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Infinity Science

Teacher's Manual

CLASS 8

Ottimo Publications

Infinity Science
Class – 8

Chapter – 1 Crop Production and Management

Knowledge Check (Page 9)

(a) Cereals (b) Vegetables (c) Medicinal plants
(d) Plantation crops (e) Pulses

Knowledge Check (Page 16)

(a) Thresher machines (b) Harvesting (c) Grain silos
(d) Winnowing

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) agriculture 2. (d) rabi crop 3. (d) all of them
4. (a) sowing 5. (c) plough

B. 1. cash crop 2. Kharif 3. horticulture
4. nutrients, space, water 5. sprinkler 6. irrigation
7. organic matter

C. 1. False 2. True 3. True
4. False 5. True 6. True

D. 1. ploughing, levelling
2. (a) Moat (pulley system) (b) Rahat (Water wheel) (c) Chain pump (d) Dhekli
3. The process of growing crops on a large scale is called agriculture.
4. The process of removing weeds from the field is called weeding.
5. (i) The first is called broadcasting or scattering the seeds by hand.
(ii) The other method is drilling.
6. Furrow irrigation, Basin irrigation, Sprinkler irrigation, Drip irrigation

E. 1. While sowing seeds few points must be kept in mind.
- Depth : Seed should be sown at the correct depth, neither too shallow nor too deep.
- Distance : Seeds should be sown at a proper distance, so that the plants get proper amount of sunlight, nutrients and water from the soil.
- Moisture : Moisture in the soil necessary for the germination of seeds.

2. Weeds may be removed manually either by uprooting them or by cutting them with the help of tools like hoe, khurpa and harrow. They can also be removed by adding weedicides. The chemical substances which destroy (kill) weeds but do not harm the crops are called weedicides or herbicides. Some common weedicides in use are dalapon, metachor and siniazine. These are diluted in water and sprayed in the field with a sprayer.
3. Irrigation is essential to provide crops with a consistent water supply, especially in areas with insufficient rainfall, ensuring healthy growth and higher yields.
4. Planting crops can deplete soil nutrients, cause compaction, and lead to erosion. However, proper soil management practices like crop rotation can help maintain soil health.

5. Here are some methods of crop improvement:
   i. Selective Breeding: Choosing plants with desirable traits and breeding them to enhance those characteristics.
   ii. Genetic Engineering: Modifying the DNA of crops to introduce specific traits, such as resistance to pests or drought.
   iii. Hybridisation: It is a technique used for developing new varieties of crops by cross breeding two different varieties. By cross breeding, a new variety can be made to have the desired characteristics from both parents.
   iv. Mutation Breeding: Inducing mutations to create new traits or characteristics in crops.
   v. Tissue Culture: Growing plants from small tissue samples to produce disease-free and high-quality crops.
   vi. Cross-Breeding: Mating different varieties or species to combine desirable traits from both.
   vii. Micropropagation: Rapid multiplication of plants through tissue culture techniques for better crop production.
6. a. **Sprinkler irrigation:** Sprinkler have perpendicular pipes with rotating nozzles. This system involves pumping water under pressure and spraying it over the crops like rain. It helps in the equal distribution of water on the crops.

   Drip irrigation: Drip irrigation is also called trickle irrigation or micro irrigation. The system minimises the uses of water and fertilisers by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone through a network of valves, pipes, tubes and emitters. Drip irrigation is used by farms, commercial greenhouses and residential gardens. It is adopted extensively in areas of acute water scarcity.

   b. **Threshing:** The process of separating the grain from the harvested stalk of hay is known as threshing. This is done by spreading the harvested crop on the ground and walking over them. Animals such as bullocks, buffaloes, or camels are also used for this.

   Winnowing: The process of separating the grains from the chaff is known as winnowing. The wind blows away the lighter chaff from the mixture. The heavier grains fall directly on the ground below and are thus separated. Big farms use huge machines called combine which cut, thresh as well as separate the grain from the chaff, all at one go.

   c.

Fertiliser	Manure
A fertiliser is an inorganic salt.	Manure is a natural substance obtained by the decomposition of cattle dung, human waste and plant residues. They are Eco friendly.
A fertiliser is prepared in factories.	Manure can be prepared in the fields.
A fertiliser does not provide any humus to the soil.	Manure provides a lot of humus to the soil.
Fertilisers are very rich in plant nutrients like nitrogen, phosphorus and potassium.	Manure is relatively less rich in plant nutrients.

F. 1. India has diverse climatic conditions, varying soil types, and different agricultural regions, which support the cultivation of a wide range of crops, including food grains, fruits, vegetables, and cash crops.

2. Leaving fields fallow allows the soil to recover, replenish nutrients, and prevent the depletion of essential minerals. It also helps break the crop disease cycle and improves soil structure.

3. Overuse of fertilisers can lead to soil degradation, reduced fertility, water pollution, and harm to beneficial microorganisms. It can also result in nutrient imbalances and crop damage.

4. Drip irrigation is water-efficient, delivering water directly to the plant roots, reducing evaporation and runoff. This method conserves water, improves crop yield, and lowers water usage, making it ideal for areas with water scarcity.

5. Overuse of chemical pesticides can harm the environment, beneficial insects, and human health. It can also lead to pesticide resistance in pests. Using them in moderation helps maintain ecological balance and prevents long-term damage.

G. (a) Combine harvester — (ii) Harvesting and threshing
(b) Khurpi (Trowel) — (i) Weeding
(c) Sickle — (v) Ploughing
(d) Sprinkler — (iii) Irrigation
(e) Wheat — (iv) Rabi crop

H. a. **Ploughing by animals:** The process of loosening and turning up of the soil is called ploughing. This is done by using a wooden or iron plough. If the soil is very dry, it may need watering before ploughing. Plouging helps the roots to penetrate deep inside and also ensures that air can easily reach the roots which is very important for the healthy growth of the plant. A plough has a strong triangular iron strip called ploughshare. A long log of wood attached to it is called ploughshaft. Ploughs are either drawn by bullocks or driven by tractors.

b. **Sprinkler irrigation:** Sprinkler have perpendicular pipes with rotating nozzles. This system involves pumping water under pressure and spraying it over the crops like rain. It helps in the equal distribution of water on the crops

c. **Winnowing:** The process of separating the grains from the chaff is known as winnowing. The wind blows away the lighter chaff from the mixture. The heavier grains fall directly on the ground below and are thus separated. Big farms use huge machines called combine which cut, thresh as well as separate the grain from the chaff, all at one go.

I. (i) (a) agriculture — (ii) (b) crops
(iii) (b) rabi — (iv) (a) kharif

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

K.

Across	**Down**
1. EARTHWORM	2. HARVESTING
4. EMASCULATION	3. MANURING
5. IRRIGATION	
6. WINNOWING	

Think & Answer (HOTS)

1. Biological control is better than using pesticides because it involves the use of natural predators, parasites, or pathogens to control pests, which reduces the harmful effects on

the environment. Unlike pesticides, biological control does not harm beneficial insects, soil organisms, or cause pesticide resistance. It is a more sustainable and eco-friendly method.

2. Monocultures deplete the soil of specific nutrients that the single crop continuously requires, leading to nutrient imbalances. They also increase the risk of pest and disease build-up, as pests target a single crop variety. Additionally, monocultures reduce soil biodiversity, which is important for maintaining soil structure and health. Rotating crops can help improve soil fertility and reduce the need for chemical inputs.

Life Skills

Do it Yourself

Group Discussion

Do it Yourself

Project

Do it Yourself

Chapter – 2 Microorganisms: Friend and Foe

Knowledge Check (Page 30)

(a) POLIO (b) ASPERGILOSIS (c) DENGUE
(d) CHOLERA (e) MALARIA

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (d) All of them 2. (a) fermentation 3. (b) food preservation
4. (b) vitamin B 5. (d) All of them

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

C. 1. inactive 2. non-green plants 3. fungi
4. viral 5. animals 6. clean

D. (a) Microbes (iii) Tiny organisms
(b) Virus (iv) Measles
(c) Yeast (i) Fermentation
(d) Pasteurisation (v) Milk Preservation
(e) Anopheles and Aedes (ii) Malaria and dengue

E. 1. Microorganisms are tiny organisms invisible to naked eye.
2. Disease causing organisms (microbes) are called Pathogens. It enters the body through direct contact, inhalation, ingestion, vectors (like insect bites), or breaks in the skin.
3. Bacteria are unicellular. They do not possess a well defined nucleus and other membrance bound organelles.
4. Pasteurisation is a process in which the foodstuff is heated at high temperature and then cooled rapidly.
5. Microorganisms cannot be seen by naked eye because they are tiny particles. They can be observed through a microscope.
6. Microbes convert the dead organic matter of plants and animals into simple substances which go back into the soil and increase soil fertility.

F. 1. Microorganisms can be divided into five major groups. These are:
- Bacteria (Singular: Bacterium): Coccus (spherical), Bacillus (rod-shaped), Vibrio (comma-shaped), Spirillia (spiral
- Fungi (Singular: Fungus): Yeast, Rhizopus (Bread mould), Agaricus, Penicillium
- Algae (singular-alga): Anabaena, Spirogyra, Chlamydomonas
- Protozoa (singular-protozoan): Paramecium, Trypanosome, Amoeba
- Viruses (Singular: Virus): Polio virus , Influenza virus, Corona Virus

2. i. Bacteria help us in making certain food items like curd, cheese, bread and pastries. Lactobacillus bacteria help make curd from milk. A spoonful of curd is added to warm milk as it contains the bacteria Lactobacillus which promote the formation of curd from milk.

ii. Cheese and paneer are also made by the action of bacteria Lactobacillus and Streptococcus on milk.

iii. Some algae like Chlorella and sea weed are used as food. They are a rich source of proteins and minerals.

iv. Agar-agar, a jelly like substance, obtained from red algae Gellidium and Gracillaria is used in preparation of various food items like ice creams, jellies and puddings.

v. Bacteria act upon tough meat and make it soft. This process is called tenderization of meat.

3. Viruses are considered at the border of living and non-living because they cannot carry out life processes, such as metabolism or reproduction, on their own. They need a host cell to replicate. Outside a host, they are inactive, but inside a host, they can reproduce and show characteristics of living organisms.

4. Diseases that microbes spread from an infected person to a healthy person through air, water, food or direct contact are called communicable diseases.

Some insects like housefly act as carriers of disease-causing microbes. Pathogens stick to their bodies. When these flies sit on uncovered food they transfer the pathogens. Whoever eats this contaminated food is likely to fall sick.

The female Anopheles mosquito is a carrier of the parasite of malaria. Female Aedes mosquito acts as a carrier of dengue

5. The conversion of free atmospheric nitrogen into usable nitrogen compounds is called nitrogen fixation. Nitrogen fixation occurs by lightning and certain microorganisms. The main nitrogen-fixing microorganisms are bacteria (Rhizobium) and blue green algae. These microorganisms convert the atmospheric nitrogen in usable compounds of nitrogen. Once nitrogen is converted into these usable compounds, it can be utilised by plants from the soil through their root system. Nitrogen is then used for the synthesis of plant proteins and other compounds. Animals feeding on plants get these proteins and other nitrogen compounds. When plants and animals die, bacteria and fungi present in the soil convert the nitrogenous wastes into nitrogenous compounds to be used by plants again. Certain other bacteria convert some parts of them to nitrogen gas which goes back into the atmosphere. As a result, the percentage of nitrogen in the atmosphere remains more or less constant

G. 1. a. Ringworm, Fungi
b. Polio, Viruses
c. Blight of potato, Fungi

2. Amoeba, Agaricus, Spirogyra

H. i. (a) small ii. (b) very small iii. (c) both iv. (a) microorganisms

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

J.

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

Think & Answer (HOTS)

1. Curd sets faster in summer because the warmer temperature accelerates the activity of the bacteria that convert milk into curd. In winter, cooler temperatures slow down this bacterial activity, leading to slower curd formation.
2. Sealed packets of chips are filled with nitrogen to prevent oxidation, which could make the chips stale or lose flavor. Nitrogen is an inert gas, so it helps preserve the freshness of the food by displacing oxygen, which could otherwise cause spoilage.

