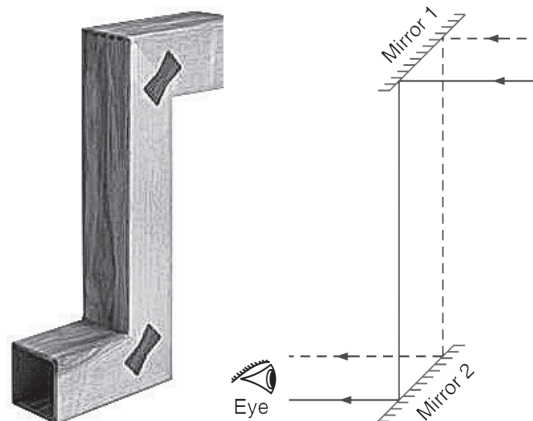
Conclusion:

- The equal measures of the angle of incidence and angle of reflection verify the first law of reflection.
- The drawing of incident ray, normal and the reflected ray on the same sheet of paper, verifies the second law of reflection.



3. A periscope is a rectangular tube, bent twice at an angle of 90° at its two ends. In it, two plane mirrors are fitted at an angle of 45° . The rays of light travelling from the object to be seen, fall on the first mirror, from where they are reflected and sent to the second mirror. The reflected light from the second mirror is received by the eyes of the observer, who is able to see the object.

A periscope is used to detect submarines or other objects at different heights from that of the viewer.



- 4. Working of the Eye:** The reflected light from an object enters the eye through cornea. Its amount is controlled by the iris and the pupil. This light passes through the aqueous humour, the eye lens and the vitreous humour in such a manner that an inverted image of the object is formed at the retina.

The photoreceptors in the retina detect the brightness and the colours of the object. The message of the image formed at retina is picked up by the optic nerve and taken to the brain, so that we can actually see.

5. Ways to take care of the eye.

- (a) The eyes should be washed every day with fresh and clean water at normal temperature.
- (b) Never rub the eyes.
- (c) In case of dust particles get into the eyes, splash a lot of clean and cold water into the eyes so as to wash away the dust.
- (d) If a foreign particle like a splinter or a metal particle got into the eyes, wash with clean and cold water immediately. If it does not come out with water, rush to the doctor.
- (e) Never look at very bright sources of light like the sun or a welding spark directly.
- (f) Do not read or write in dim or very bright light and also in a moving vehicle.
- (g) While reading or writing, keep your books or notebooks at a distance of distinct vision (25 cm) from the eyes.
- (h) Do not spend much time looking at computer screen or a television screen.

- 6.** (a) 1—Eye lens 2—Pupil, 3—Iris, 4—Retina, 5—Blind spot

(b) Lens

(c) Retina

(d) Pupil

(e) At this place, the optic nerve is connected to the retina, so it lacks photoreceptors and hence, the image formed at this point is not sensed by the eye. Therefore, it is called blind spot.

- G.** 1. A rainbow cannot be seen after the rain if the sun does not shine because there would be no sunlight and hence splitting of light into seven colours will not take place.
2. An owl can see very well in complete darkness because it has a large number of rods and very few cones in its eyes. Besides this, it has a large cornea and a large pupil which allow more light to enter its eyes.

Passage/Case-based Questions

- 1. Lateral inversion property of mirror is used in this case.
- 2. The image formed by a plane mirror is erect, virtual and of same size as that of the object.

- H.** 1. CATARACT 2. IRIS 3. PERISCOPE 4. LATERAL INVERSION 5. REAL 6. PARALLEL 7. NORMAL 8. SIX