Life Skills

Do it Yourself

Group Discussion

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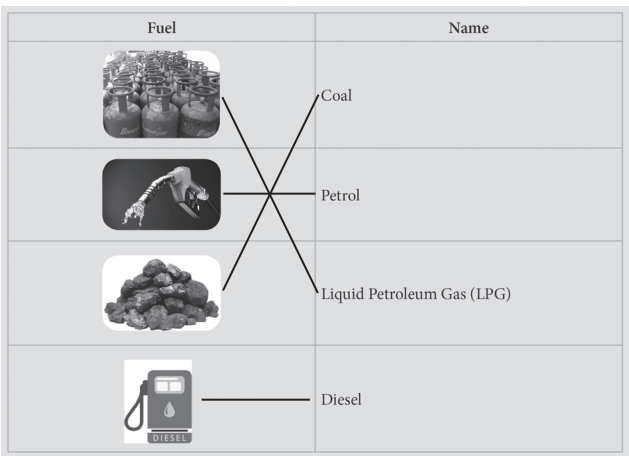
Project

Do it Yourself

Chapter – 3 Coal and Petroleum

Warm-up (Page 39)



Knowledge Check (Page 41)

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

Knowledge Check (Page 43)

(a) Carbonisation (b) 86-97% (c) Coke (d) Coal tar
(e) Coal gas

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) Anthracite 2. (b) Refining 3. (d) Paraffin wax 4. (b) Bituminous
5. (b) Natural gas

B. 1. coal 2. Natural gas 3. Petroleum 4. wood
5. Liquefied Petroleum Gas

C.

Column A	Column B
Petrol	Light vehicles
Diesel	Heavy vehicles Vaseline
Kerosene	Fuel for lamps
Paraffin wax	Vaseline
Bitumen	Road surfacing

D. 1. It is used
- to generate electricity in power stations.
- as fuel in domestic and industries.

2. Coal, petroleum
3. Compressed Natural Gas
4. Refining
5. Oil and Natural Gas Corporation (ONGC)

E. 1. Fossil Fuel are exhaustible energy resources formed from the dead remains of living organisms millions of years ago.
2. Under high pressure and temperature in the absence of air, a slow chemical process is called carbonisation.
3. It is used for the manufacture of steel and in extracting many metals. It is also used as a fuel.
4. Long years ago, many microscopic animals and plants present in sea found dead. Their bodies which settle down at bottom of the sea will be covered slowly with clay and sand. These organisms under high temperature, pressure and bacteria will be converted into petroleum and natural gas in the absence of air. The product thus formed will be trapped between two layers of impervious rock and forms oil trap. The natural gas will always present above petroleum under the earth.
5. Compressed Natural Gas (CNG) is used for power generation. To reduce the pollution rate, CNG is used nowadays as a fuel for transport vehicles.
6. Wood → peat → lignite (soft coal 25-30% C) → sub-bituminous coal (medium soft 35-45% C) → bituminous (medium hard 34-86% C) → anthracite (hard coal with 86-97% C).
7. A process in which petroleum is separated into useful and usable fractions using fractional distillation.

F. 1. Plants and trees were buried under the earth surface for long years ago which are decomposed to form coal. Due to flood, earthquakes and volcanic eruptions, many forests were buried under earth and covered up with sand, water and clay. With extreme humid and hot conditions, they are attacked by anaerobic bacteria which slowly remove oxygen and hydrogen leaving carbon alone.

Plants → anaerobic bacteria removes hydrogen and oxygen → COAL (million of years before)

2. The products of fractional distillation of petrol and their uses are given below.

S. No.	Fractions	Uses
1	Diesel oil	In diesel engines and generators as fuel.
2	Paraffin wax	Vaseline, Shoe polishes, candles, ointment
3	Lubricating oil	Lubrication
4	Bitumen	Road surfacing, Paints
5	Kerosene	Fuel for lamps, stoves and for illumination.
6	Gasoline or petrol	Aviation and motor fuel, the solvent in dry cleaning.
7	Fuel oil	In boilers and furnaces as industrial fuel.
8	Liquefied petroleum gas (LPG)	Gaseous fuel for home and industry.

3. • Both coal and petroleum are exhaustible energy sources. The natural deposits will get exhausted on over-extraction.
   • The rate at which we are using these resources, the stock can be available only for about the next 20-30 years.
   • Import of coal and petroleum will increase which in turn will have a severe drain on foreign exchange reserve to meet the cost of importing petroleum.
   • Fossil fuel obtained due to excessive mining will create hollow spaces in the earth which may result in land collapse.
   • Cost of petroleum products will become too costly and as result prices of all commodities will increase and cause inflation for which an ordinary person cannot even afford.
   • Air pollution is caused due to the burning of fossil fuels. Gaseous pollutants like carbon monoxide, carbon dioxide and oxides of sulphur and nitrogen are released on burning coal which in turn leads to the greenhouse effect and can cause global warming.
4. • Usage of fuels should be restricted and used when it is absolutely necessary.
   • Should not waste or misuse fossil fuels.
   • Should adopt and use alternative of renewable sources of energy like solar, wind, nuclear, tidal and biomass energy to meet our energy needs.
   • We can use biogas as a domestic fuel instead of fossil fuel.
5. i. It causes less pollution comparatively and is a cleaner fuel.
   ii. It has high calorific value.

iii. It can be transported through networks of underground pipes to houses and industries without additional storage and transport and hence it has the greatest advantage over other fuels.

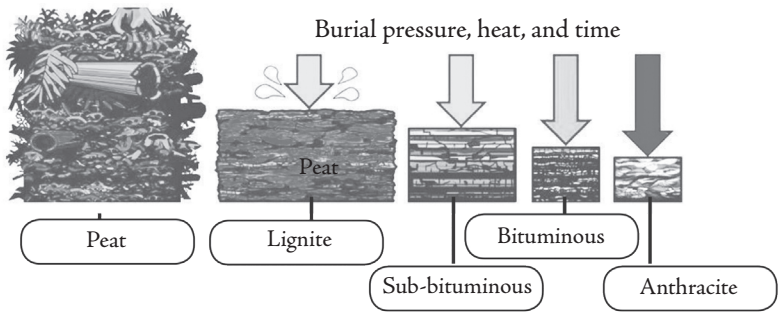
iv. No poisonous gas on burning is produced.

v. Pollution is less when compared with other fuels since it burns with a smokeless flame.

6. Petrochemicals are substances which are obtained from petroleum and natural gas. Petrochemicals provide raw materials for the preparation of a variety of substances. They are mainly used for making fertilisers, explosives, plastic, perfumes, synthetic rubber, synthetic fibres, dyes, drugs and varnishes.

Earlier, important chemicals were prepared from products. But nowadays, coal products have been replaced by petroleum products for their use.

G. (a)



(b)

H. (i) (c) both (ii) (b) two (iii) (a) natural (iv) (a) exhaustible

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

J.

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

Think & Answer (HOTS)

1. Burning fossil fuels releases harmful gases like carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter. These contribute to air pollution, global warming, acid rain, and health problems.
2. Natural gas is found deep underground, often with oil deposits. It is called a clean fuel because it produces fewer emissions (CO2, NOx, SO2) when burned, making it less harmful to the environment.
3. CNG is preferred over diesel because it is cleaner, produces fewer pollutants, and is more cost-effective.

   Advantages of CNG:
   - Lower emissions
   - Reduced engine wear
   - Cheaper fuel
   - Quieter operation

   Disadvantages of CNG:
   - Limited refueling infrastructure
   - Lower energy density
   - Requires storage space
   - Vehicle modification needed

Life Skills

Do it Yourself

Project

Do it Yourself

Chapter – 4 Combustion and Flame

Knowledge Check (Page 57)

(a) Wood, paper (b) explosion (c) kindling temperature
(d) 35°C (e) combustile

Knowledge Check (Page 60)

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

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (c) Petrol 2. (c) Electrical fire 3. (a) Combustible substance
   4. (a) Coal 5. (b) Blue

B. 1. Ignition temperature: The lowest temperature at which a substance catches fire and starts burning.
   2. Flame is produced if both the combustible substance and the supporter of combustion should be in its gaseous/vapour state.
   3. Calorific value: The amount of heat produced in kilojoules when one gram of a fuel is completely burnt.
   4. Sulphur dioxide (SO_2) is released on burning coal and diesel while oxides of nitrogen are released by petrol engines. These oxides of nitrogen and sulphur will produce acid rain.

5. Most of the fuels release carbon dioxide which in turn increases the CO_2 level in the atmosphere. This results in the increase of temperature of the earth. This process is called a greenhouse effect. It leads to global warming.

C.

Column A	Column B
1. Combustible	d. Petrol
2. Non-combustible	e. Sand
3. Ignition temperature	a. Kindling temperature
4. Flame	b. Zone of combustion
5. Water	c. Fire extinguisher

D. 1 The substances burn in the presence of air or oxygen and produce heat and light are called combustible substances.

The substance which cannot produce heat and light and burn in air or oxygen is called non-combustible substances.

2. Complete Combustion occurs with sufficient oxygen, producing carbon dioxide (CO_2) and water (H_2O), and it generates more heat with a blue flame.

Incomplete Combustion happens with limited oxygen, producing carbon monoxide (CO), soot, carbon dioxide (CO_2), and water (H_2O), with less heat and a yellow flame.

3. Combustion that takes place in a very short period of time with the evolution of a large amount of heat and light is called rapid combustion.

The combustion which takes place without external supply of heat given is known as spontaneous combustion.

4. A yellow flame is produced when the combustion is incomplete due to insufficient supply of air. It produces an appreciable amount of heat and light and such a flame is also called as a luminous flame.

A blue flame is obtained when the combustion is complete due to the sufficient amount of air and produce little amount of light and hence is called as a non-luminous flame.

5. Water Fire Extinguisher: Water cools down the burning material below its ignition temperature and cools down. But they cannot be used in certain cases.

Carbon dioxide Fire Extinguisher: It contains sodium bicarbonate filled inside the cylinder and a separate glass bottle filled with sulphuric acid is placed as shown in the figure under high pressure.

E. 1. Combustion: The process of burning of a substance in the presence of air or oxygen with the liberation of heat and light.

2. Substances like alcohol, petrol, LPG and nylon fabrics catch fire very easily because of its low ignition temperature and such substances are called inflammable substances.

3. Ignition temperature: The lowest temperature at which a substance catches fire and starts burning.

4.

S. No.	Fractions	Uses
1	Diesel oil	In diesel engines and generators as fuel.
2	Paraffin wax	Vaseline, Shoe polishes, candles, ointment
3	Lubricating oil	Lubrication

4	Bitumen	Road surfacing, Paints
5	Kerosene	Fuel for lamps, stoves and for illumination.
6	Gasoline or petrol	Aviation and motor fuel, the solvent in dry cleaning.
7	Fuel oil	In boilers and furnaces as industrial fuel.
8	Liquefied petroleum gas (LPG)	Gaseous fuel for home and industry.
9	Biogas	35-40
10	Hydrogen	150
11	Diesel	45
12	LPG	50

5. LPG is an ideal fuel for domestic use because it burns efficiently, produces less pollution, is easy to store, and leaves no residue, unlike wood, which produces smoke, soot, and requires more handling.

F. 1. There are three types of combustion—rapid combustion, spontaneous and explosion.

i. **Rapid Combustion:** Combustion that takes place in a very short period of time with the evolution of a large amount of heat and light is called rapid combustion. Examples are combustion of LPG which produces instant heat and light. Similarly, candle starts burning when a burning matchstick is brought near its wick.

ii. **Spontaneous Combustion:** The combustion which takes place without external supply of heat given is known as spontaneous combustion. For example, white phosphorus catches fire on its own at room temperature. Forest fires are another example of spontaneous combustion.

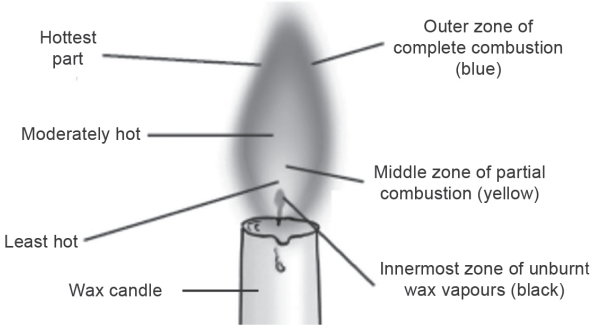
iii. **Explosion:** The process in which combustion takes place with the sudden release of heat, light and sound along with the liberation of a large amount of gas is called an explosion. For example, bursting of firecrackers during Diwali is an explosion. It can also take place by applying pressure.

2. The following three conditions are necessary for combustion to take place.

i. **Presence of a Combustible substance:** Combustion takes place only if the substance is combustible.

ii. **Presence of a Supporter of Combustion:** Substance which helps in the combustion of a combustible substance is called a supporter of combustion. Examples are oxygen or air which acts as a supporter of combustion during the combustion of magnesium, charcoal and coal. An adequate supply of air or oxygen is essential for burning. If the oxygen supply is cut off, then the combustion stops. Hence supporter of combustion is necessary.

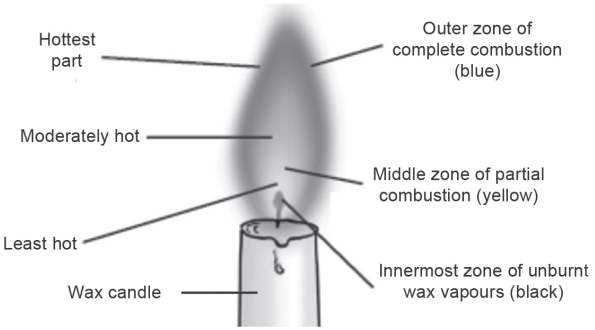
iii. **Attainment of Ignition temperature:** The lowest temperature at which a substance catches fire and starts burning is called an ignition temperature. It is also called as kindling temperature. Ignition temperature varies with every substance. For example, white phosphorus catches fire easily on slight heating because its ignition temperature is 35°C. A substance cannot catch fire if its temperature is lower than its ignition temperature. For example, matchstick, kerosene, petrol, wood or coal does not catch fire on its own because its ignition temperature is more than the atmospheric temperature.

3. The commonly used fire extinguishers are:
   - **Water Fire Extinguisher:** Water cools down the burning material below its ignition temperature and cools down. But they cannot be used in certain cases. For example, water cannot be poured when fuels are burning since water is lighter than fuels and substance continues to burn. Similarly, electric fires should not be extinguished using water as it conducts electricity and is more dangerous.
   - **Carbon dioxide Fire Extinguisher:** It contains sodium bicarbonate filled inside the cylinder and a separate glass bottle filled with sulphuric acid is placed as shown in the figure under high pressure. When the fire is extinguished, two substances react producing carbon dioxide which is used to cut off air supply immediately since it brings the combustible substance below its ignition temperature.
4. 

Different zones of a Candle flame
5. The important characteristics of an ideal fuel are:
   - It should possess high calorific value.
   - It should release heat in a controlled manner with a moderate rate of combustion.
   - It should be easily available and cheap.
   - Ignition temperature should be above the room temperature but should have low value.
   - It should be eco-friendly and should be safe to store, transport and handle.
   - It should produce the very small amount of residues.
6. When the fuel is burnt, pollutants like carbon dioxide, carbon monoxide, oxides of nitrogen and sulphur, ash, smoke and unburnt carbon particles etc. are produced. Such gases are not eco-friendly and produce various harmful effects to our environment. Some of them are given below:
   - **Suspended Particulate Matter (SPM):** It is produced when burning of fossil fuel takes place with the release of ash and some fine particles of carbon which is unburnt in the air. They produce various respiratory diseases like asthma and bronchitis. Especially in winter, they produce smog which is harmful to both plants and animals. They also reduce visibility, blacken buildings and spoils clothes.
   - **Carbon dioxide (CO_2):** Most of the fuels release carbon dioxide which in turn increases the CO_2 level in the atmosphere. This results in the increase of temperature of the earth. This process is called a greenhouse effect. It leads to global warming which results in excessive melting of polar ice, rising of water levels in oceans and seas and hence low lying areas will merge and flooding takes place.

- **Carbon monoxide (CO):** It is a poisonous gas released when incomplete combustion of fossil fuel takes place. It combines with haemoglobin present in the blood when inhaled and forms carboxyhaemoglobin. Oxygen cannot be carried out by this compound and hence oxygen deficiency takes place which results in suffocation and even death.
- **Oxides of Nitrogen and Sulphur:** Sulphur dioxide (SO_2) is released on burning coal and diesel while oxides of nitrogen are released by petrol engines. These oxides of nitrogen and sulphur will produce acid rain when they dissolve in rainwater. Plants, soils and buildings are affected due to acid rain.

G. a.



Different zones of a Candle flame

b. Global warming refers to the long-term increase in Earth's average surface temperature due to human activities, primarily the emission of greenhouse gases like carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These gases trap heat in the atmosphere, leading to a rise in temperature.

Key causes:

- Burning fossil fuels (coal, oil, natural gas)
- Deforestation
- Industrial activities

Effects:

- Melting polar ice caps
- Rising sea levels
- Extreme weather events (heatwaves, floods, storms)
- Ecosystem disruption

Global warming is a major driver of climate change, which impacts the environment and human societies.

H (i) The gas 'A' released on burning of coal and diesel is carbon dioxide (CO_2).

(ii) The gas 'B' released by petrol engines is nitrogen oxides (NO_x).

(iii) These gases cause respiratory disorders because they irritate the lungs and airways, leading to breathing difficulties, asthma, and other respiratory problems. Carbon dioxide (CO_2) contributes to global warming, while nitrogen oxides (NO_x) can combine with moisture in the air to form acid rain, which harms the respiratory system.

(iv) The full form of CNG is Compressed Natural Gas.

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

J. **Across**

1. COMBUSTION
4. LUMINOUS
5. EXPLOSION
6. CEMENT

Down

2. IGNITION
3. DIESEL

Think & Answer (HOTS)

1. If the oxygen supply to a burning fuel is stopped, the combustion process will slow down or stop entirely. Combustion requires oxygen to react with the fuel. Without oxygen, the chemical reaction cannot occur, and the fuel will not burn.
2. Hydrogen has the highest calorific value, meaning it produces a lot of energy when burned. However, it is not recommended for domestic use because it is highly flammable and poses a risk of explosion. It is difficult to store and handle safely, and its leakage can cause dangerous situations.
3. It is unsafe to sleep in a room with a coal fire burning because burning coal produces carbon monoxide (CO), a colorless, odorless, and toxic gas. Inhaling CO can lead to poisoning, causing dizziness, headaches, unconsciousness, or even death, especially in enclosed spaces with poor ventilation.
4. The concept behind wrapping a person in a blanket when they catch fire is to cut off the oxygen supply to the flames. Blankets help to smother the fire, preventing it from getting enough oxygen to continue burning. This action helps to quickly extinguish the fire and reduces the damage to the person.

Life Skills

Do it Yourself

Project

Do it Yourself

Chapter – 5 Conservation of Plants and Animals

Knowledge Check (Page 69)

(a) Heavy (b) No

Knowledge Check (Page 73)

(a) east (b) forest

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) Madhya Pradesh 2. (a) 1973 3. (c) Indian Giant Squirrel
4. (d) Plastic paint 5. (a) Cheetah

B. 1. False 2. True 3. False 4. True
5. False 6. True

C. 1. the southern 2. cut down 3. Plants
4. too much 5. endemic flora 6. found
7. Australia

D. 1 Project tiger
2. Wood pulp
3. Cheetah
4. The best solution to deforestation is afforestation and reforestation, where new forests are planted and damaged forests are restored. Additionally, sustainable forest management, reducing illegal logging, and promoting eco-friendly practices like agroforestry and using alternative resources also help in addressing deforestation.
5. The Wildlife Protection Act, 1972 and the Forest Conservation Act, 1980 were made to protect forests and wildlife in India.
6. 3,000
7. Every winter, thousands of birds from near the North Pole migrate south to escape from harsh winter. Thousands of such birds migrate to India during winter season, and many of them also reach Pachmarhi Biosphere Reserve.

E. 1. Trees are cut for timber, firewood, paper production, building materials, and clearing land for agriculture, infrastructure, and urbanization.
2. Deforestation removes trees that absorb and store water. Without trees, rainwater flows more rapidly over the land, leading to increased runoff and higher chances of flooding.
3. During floods, waterborne diseases spread due to contaminated water. During droughts, lack of clean water and poor hygiene can lead to the spread of diseases. Both conditions also strain healthcare systems, making it easier for diseases to spread.
4. Forests help prevent soil erosion by holding soil in place with their roots. The tree canopy also reduces the impact of rainfall on the soil, preventing it from being washed away.
5. A biosphere reserve is a designated area that includes both protected and buffer zones, designed to conserve biodiversity, promote sustainable development, and maintain the balance of ecosystems.
6. Pachmarhi National Park
Bora Sanctuary
7. Vulnerable species are those at risk of becoming endangered in the near future.
Endangered species are those at a very high risk of extinction in the wild.
8. When a species is completely wiped out from the earth, it is called extinct species.
For example; cheetah became extinct from India a long time ago. They are now being reintroduced in India by bringing them from the jungles of Africa.

F. 1. Removal of topsoil is called soil erosion. Trees and plants hold the topsoil in place. Once forest cover is removed, the topsoil is at a greater risk of being blown away by wind or washed away by water.
Topsoil is necessary for growth of plants because topsoil contains necessary materials for that. The soil below the topsoil cannot sustain plants. So, when topsoil is removed the hard and rocky layer gets exposed and hence plants rarely grow on such soils. In the long run, such place changes into desert. This process is called desertification.
Deforestation also reduces the water-holding capacity of soil. It also causes deterioration in other properties of soil such as nutrients, soil texture, etc.
2. Deforestation contributes to air pollution by releasing stored carbon dioxide (CO_2) from trees and reducing oxygen production. It also increases dust and particulate matter in the air. The consequences include global warming, climate change, health issues like respiratory problems, and loss of biodiversity.

3. Wildlife Sanctuary:
   - Focuses on protecting wildlife in its natural habitat.
   - Human activities like grazing, collection of forest products are allowed under regulated conditions.
   - Less strict protection compared to national parks.
   - National Park:
   - A strictly protected area meant for conservation of wildlife and natural resources.
   - No human activities like grazing or logging are allowed.
   - Managed by the government, with strict rules for conservation.

   Biosphere Reserve:
   - A larger area that includes both protected zones (national parks, sanctuaries) and buffer zones for sustainable human activities.
   - Aimed at promoting biodiversity conservation, research, and sustainable development.
   - Focuses on the interaction between humans and the environment.
4. Vulnerable Species:
   - Species that are at risk of becoming endangered in the near future due to factors like habitat loss or hunting.

   Endangered Species:
   - Species that are at a very high risk of extinction in the wild due to drastic population decline or habitat destruction.

   Extinct Species:
   - Species that no longer exist anywhere on Earth. They have completely disappeared from the planet.

G. a. Bharatpur, India
   b. China
   c. habitat degradation

   Global warming refers to the long-term increase in Earth's average surface temperature due to human activities, primarily the emission of greenhouse gases like carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These gases trap heat in the atmosphere, leading to a rise in temperature.

   Key causes:
   - Burning fossil fuels (coal, oil, natural gas)
   - Deforestation
   - Industrial activities

   Effects:
   - Melting polar ice caps
   - Rising sea levels
   - Extreme weather events (heatwaves, floods, storms)
   - Ecosystem disruption

   Global warming is a major driver of climate change, which impacts the environment and human societies.

H. 1. (c) A is correct but R is wrong
   2. (d) A is wrong but R is correct

I. **Across**

2. EXTINCT
3. BIODIVERSITY
5. DEFORESTATION
6. AFFORESTATION

Down

1. ENDANGERED
4. VULNERABLE

Think & Answer (HOTS)

I would not prevent my friend from making paper boats, as long as it doesn't disrupt the class or waste paper. Making paper boats can be a creative and relaxing activity for some, and it might help him focus or relieve stress. However, I would suggest that he be mindful of the environmental impact of using paper and encourage him to recycle the paper after use, so it doesn't contribute to waste. If it becomes disruptive, I would politely ask him to do it during breaks or outside class.

Life Skills

In case of a flood, I would:

1. Store clean drinking water in advance.
2. Boil water to kill bacteria.
3. Use water purification tablets or filters.
4. Avoid drinking from open, contaminated sources.
5. Keep water containers covered.
6. Stay informed about emergency water supplies.

Project

Do it Yourself

Chapter – 6 Age of Adolescence

Knowledge Check (Page 81)

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

Knowledge Check (Page 85)

1. mammary
2. testosterone
3. 18
4. Adam's apple
5. ovulation

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) adrenalin
2. (a) pituitary
3. (c) Oestrogen
4. (d) 45-55 years
5. (a) cocaine

B. 1. Harmones
2. Puberty
3. adolescence
4. ovulation
5. drug abuse

C.

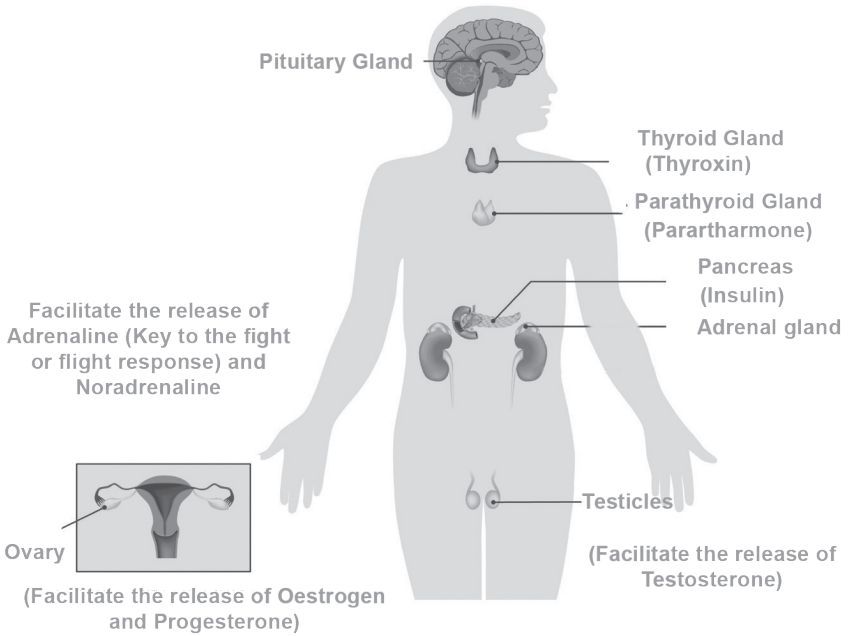
1.	Endocrine glands:	Pituitary gland	Thyroid gland
2.	Hormones:	Adrenalin	Insulin
3.	Reproductive hormones:	Testosterone	Oestrogen
4.	Secondary sexual characters in boys:	Deepening of voice	Facial hair growth
5.	Secondary sexual characters in girls:	Development of breasts	Widening of hips

D.

Column A	Column B
Pituitary gland	Thyroxine
Sound box	Adam's apple
Mammary glands	Milk-producing gland
Drug	Marijuana
Testes	Testosterone

E.
1. The adrenal gland is called the gland of emergency because it secretes adrenaline (also known as epinephrine), which prepares the body for the "fight or flight" response during stressful situations by increasing heart rate, blood flow, and energy supply.
2. Thyroxine, secreted by the thyroid gland, regulates metabolism by controlling the rate at which the body uses energy. It also plays a role in growth and development, and its deficiency can lead to hypothyroidism, while excess can cause hyperthyroidism.
3. Insulin, secreted by the pancreas, regulates blood sugar levels by promoting the absorption of glucose into cells, lowering blood sugar levels. If insulin is not produced or used properly, it can lead to diabetes.
4. Adolescence is the period of transition from childhood to adulthood, marked by physical, emotional, and psychological changes. It typically begins between the ages of 10 to 13 and ends around 18 to 21 years.
5. A balanced diet is crucial during adolescence to support growth, development, and hormonal changes. It ensures proper bone development, muscle growth, and provides energy for physical and mental activities, while also helping to maintain overall health.

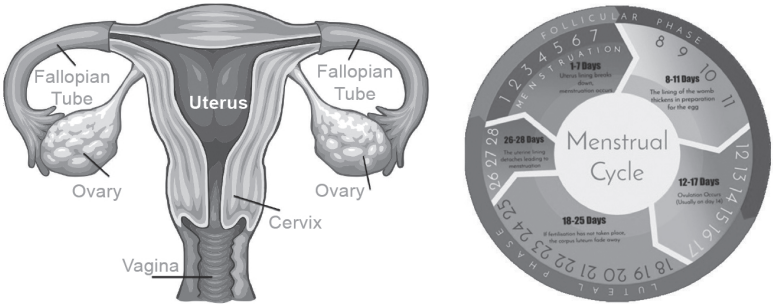
F. 1 .



Diagrammatic representation of the human endocrine system

2. The adrenal glands are located on top of the kidneys and secrete adrenaline (epinephrine) and cortisol. Adrenaline triggers the fight or flight response. It increases heart rate, blood flow to muscles, breathing rate, and releases energy from stores in the body, preparing the body for rapid action in stressful or emergency situations.
3. Physical Changes:
    - Development of reproductive organs: The ovaries enlarge and start to produce mature eggs in girls while the testes and penis develop completely and the testes start to produce sperms in boys.
    - Enlargement of breasts: During puberty, breasts size increases and milk-producing glands called mammary gland start develop inside the breasts.
    - Increase in height and weight: There will be a rapid increase in height and weight in both boys and girls. In general, girls grow faster than boys. But the growth may vary from person to person. Both of them attain their maximum height around 18 years of age.
    - Change in body shape: The muscles develop and shoulders and chest become broader in boys while hips broaden and the pelvic region widens in girls.
    - Body hair: Boys develop facial hair like moustache and beard and hair on the chest. During puberty, hair is developed under armpits, in the public region as well as arms and legs in both boys and girls.
    - Change in voice: There is a change in voice due to the increase in the size of voice box or larynx during puberty. In general, this increase in size is prominently observed in boys and the enlarged voice box can be seen as a lump called Adam's apple in the neck region. Because of the larger voice boxes, boys have a deep voice while the girls have a high-pitched voice. At the initial stage, increase in size of the larynx may cause a boy's voice to crack or break but it becomes normal after a point.
    - Increased activity of sweat and oil glands: Sweat and oil glands in the body become active and cause increased sweating during puberty. Therefore, the activity of oil glands causes acne or pimples in adolescents.
4. Menstrual Cycle: The cyclic procedure in which production and release of mature ova along with associated changes in the ovaries and uterus are called the menstrual cycle. In Latin menstrual means month. The start of the menstrual cycle indicates that the girl has acquired the ability to have a baby. During the menstrual cycle, the following sequence of events takes place.
    - The pituitary gland secretes a hormone which stimulates the ovaries to release a mature ovum. There are two ovaries present which take turns to produce an egg or ovum. One ovum is released every 28 days. The process in which release of a mature ovum by an ovary takes place is called as ovulation.
    - The two important hormones oestrogen and progesterone are released by the ovaries. Their function is to change the lining of the uterus and prepare itself for a possible pregnancy.
    - From there, the ovum begins its journey down the fallopian tube.
    - In case if the ovum is not fertilized by a sperm, it dies and disintegrates and the hormone levels will drop.
    - The lining of the uterus breaks down and shed which is accompanied by a loss of blood. This phase usually lasts for 4-6 days and it is called a girl's menstrual period of menstruation.

- If there is no fertilization takes place within 28 days then the next menstruation starts in the same manner. The figure below shows the various changes takes place during the menstrual cycle.



Ovulation and Menstruation cycle

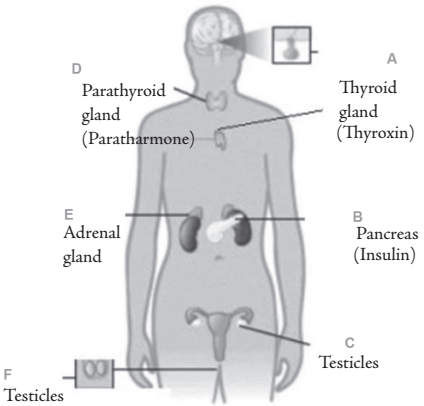
5. Puberty is the time of growth in which an individual becomes sexually mature and achieves reproductive maturity. Below are some of the changes that take place when boys and girls attain puberty.
   - Increased production of testosterone in boys and oestrogen in girls, leading to secondary sexual characteristics.
   - Emotional changes such as mood swings, identity exploration, and heightened sensitivity due to changes in hormone levels.
6. Addictive Substances: Adolescence all over the world faces a common problem of using substances like alcohol, cigarettes, gutkha and pan-masala due to negative energies surrounding him which are very harmful to health. Continuous usage may become highly addictive.

   Drug Abuse: Usage of drugs for the purposes other than medical use is called drug abuse. Drugs are chemical substances which produce physical, mental, behavioural or emotional changes in the person who uses it. Drug abuse is very harmful and affects the body seriously. Also, once a person starts taking drugs, they become addictive physically and psychologically and completely depend on them. Once addicted to drugs, it is difficult to stop taking drugs. Therefore it is very important to say strictly no to drugs and avoids them at all costs. Common examples of drugs are cocaine and marijuana.

   AIDS: The person who uses drugs has a high risk of getting infected with HIV (Human Immunodeficiency Virus) due to the deadly virus which causes AIDS (Acquired Immunodeficiency Syndrome). The HIV virus can be spread by sharing the same syringes used for injecting drugs into the body. AIDS can be spread due to sexual contact with the infected person.

G. a.

b.



H. (i) (a) Adolescence
(ii) (c) both
(iii) (a) male
(iv) (b) boys

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

J.

Across

4. OVUM
5. SPERM
6. OESTROGEN
7. PENIS
9. MAMMALS
10. TESTES

Down

1. CHROMOSOMES
2. AMOEBA
3. BUDDING
8. VAGINA

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

Think & Answer (HOTS)

1. The father determines the baby's sex because he can contribute either an X (female) or Y (male) chromosome, while the mother always contributes an X chromosome.

2. Yes, childhood marriage affects girls' health by increasing the risk of early pregnancies, complications during childbirth, maternal mortality, and psychological issues due to immaturity and lack of education.

Life Skills

Do it Yourself

Project

Do it Yourself

Chapter – 7 Reproduction in Animals

Knowledge Check (Page 92)

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

Knowledge Check (Page 97)

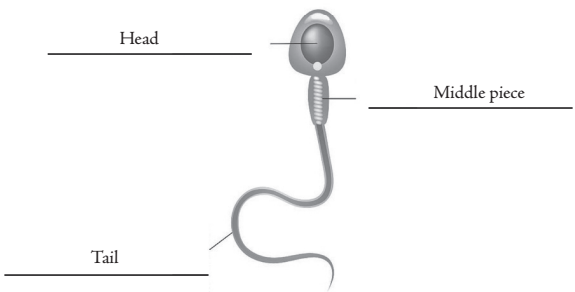
1. sperm 2. external fertilisation 3. fertilisation
4. chromosomes 5. oviparous

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) binary fission 2. (b) asexual reproduction 3. (c) zygote
4. (b) oviduct 5. (a) X and Y

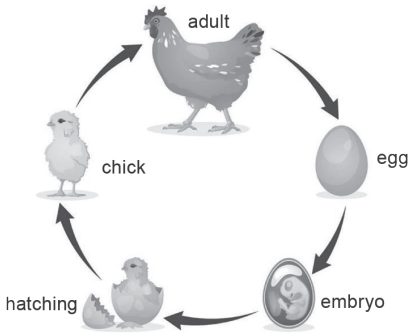
B. 1. Reproduction: The process in which living things produce offspring of their own kind.
2. Fertilisation: The fusion of male and female gametes to produce a new organism.
3. The sex of a baby developing inside the mother's womb is determined by the chromosomes.
4. Zygote: On fertilisation of an egg, the single-celled zygote formed divides repeatedly to form a ball of cells, as it travels through the Fallopian tube.
5. An ovum from the ovary is released every month by a process called ovulation.
6. The reproductive cells vary with male and female individuals. Those reproductive cells are called gametes.
7. Major internal organs and the different body parts develop gradually. At this stage of growth of the embryo, most of the body parts can be identified and are known as a foetus. It takes 40 weeks for a baby to stay and grow fully inside the mother's womb. This period is called the gestation period.
8. Once the foetus is developed fully, uterus walls begin to contract to push the baby out of the mother's body. This process called as parturition.

C.

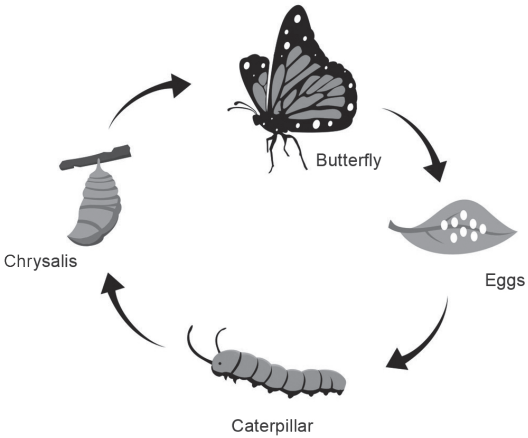


D. 1. Fertilisation
2. Sperm
3. Ovum
4. Embryo
5. Female foeticide

E. 1. The baby grows inside the womb (uterus) after fertilisation. The fertilised egg (zygote) divides and forms an embryo. Over time, the embryo develops into a fetus, with organs, limbs, and systems forming. The baby receives nutrients and oxygen through the placenta via the umbilical cord.
2. No, a newborn baby cannot eat solid food. They rely on breast milk or formula milk for nutrition in the initial months as their digestive system is not developed for solid food.
3. Vaccination is important to protect newborn babies from infectious diseases. It helps build immunity against harmful pathogens, preventing serious illnesses such as polio, measles, and whooping cough.
4. The life cycle of a hen consists of the following stages:
   i. **Egg:** The hen lays eggs, which have a hard shell to protect the developing chick inside.
   ii. **Embryo:** Inside the egg, the embryo develops with proper warmth (usually provided by the mother during incubation).
   iii. **Hatching:** After about 21 days, the chick breaks out of the egg using its egg tooth in a process called hatching.
   iv. **Chick:** After about 21 days, the chick hatches from the egg. It is small, covered in soft feathers, and needs care and warmth.
   v. **Adult Hen:** The chick grows into a fully mature hen or rooster, capable of reproduction, completing the life cycle.



5. The main stages in the life cycle of a butterfly are:
   i. **Egg:** The butterfly lays eggs on leaves or stems of plants.
   ii. **Caterpillar (Larva):** The egg hatches into a caterpillar, which eats leaves and grows rapidly.
   iii. **Chrysalis (Pupa):** The caterpillar forms a cocoon or chrysalis around itself, where it undergoes transformation.
   iv. **Adult Butterfly:** The fully developed butterfly emerges from the chrysalis, ready to fly and reproduce.



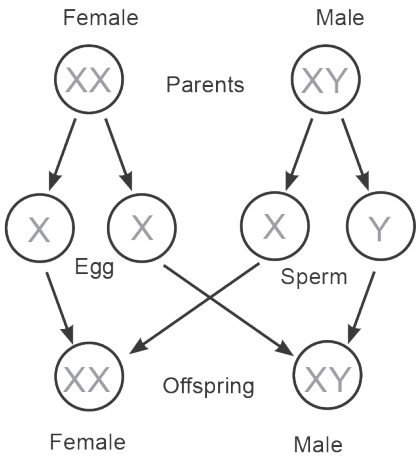
Life Cycle of a butterfly

6. The sex of the unborn baby is identified through the chromosomes. The female has two X chromosomes (XX), while the male has one X and one Y chromosome (XY). Techniques like ultrasound can also be used to identify the sex during pregnancy.

F. 1. Amoeba: Reproduces through binary fission where the nucleus divides, and the cell splits into two identical daughter cells.
Hydra: Reproduces by budding, where a new organism grows on the parent's body and later detaches.

2. Male: Includes testes (produce sperm), epididymis (stores sperm), vas deferens, seminal vesicles, and urethra (delivers semen).
Female: Includes ovaries (produce eggs), fallopian tubes (carry eggs), uterus (houses fetus), cervix, and vagina.

3.



Role of Chromosomes in Sex determination

The sex of a baby developing inside the mother's womb is determined by the **chromosomes**. It is a thread-like structure present in the nucleus. Chromosomes carry information in the form of genes. Every cell contains 23 pairs of chromosomes which include one pair of sex chromosomes. Sex chromosomes are of two types namely X and Y which is named after their shapes. Male cells contain XY pair of sex chromosomes while female cell contains an XX pair of sex chromosomes.

The sperm and ovum form a gamete which contains only one set of chromosomes consisting of one member of each pair. For example, The ovum contains one X chromosome while the sperm may contain either X or Y chromosomes. During fertilisation of the ovum, the sex of the baby will depend on which sperm fertilises it. If the sperm carrying X chromosome fertilises the ovum containing X, then the baby will be a girl as the chromosome pair will be XX. Similarly, if the sperm carries the Y chromosome, then the baby will be a boy as the chromosome pair formed will be XY.

4. Female Infanticide: The killing of newborn girls due to gender preference, leading to skewed sex ratios and social issues.

   Adolescent Pregnancy: Pregnancy in girls aged 10-19, causing health risks, social stigma, and disruption in education.

5. a. Internal Fertilisation: The fusion of male and female gametes occurs inside the female's body. Examples are mammals such as cow, horse, dog, cat, human beings.

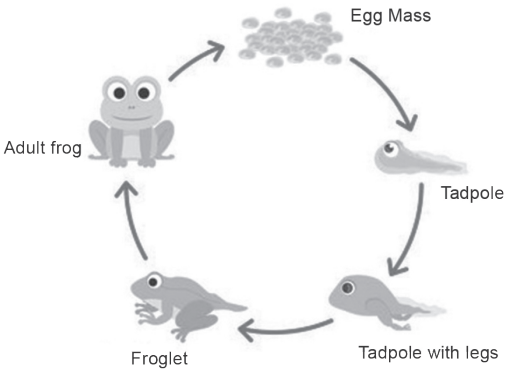
   External Fertilisation: The fusion of male and female gametes occurs outside the body. Examples are fish, frog and starfish.

   b. Sexual Reproduction:
   - Involves the fusion of two gametes (male and female).
   - Offspring inherit genetic material from both parents, leading to genetic diversity. Examples: Humans, animals, and plants.

   Asexual Reproduction:
   - Involves one parent and no fusion of gametes.
   - Offspring are genetically identical to the parent (clones). Examples: Amoeba (binary fission), Hydra (budding).

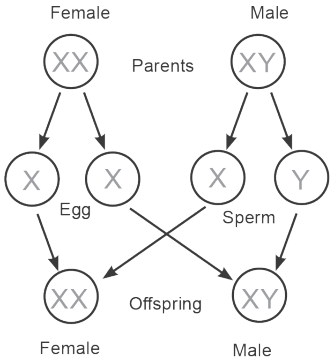
   c. Oviparous animals: Animals that lay eggs, which hatch into offspring.
   Viviparous animals: Animals which give birth to live offspring.

G.



Life Cycle of a frog

H.



I. (i) X and Y (ii) XY (iii) XX (iv) (a) boy

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

K.

Across	**Down**
4. OVUM	1. DNA
5. SPERM	2. AMOEBA
6. OESTROGEN	3. BUDDING
7. PENIS	8. VAGINA
9. MAMMALS	
10. TESTES	

Think & Answer (HOTS)

1. Bad odour in adolescents: The increase in hormones during puberty stimulates sweat glands, especially in areas like the armpits, leading to more sweating. Bacteria break down the sweat, causing a bad odour.
2. Mood swings in adolescents: Hormonal changes during puberty affect the brain's neurotransmitters, causing emotional fluctuations. Additionally, social pressures and identity changes contribute to mood swings.
3. Menstruation in adolescent girls: Hormonal changes, particularly the release of oestrogen and progesterone, regulate the menstrual cycle. The thickening of the uterine lining and shedding if pregnancy doesn't occur causes menstruation.

Life Skills

Do it Yourself

Project

Do it Yourself

Chapter – 8 Force and Pressure

Knowledge Check (Page 106)

1. push 2. pull 3. Force 4. Non-contact force
5. Applied/muscular

Knowledge Check (Page 111)

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

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) Newton 2. (c) friction 3. (c) Force/area 4. (c) Barometer
5. (b) balloon floats

B. 1. Force: It is a push or pull acting on an object
2. Pressure: Force per unit area is called pressure
3. Atmospheric pressure: The pressure exerted on an object by the weight of the air above it
4. A device used to measure atmospheric pressure is called a barometer.
5. A manometer consists of a U-shaped tube containing liquids like water.

C. 1. Electrostatic force 2. Magnetic force
3. Gravitational force 4. Pascal 5. Fluids

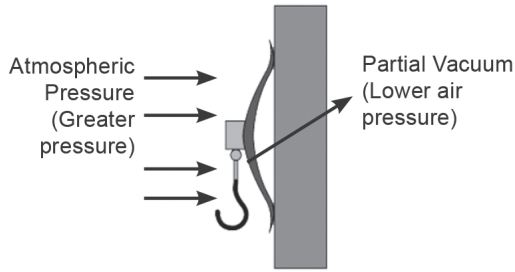
D. 1. Making chapattis by applying force with our hands on the dough can change the shape of the dough.
2. If two or more forces act in the opposite direction, then the magnitude of the force on the object is the difference in the forces.
3. On combing or brushing your hair for 4-5 times and then take the comb near some small bits of paper without touching the papers with a comb. The paper bits get attracted to the comb because of the electrostatic force exerted on the comb. The comb is charged on rubbing it in your hair and attracts the paper which is an uncharged object.
4. Magnetic force
5. $A = 10/1000000 = 0.00001\ m^2$
   $P = 5/0.00001 = 500000\ Pa$
6. Force and surface area
7. Astronauts wear special suits when they go into space. The reason is that, on moving to higher altitudes, the atmospheric pressure decreases and the higher pressure is exerted by the blood which can even cause blood vessels to burst and leads to bleeding (nose bleeding). Therefore astronauts wear those special pressurised suits to maintain the pressure inside.

E. 1. The strength of force acting on an object decides the magnitude of force because it depends upon the number of forces acting on that particular action. The possibilities are:
   - If two or more forces act in the same direction, then the magnitude of the force is the sum of the forces act on that object.
   - If two or more forces act in the opposite direction, then the magnitude of the force on the object is the difference in the forces.
2. Forces that do not need any physical contact with the object on which they are acting upon are called as non-contact forces.
   Forces which act on objects either by direct or indirect physical contact are called contact forces.
3. Aim: To study atmospheric pressure using rubber sucker.
   Procedure:
   - Take a rubber sucker and press it on a smooth surface like kitchen tile or a plain glass window and try to pull it now.

- It is observed that it is difficult to pull the rubber sucker off the smooth surface.

Inference: A partial vacuum and a pressure of air are created on pressing the outer surface of the sucker while pushing it against the smooth surface.

Try It: Similarly, try the same procedure with smooth stainless steel or ceramic plate and move the plate in any direction/angle. The rubber sucker remains stuck to the plate even if the plate is tilted in all directions and find it difficult to remove the rubber sucker off the plate. This shows that air exerts pressure in all directions.



4. The pressure found to increase as we go deep beneath the surface of the liquid. The pressure of water at the sea level is less than the pressure of water under deep sea. This the reason, the deep-sea divers use special suits called diving suits and buoyancy compensators to combat the weight of their diving equipment and the water pressure at great depths.

   In general, dams are made stronger and thicker at the bottom than at the top to withstand the high pressures at greater depths.

5. Some examples of applications of pressure are given below:

   i. Syringes are used to take blood for making blood tests. The pressure of the blood forces the liquid to move into the syringe when the syringe plunger is withdrawn.

   ii. The area at the edge of a knife's blade is very small and hence creates high pressure for a blade to cut through the material.

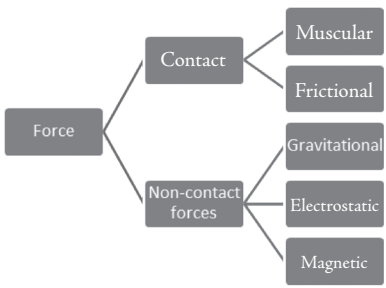
   iii. While using straw, the air is sucked out of and the air pressure inside it decreases and the atmospheric pressure outside forces the liquid to go inside the straw.

   iv. Skis reduce the pressure on the snow since it has a large area which ensures the skis do not sink into the snow.

   v. On the soles of the football shoes, the pressure under the studs is high enough for them to sink into the ground and hence extra grip is produced.

   vi. A vacuum cleaner contains a fan inside which creates a low pressure inside the device and thus air and dirt particles are sucked into the device.

F.



G. a. If a force applied and the movement of the object is in the same direction then it is referred to as pull. Examples are, opening the drawers and crane pulling up an object.
   b. A force which makes an object to move away from the direction of force applied is called a push. Examples are, pushing a door open, a man hitting a golf ball and a woman pushing the shopping cart.
   c. Making chapattis by applying force with our hands on the dough can change the shape of the dough.
   d. Muscular force

H. (i) Push, pull (ii) faster (iii) stationary (iv) stationary, direction

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

J.

Across	**Down**
5. ALTITUDE	1. PRESSURE
6. BAROMETER	2. SYRINGES
7. DAMS	3. FLUIDS
9. MANOMETER	4. INCREASE
	5. ASTRONAUTS
	8. PASCAL

Think & Answer (HOTS)

1. The force acting during activities like running, walking, and sitting is gravity, which pulls your body towards the Earth.
2. Tankers have a large base area to reduce pressure on the ground, preventing them from sinking by distributing the weight over a larger area.
3. Flat-footed persons can walk in sand more easily because their larger foot surface area reduces pressure, preventing them from sinking.
4. Juice cannot be sucked with a straw on the moon because there is no air pressure, and without it, the liquid cannot be pushed up the straw.
5. A sharp knife is easier to use because it has a smaller contact area, increasing pressure and making it easier to cut through the object.
6. Water rushes out more forcefully from the bottom hole because the pressure at the bottom is higher due to the weight of the water above.
7. Fountains work by pumping water under pressure through a nozzle, causing it to shoot up and fall back due to gravity.

Life Skills

Do it Yourself

Project

Do it Yourself

Chapter – 9 Friction

Knowledge Check (Page 121)

1. friction 2. rough 3. smooth 4. adhesive 5. drag

Knowledge Check (Page 122)

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

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (c) in physical contact
2. (d) All of these
3. (a) lubricants
4. (b) reduce friction
5. (c) rolling friction

B.

Column I	Column II
(a) Grease	(iv) fluid friction
(b) Tyres of vehicles	(v) increase friction
(c) Bird	(ii) reduce friction
(d) Shoes with groove	(iii) wear out due to friction
(e) Mass of the objects	(i) decides frictional force

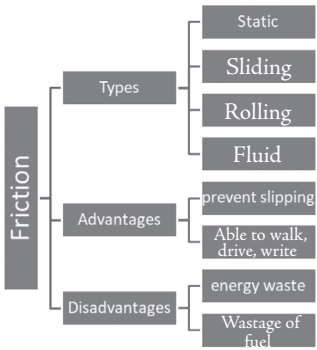
C. 1. Frictional terms: Friction, Static, sliding, rolling, fluid
2. Ball bearing: A device used to reduce friction
3. Fluid friction: The force of friction due to air and water or other fluids
4. Static friction: The friction which acts on objects when they rest on a surface
5. Friction: The resistance to motion felt when two surfaces are in contact move with respect to each other

D. 1. Frictional force depends on two main factors:
   i. The nature of the surface in contact
   ii. The mass of the object
2. Friction is caused by:
   i. Roughness of Surfaces
   ii. Intermolecular Forces
   iii. Normal Force
   iv. Material Type
3. Soles of the shoes have grooves or spikes to increase friction and prevent slipping.
4. Kabaddi players rub their hands with dry soil to increase friction.
5. Soles of the shoes have spikes to increase friction and prevent slipping.

E. 1. The friction that acts on objects when they slide over a surface is called as sliding friction. When an object rolls over the surface of another object, the resistance to its motion is called rolling friction.
2. The force of friction due to air and water (and other fluids) is called fluid friction. In general gases and liquids are called as fluids. Fluids also produce friction similar to solids. The friction offered by fluid depends on the speed of the object and the speed of the fluid.
3. **Advantages of Friction**
   i. Due to friction, we can able to walk, drive, open doors, write, turns taps and doing daily activities.
   ii. Screws and nails do not slip off because of the friction between the wood and the metal surface of the screw.
   iii. Friction enables us to pick and hold things with hands.
   iv. Knot remains in place because of friction of rope with which the object you tie it.
   v. Bed sheets remain on the bed because of friction.
   vi. You can sit on a chair without sliding because of friction.
   vii. Friction enables a car to move on the road without skidding.
   viii. A matchstick is lighted using friction.

4. **Disadvantages of Friction**
   i. Automobile and machinery parts heat up due to friction produced during their movement. It results in wastage of fuel and energy.
   ii. Friction causes wear and tear of the moving parts.
   iii. Friction wears away the soles of the shoes and becomes unfit to wear.
   iv. Brake pads of vehicles gradually wear out due to friction.
   v. Tyres of the vehicles wear out due to friction.
   vi. The efficiency of the machines is reduced due to friction.
   vii. Friction slows down the motion.

F.



G. Do it Yourself

H. (i) When two surfaces in contact move with respect to each other, the resistance to motion is experienced and it is called friction.
(ii) The ball eventually comes to a halt because friction between the ball and the surface slows it down and stops its motion.
(iii) Oily hands reduce the friction between the hands and the glass, making it difficult to grip the glass firmly and hold it.
(iv) Frictional force is the force exerted by one surface on another that opposes the relative motion between them when they slide or roll against each other.

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

J. 1. FRICTION
2. SLIDING
3. ROLLING
4. FLUID
5. STATIC

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

Think & Answer (HOTS)

1. As the speed of an object moving through a fluid increases, the friction (drag) also increases because the object interacts more with the fluid particles.

Example: A fast swimmer experiences greater drag than a slower swimmer.

2. Fine powder is sprinkled on a carromboard to reduce friction, allowing the carrom coins to slide smoothly and easily on the board.

Life Skills

When you wear a new slipper that is not the correct size, it may cause discomfort and lead to friction between your feet and the slipper. The increased friction can result in blisters, which are painful and caused by the skin rubbing against the footwear.

It is not necessary to wear footwear that is an incorrect size. Wearing properly fitting footwear reduces friction, prevents blisters, and ensures comfort. Properly sized shoes help maintain healthy feet and prevent unnecessary injuries.

Do it Yourself

Project

Do it Yourself

Chapter – 10 Sound

Knowledge Check (Page 132)

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

Knowledge Check (Page 134)

1. 330 m/s 2. ultrasonic waves 3. Music
4. string instruments 5. percussion

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) vibration 2. (a) pinna 3. (b) different
4. (a) infrasonic waves 5. (d) all of these

B. a. The amplitude of the oscillation is defined as the maximum displacement of the bob from the mean position during an oscillation.

b. The time taken to complete one oscillation is called the time period of the oscillation and it is measured in seconds.

c. An oscillation refers to a single complete cycle of motion, such as the movement of a vibrating string or sound wave. It includes a forward and backward motion, or one crest and one trough of a wave.

d. The number of oscillations per second is called the frequency of oscillation.

C. 1. Music: Music is a sound that is pleasant to hear to the ears and can be achieved using various musical instruments.

Noise: Unpleasant, discomfort-causing sound from any source.

2. Stringed Instruments: The sound is produced in these instruments by vibrating the string. The pitch or shrillness of the sound can be altered by changing the length of the vibrating portion of the string.

Percussion Instruments: In these instruments, the sound is produced by a vibrating skin or membrane.

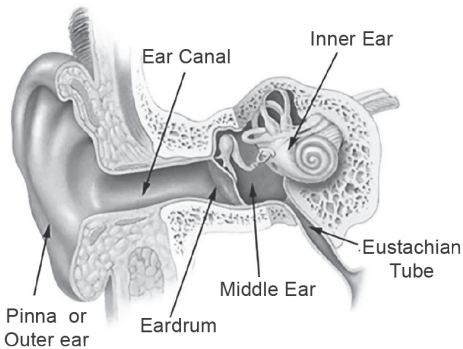
3. Sound frequencies ranging between 20 Hz to 20,000 Hz are audible sound.
   If the sound frequency is below 20 Hz and above 20,000 Hz are inaudible sounds

D.

Column I	Column II
(a) Air	(v) Wind instruments
(b) Iron	(iv) 5000 speed
(c) Audible sound	(ii) 20 Hz to 20,000 Hz
(d) Violin	(iii) 20,000Hz
(e) Sound of Loudspeaker	(i) Noise

E. 1. Sound is produced due to vibration.
2. When a speaker vibrates, it pushes and pulls air particles, creating sound waves that travel through the air.
3. Sound waves need a medium (like air, water, or solid objects) to propagate, and since there are no particles in a vacuum, sound cannot travel through it.
4. Compressions are regions of high pressure where particles are close together, and rarefactions are regions of low pressure where particles are spread apart in a sound wave.
5. The scientific term is frequency, measured in Hertz (Hz).
6. The time period is the time taken for one complete cycle of oscillation (vibration).
7. Pitch refers to the perceived frequency of a sound, determining whether it is high or low.

F. 1. In human beings, the organ which is involved in producing sound is larynx which is also called the voice box.
2. The human ear can be broadly classified into three parts namely the outer ear, the middle ear and the inner ear.
   - Outer ear: The visible part of our ear is called as pinna. The main role of the pinna is to collect sound waves and direct them to ear tube. The ear tube ends up with eardrum which is also called a tympanum. The eardrum vibrates when the sound waves strike it and transmit the sound to the middle ear.
   - Middle ear: It is a cavity containing three important ear bones. These bones are placed in such a way that they move when the eardrum vibrates and thus transmits the vibrations to the inner ear.
   - Inner ear: A small opening connects the middle ear and the inner ear. The inner ear is filled with fluid which vibrates and excites tiny hair present in them. These tiny hairs transform the vibrations into electrical impulses which are then transferred to the brain through the auditory nerve. After this process, we can hear the sound.



Internal Structure of Human Ear

3. Music is a sound that is pleasant to hear to the ears and can be achieved using various musical instruments. The musical instruments can be classified as
   - Stringed Instruments: The sound is produced in these instruments by vibrating the string. The pitch or shrillness of the sound can be altered by changing the length of the vibrating portion of the string. Examples of stringed instruments are violin, guitar and sitar.
   - Wind Instruments: In wind instruments, the sound is produced by the vibrating air column present inside the instrument. The examples are trumpet, flute and harmonics.
   - Percussion Instruments: In these instruments, the sound is produced by a vibrating skin or membrane. The examples are tabla, drums and dholak.
4. The speed at which sound wave travels depends on the medium through which it is travelling. The important factors which affect the speed of sound are temperature, nature and physical state of the substance. Let us discuss it with an example. The speed of sound in air is 330 m/s at 0°C whereas 346 m/s at room temperature. Table shows the speed of sound in various substances.

   Table Speed of sound in different substances (approx.)

Substance	Speed m/s
Air	346
Water	1498
Mercury	1452
Glass	5000
Aluminium	5000
Iron	5000
Diamond	12,000

   Above table clearly shows that sound waves travel faster in solids and slower in gases.
5. **Noise**

   Noise is defined as an unpleasant, discomfort - causing sound from any sources. A continuous presence of harmful, unwanted or annoying noise in the environment is called noise pollution.

   Sources of Noise Pollution

   Objects which produce a noise from any source cause a noise pollution. Examples are loudspeakers, automobiles, air coolers, air conditioners, television and radio when played in a louder volume.

   Effects of Noise Pollution

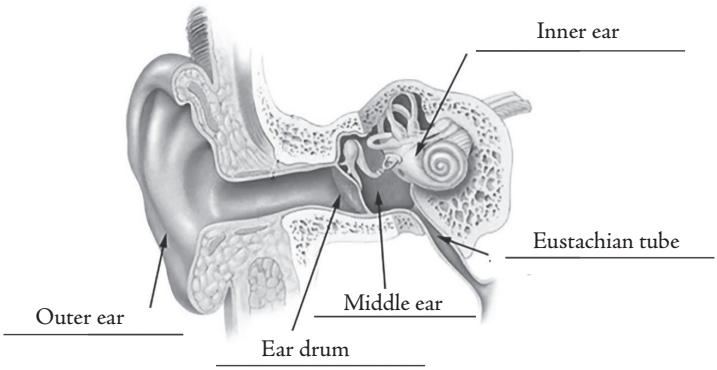
   The effects of noise pollution should not be underestimated since it causes a lot of stress and discomfort. There are many harmful effects due to noise pollution. Some of them are listed below:
   - Creates a lot of irritation and loss of concentration.
   - Sleep is disturbed and undergoes stress which leads to high blood pressure.
   - Continuous exposure to noise over a time period or sudden exposure may cause ear damage and loss of hearing.

Measures to Reduce Noise Pollution

Noise pollution can be minimised only when all of us maintain a certain degree of discipline. Some of the measures to control noise pollution are:

- Avoiding loudspeaker usage.
- The volume of the television and radio should not be played too loud and people also should not talk too loudly.
- Avoid playing loud music and using unnecessary horn while driving.
- Vehicles should be fitted with effective silencers.
- Sound absorbing materials like curtains or rugs should be used at homes.
- Planting trees along the roadsides help in reducing noise.

G.



H. (i) No (ii) Aquatic animals communicate in water by producing sound waves, which travel through the water as a medium.

(iii) No (iv) Physical medium

I.

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

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

Think & Answer (HOTS)

1. Sound cannot be heard on the moon because there is no atmosphere or air to carry sound waves, as sound requires a medium (like air) to propagate.
2. A thundering sound is heard after lightning because light travels faster than sound. The flash of lightning reaches us almost instantly, but the sound of thunder takes longer to travel due to the slower speed of sound.
3. The advantage of an air chamber in a musical instrument is that it amplifies the sound, making it louder and more resonant by allowing the air inside to vibrate and produce sound waves.
4. A wide range of frequencies is not possible in percussion instruments because they produce sound by striking or vibrating a solid surface, which typically results in a limited range of frequencies, unlike string or wind instruments that can vary pitch more easily.

Life Skills

Yes, that is true. Frequently honking a vehicle is not recommended because it can contribute to noise pollution, which is harmful to both people and the environment. It can cause stress, disturb peace, and even affect people's health. Honking should be done only when necessary for safety reasons, not out of frustration or habit.

Do it Yourself

Project

Do it Yourself

Chapter – 11 Chemical Effects of Electric Current

Knowledge Check (Page 143)

1. poor 2. poor 3. anions 4. can 5. anodes

Knowledge Check (Page 145)

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

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) (d) wooden piece 2. (a) good conductors 3. (c) Ions
4. (b) repel 5. (a) Nickel

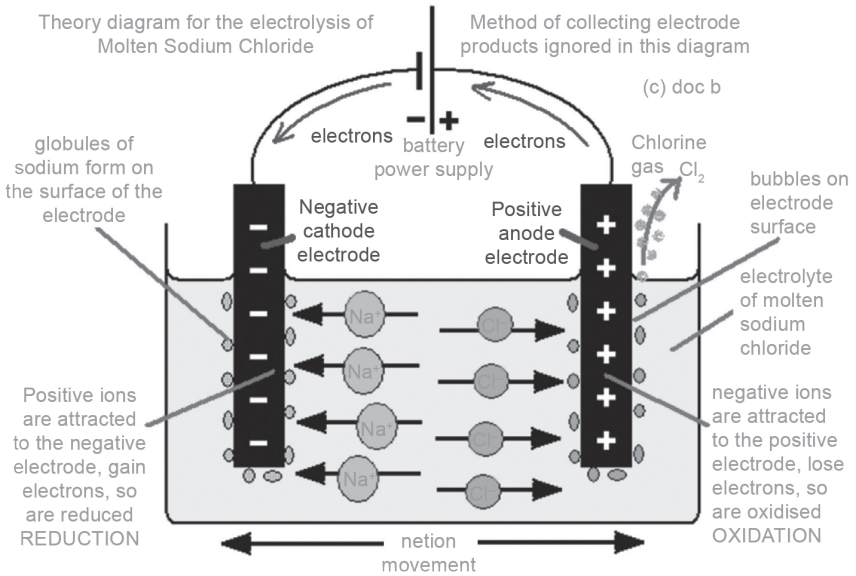
B. 1. Good Conductors: Vinegar, Lemon juice, Common salt, Copper, Aluminium, Stainless steel
Bad Conductors: Rubber, Wood, Plastic

C. 1. Water conducts electricity, increasing the risk of electric shock.
2. Pure water lacks ions, while tap water contains dissolved salts and minerals that conduct electricity.
3. Sodium chloride dissociates into ions (Na^+ and Cl^-) in water, which carry the current.

D. 1. Good conductors: Allow electricity to pass (e.g., Copper, Aluminium).
Bad conductors: Do not allow electricity to pass (e.g., Rubber, Wood).
2. Ions are charged particles formed when atoms lose or gain electrons.
Cations: Positive ions (e.g., Na^+).
Anions: Negative ions (e.g., Cl^-).

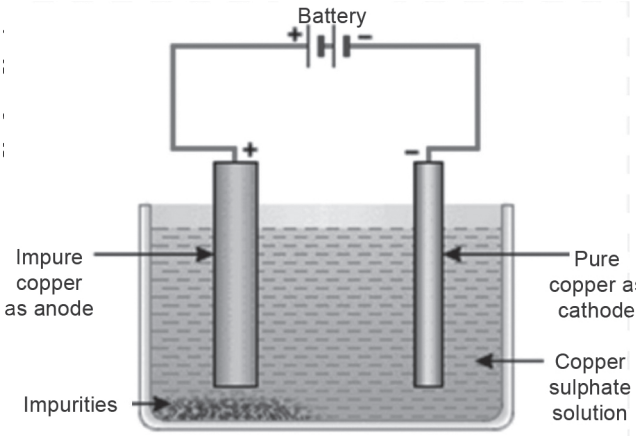
3. Nickel, Chromium, Zinc
4. Electroplating provides corrosion resistance, improves conductivity, and enhances the appearance and durability of electronic components.

E. 1. The reaction may vary based on the electrolyte and electrodes chosen as metals. During electrolysis of a solution of sodium chloride (NaCl), we will observe hydrogen gas (H_2), chlorine gas (Cl_2) and sodium hydroxide (NaOH).



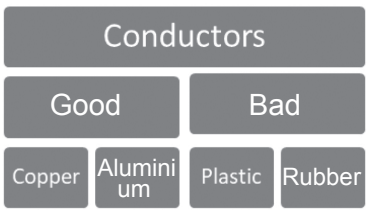
Electrolysis of Sodium Chloride (NaCl)

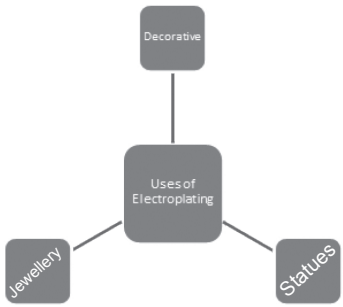
2. The process of electrolysis is used in the industry for the production of many metals and non-metals like magnesium, chlorine, aluminium and fluorine.
   - The main use of electrolysis is the coating of one metal over the other. This technique of coating one metal with another using an electric current is called electroplating.
3. Applications for electroplating are given below:
   - Some metals corrode easily. This can be avoided by protecting it with another metal that does not corrode easily. In general, Nickel and Chromium are widely used in the automobile industry for the coating to avoid corrosion.
   - For decoration purpose, electroplating is used. For instance, cutlery, statues and jewellery made of cheaper metals get coated with expensive metals like gold and silver to maintain their look.
   - Electroplating is also used in the manufacture of printed circuit boards which is used in electronic appliances like television and computers.
4. Electrolysis is used in refining impure metals. This method is also called electrorefining. This technique is used to purify metals like gold, silver and copper. The purification of copper is shown in the figure given here.



Experimental set up for the electrolytic refining of copper

F.





G. 1. Electrolyte: Liquid that conducts electricity due to the presence of ions.
2. Electrolysis: The process in which electric current is passed through the electrolyte in an electrolytic cell is called as electrolysis.
3. Cathode: The electrode connected to the negative terminal of the battery is called a cathode.
4. Anode: The electrode connected to the positive terminal of the battery is called an anode.
5. Electrode: The rods through which current enters or leaves the liquids are called electrodes.
6. Electrorefining: Electrorefining is a technique used in the refining of impure metals.

H. (i) Electrical conductivity is a measure of the ability of a substance to allow the flow of electric current.
(ii) Yes. Copper and steel are good conductors of electricity because these materials possess high electrical conductivity.
(iii) Plastic, wood and rubber
(iv) Water is not used to put out electrical fires because water is a good conductor of electricity.

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

J.

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

Think & Answer (HOTS)

1. Electroplating involves the use of toxic chemicals and heavy metals, such as cyanide, which can pollute water and soil. Additionally, the waste generated during electroplating can be harmful to the environment if not disposed of properly.
2. Carbon electrodes are used in electrolytic cells because they do not react with the electrolytes or the products of electrolysis. They are also good conductors of electricity.

Life Skills

Yes, Hema's advice makes sense. The reason is that wet hands conduct electricity. If Seema switches off the light with wet hands, she could the risk of an electric shock.

Do it Yourself

Project

Do it Yourself

Chapter – 12 Some Natural Phenomena

Knowledge Check (Page 154)

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

Knowledge Check (Page 157)

1. Lightning conductor 2. fault line 3. Seismograph
4. Richter 5. lithosphere

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (b) negative charge 2. (b) conduction 3. (b) repel
4. (b) conductive 5. (c) mantle

B. 1. Richter scale is the most commonly used scale to measure the magnitude of the earthquake.
2. The point vertically above the focus on the surface of the Earth is called epicentre.

3. The instrument used to measure seismic waves is called a seismograph.
4. There are vibrations produced during the earthquake which travel in the form of waves within the earth or along the surface of the earth. These waves are called seismic waves.
5. The theory which explains that the surface of the Earth is made up of plates that move with respect to each other is called plate tectonics.
6. The sudden movement in the plates results which causes an earthquake. The point at which the edges give way is called focus.
7. A seismologist is a scientist who studies earthquakes and seismic waves.

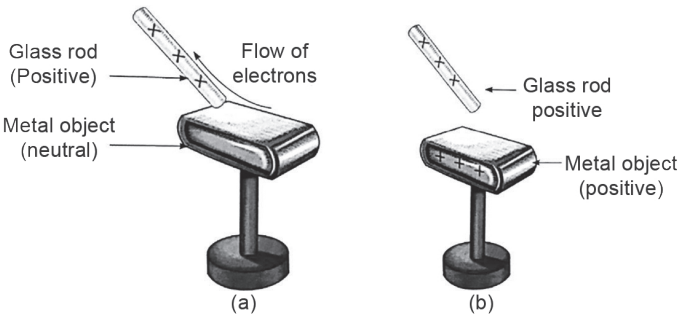
C.

Column A	**Column B**
1. Protons	b. Positive charge
2. Unlike charges	e. Repel each other
3. Electroscope	d. Detects charges
4. Charging by friction	c. Rubbing
5. Earthing	a. Discharge to the Earth

D.
1. Protons: The positively charged particles in an atom are called protons.
   Electrons: Negatively charged particles are called electrons.
2. Lightning: A flash of electricity in the atmosphere.
   Thunderstorm: A storm with lightning, thunder, and often heavy rain.
3. Discharge: Release of electrical charge.
   Earthing: Connecting an object to the ground to safely release charge.
4. Electroplating provides corrosion resistance, improves conductivity, and enhances the appearance and durability of electronic components.

E.
1. Protons (positively charged) and electrons (negatively charged).
2. Install a lightning rod.
3. Areas in the Himalayan region, North-East India, and parts of Gujarat and Kutch
4. The instrument used to measure seismic waves is called a seismograph.
5. Stay indoors, avoid using electrical appliances, and stay away from windows.

F.
1. Another method of obtaining charge is by conduction. This can be done by touching a charged body. For example, take a charged glass rod and touch a metal object with it. On doing so, the metal object will also be charged. The nature of the charge acquired will be the same as that of the charging body. If the glass rod possesses a positive charge, then the metal rod while touching it also acquires a positive charge.



Charging a metal object by conduction

2. An electroscope is a device which is used to detect and measure the transfer of electric charge. The device contains two thin metal strips called leaves, connected to a metal knob by a metal rod as shown in the figure.

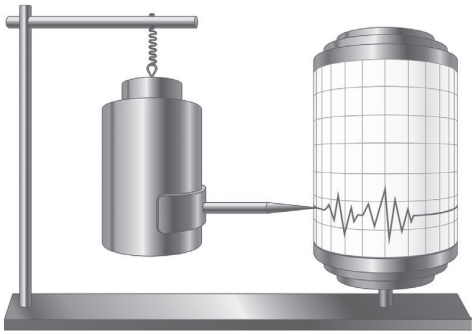
   Working:

   - A charged object is made to touch the knob of the electroscope.
   - The charge is transferred to the thin metal strips through the metal rod.
   - The metal strips repel each other since they have similar charges. Hence, the electroscope can be used to check if a body carries a charge.

3. The purpose of using lightning conductors is to protect buildings from the damaging effects of lightning. Lightning mostly strikes the projecting objects like poles, wires, trees or larger buildings, flatter surfaces projecting to the same height. Individual buildings are also the primary targets of lightning. The idea behind lightning protection is to provide a direct and easy path for a lightning bolt to enter the ground without damaging the building or any other objects.
4. The instrument used to measure seismic waves is called a seismograph. The output of seismograph is called as a seismogram. It shows a series of waves. The scientists who study about the behaviour of earthquakes are called as seismologists.

   Working of Seismograph:

   - It consists of an oscillator which may be a vibrating rod or a pendulum, writing device, roll of paper.
   - The writing device is attached to the oscillator. So that when the earthquake occurs, the oscillator begins to vibrate which creates vibrations in the writing device. The pen starts plotting wave-like patterns in the paper.
   - This wave pattern is analysed by the scientists and construct a complete map of the earthquake.

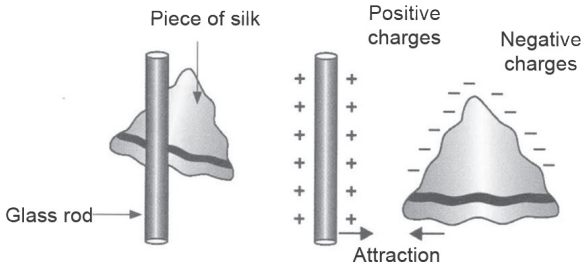


Working of Seismograph

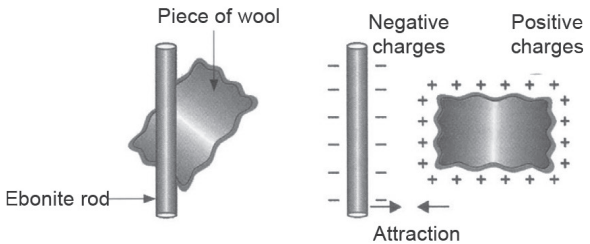
5. Preventive measures to avoid the damage caused by earthquakes are listed below:
   - Can work towards earthquake resistant buildings since the major loss is due to them.
   - Avoid buildings in the landfills and reclaimed areas because of the type of soil, the land will be weak and are more dangerous and cannot support buildings.
   - Lightweight materials should be used for construction in earthquake-prone areas to avoid the loss of life.
   - Ceiling fans, air conditioners, and air coolers should be fixed firmly since these objects can cause harm in case they fall down during an earthquake.

- Cupboards and shelves should be fixed to the walls so that they do not fall on someone during an earthquake easily.
- If you are indoors, take a cover under heavy table or cot. Keep yourself away from heavy objects.
- We should stay away from tall and heavy objects that may fall on you due to tremors.
- In an open area, we should try to move away from buildings and trees, electric poles and overhead power lines.
- If you are in a vehicle, stay inside and the vehicles should move away from bridges, tunnels, overpasses.
- Should avoid parking vehicles under trees, light posts and sign boards.

G. a. Some charges are obtained while rubbing one material with another. For example, when a glass is rubbed with a small piece of silk and ebonite (a hard rubber) with wool charges are obtained.

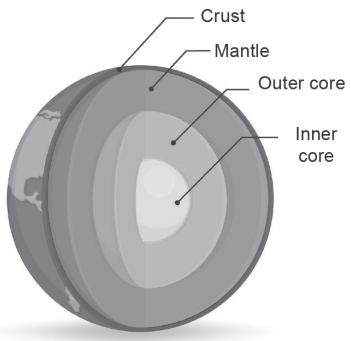


Glass rod rubbed with a piece of silk



Ebonite rod rubbed with a piece of wool

b.



H. (i) atoms (ii) Electrons (iii) positively (iv) equal

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

J.

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

Think & Answer (HOTS)

1. Earthing electrical wires: To prevent electrical shocks and safely dissipate excess electricity into the ground in case of a fault.
2. Avoid standing under a tree or open terrace during lightning: Lightning strikes tall objects; standing under a tree or on a terrace increases the risk of being struck.
3. Avoid standing on bridges or tunnels during an earthquake: Bridges and tunnels may collapse or be severely damaged during an earthquake, posing a risk of injury.

Life Skills

Yes, water is a good conductor of electricity. If lightning strikes, the electrical charge can travel through water and potentially cause an electric shock. So, it's safer not to bathe during a lightning storm.

Project

Do it Yourself

Chapter – 13 Light

Knowledge Check (Page 167)

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

Knowledge Check (Page 172)

1. dispersion 2. Optic 3. cornea 4. real 5. antioxidants

Competency-Based Exercise (As Per NEP Guidelines)

A. 1. (a) Sun 2. (d) retina 3. (c) multiple reflections
4. (b) Ciliary muscles 5. (b) carrots

B. 1. Reflection: The phenomenon in which a ray of light hits a mirror or any polished surface and bounces off the surface is called as the reflection of light.
2. Refraction: The bending of light as it passes from one medium to another, due to a change in its speed.

3. Angle of incidence: The angle between the incident ray and the normal.
4. Angle of reflection: The angle between the reflected ray and the normal.
5. Incident ray: The rays of light which come from an object and hit the mirror.
6. Reflection: When the light rays hit a polished surface or a mirror, it bounces off the surface. This phenomenon is called as a reflection of light.
7. Points of incidence: The point at which the incident ray hits the mirror.
8. Blind spot: There is a portion on the retina where the nerve fibres enter the optic nerve. This particular portion does not have cones or rods. Thus the image which falls on this portion of the retina is not visible and hence this spot is called as the blind spot.
9. Reflected ray: The rays of light which get reflected from the mirror.

C.

(a) kaleidoscope	(ii) multiple reflections
(b) Second law of reflection	(i) $i = \angle i = \angle r$
(c) Rainbow	(iv) seven colours (VIBGYOR)
(d) Cataract	(iii) Eye disorder
(e) Carrots, broccoli and butter	(v) Rich in Vitamin A

D. i. Regular reflection, Reflection from a polished surface is called regular reflection.
ii. Diffused reflection, reflection from a rough surface is called as diffused reflection.

E. 1. When the light rays hit a polished surface or a mirror, it bounces off the surface. This phenomenon is called as a reflection of light.
2. A stainless steel plate gives diffused reflections because its surface is rough on a microscopic level, causing light to scatter in many directions instead of reflecting in a single direction.
3. The real life examples of multiple reflections are elevators/ lifts have mirrored walls.
4. The primary use of periscope is in submarines which remain under water.
5. Rainbow is formed when the water droplets in the sky split up the sun's rays and form a spectrum.
6. The image produced in the human eye will be retained for a short period of time after the object (producing the image) is removed. This phenomenon is called as the persistence of vision.
7. There are many vitamins and minerals available which help to neutralize these free radicals and those foods are called antioxidants. Antioxidants called 'carotenoids' which is present in coloured fruits and vegetables are very useful in maintaining healthy eyes.

F. 1. Let us study the observations obtained from the activity in a scientific manner using a diagram.

As shown in figure, draw a perpendicular line which makes 90° angle to the mirror at the point where the slit is located. This line SN is called as the normal.

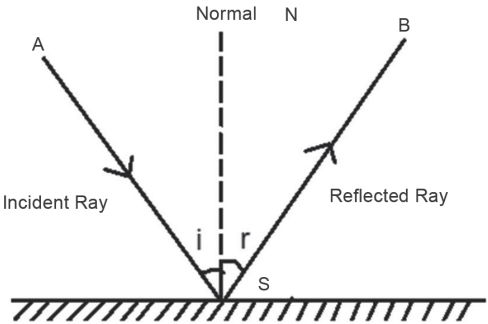
The ray of light which comes from the object and hits the mirror is called as an incident ray. In Figure, AS is an incident ray.

The ray that bounces off or reflects from the mirror is called as reflected ray. The reflected ray in figure is BS.

The point at which the incident ray hits the mirror is called the point of incidence. S is the point of incidence.

A normal drawn to the mirror at the point of incidence is called a normal at the point of incidence. The angle between the incident ray and the normal is called the angle of incidence. The angle $\angle ASN$ that is, $\angle i$ is the angle of incidence of the incident ray, AS.

The angle between the reflected ray and the normal is called the angle of reflection. The angle ∠BSN that is ∠r of reflection of the reflected ray, BS.



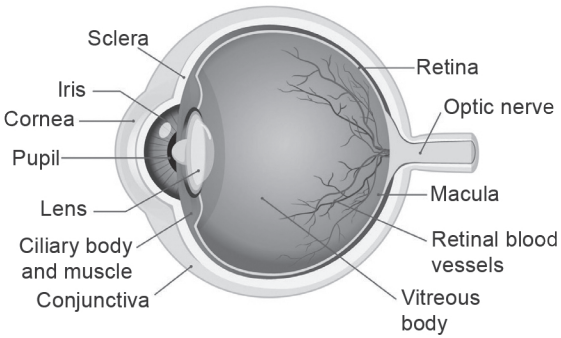
Reflection from a plane mirror

2. The two laws of reflection remain same whatever shape of the mirror may be used. But the characteristics of the image formed like the size of the image, whether it is upright or inverted when compared to the object may vary depending upon the type of mirror. Let us study the characteristics of an image formed by the plane mirror. The characteristics are given below.
   - Size: On looking at dressing mirror while moving back and forth and looking at images of various objects around you, it is observed that size of the image and the object remains same.
   - Upright or Inverted: While looking at the mirror, you see yourself standing upright or inverted with your feet pointed to the ceiling. In other words, a plane mirror forms an upright image which is also called as an erect image.
   - The distance of the image from the mirror when compared to that of object: When you stand in front of the mirror and move either closer or away from the mirror, your image also seems to move closer or away respectively. The reason is that in a plane mirror, the distance of the image from the mirror is equaled the distance of the object from the mirror.
   - Lateral Inversion (left-right reversal): On writing a name on a sheet of paper and holding it in front of a mirror, you can see the name is reversed. But some letters look peculiar. This is because the reflected image undergoes left-right inversion which is also called as lateral inversion.
3. Kaleidoscope is a device which works on the principle of multiple reflections. It contains three plane mirrors which are inclined at an angle of 60° to each other. Having cylindrical cardboard as a base with a few pieces of coloured glass at one end, the mirrors form multiple images of these glass pieces.

   This results in a beautiful pattern when it is seen from the other end. The pattern changes continuously by rotating the cylindrical box due to the shifts in the position of glass pieces.
4. We are able to see the world around us and distinguish colours, see things which are far away. All of these are possible because of our eyes. Let us discuss in detail about the structure of the eye.

The size of the human eye is very small and will be about 2.5 cm in length. Eyelids act as the shutters of the eye and protect them from injury. The eye has many internal parts which are given below.

- Pupil: The inner aperture that we can see in the centre of the eye is called as a pupil. It is like a hole by which the light enters the eye.
- Iris: Its main function is to control the size of the pupil and is the coloured part of the eye. The iris helps in regulating the amount of light that enters the pupil by increasing and decreasing the size of the pupil.
- Sclera: It is filled with a clear watery fluid and it is the white part of the eye that we can see.
- Cornea: It is a thin transparent tissue which covers the front of the eye.
- Retina: The lining which lies just behind the eyeball is called retina. The retina is sensitive to light and has receptors called as rods and cones. These receptors respond to a light which enters and generate the impulse which can be read by the brain. The brain finally sends back messages that tell us what we have seen.
- Ciliary muscles: These are responsible for controlling the focal length of the eye lens.
- Lens: The transparent tissue between the pupil and retina is the lens. It helps in focussing the light which passes through the pupil into the eye. The lens helps us in focussing an image on the retina by bending the light rays.
- Optic nerve: The function of these nerves is to connect the eye to the brain and carry impulses to and from the brain.



Structure of a Human Eye

5. The common defects which are found eyes are sightedness or myopia and long-sightedness or hypermetropia or hyperopic.
   - Myopia (Short-sightedness): The person who has myopia as a defect in the eyes cannot see the distant objects clearly while the nearby objects can be clearly seen. In order to correct this defect, a diverging or concave lens is used to create an extra divergence so that the images get formed on the retina.
   - Hypermetropia (Long-sightedness): The person who has hypermetropia as a defect in the eyes cannot see the nearby objects clearly while they can see the distant objects clearly. The reason for this defect is that the focal length of the eye lens is too long or the eye ball is too short. Thus, nearby objects are brought to focus at a point behind

the retina. In order to correct this defect, convex or converging lens is used since the rays require an extra convergence to meet at a lesser distance.

- Cataract: It is the common defect found at the people who are generally old. The reason for cataract defect is that the eye lens becomes cloudy leading to the loss of vision. This defect can be treated with surgery by removing the eye lens and insert a new artificial lens in its place.

6. There are some people who find disability of vision. The disability may be partial or complete. These persons were called as visually challenged persons. These people generally have the extraordinary development of other senses like hearing and sense of touch. Louis Braille was born in 1809 in France. He was blind during his childhood due to an accident. He developed a system for visually challenged persons and published it in 1821. Braille scripts were written in the form of raised dots. It is composed of 63 dot patterns or characters. Each character is written in a grid containing six cells. It can be written using Braille slate and stylus. The reader will read the script by touching it.
7. Eyes are very sensitive and are considered as an important organ in our body. We cannot able to see the world around us without eyes. So take proper care for an eye is considered very important. Below are some of the tips to care eyes.
   - Should not read under too bright or too dim light.
   - Avoid looking at the sun and bright objects directly.
   - Minimal distance should be maintained between eyes and book while reading. It should not be too close or too far.
   - Wash gently with cold water when something enters into eyes. Do not rub the eyes as it may further irritate the eyes.
   - Consult an ophthalmologist or eye specialists immediately when there are any problems related to eyes like itching and burning sensation. as it will worsen the situation if neglected.
8. a. Luminous objects which emit light on their own. Examples are sources of light like the sun, stars, and a light bulb.

   Non-luminous objects which do not emit light on their own and are seen in the presence of a source of light. Examples are a table, chair, tree, etc. These objects are not visible in the absence of light sources.

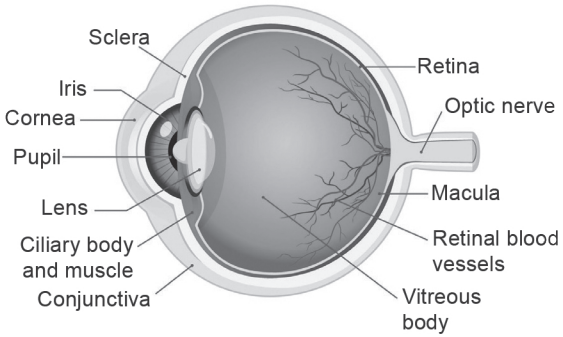
   b. Reflection: The phenomenon in which a ray of light hits a mirror or any polished surface and bounces off the surface is called as the reflection of light.

   Refraction: The bending of light as it passes from one medium to another, due to a change in its speed.

   c. Myopia (Short-sightedness): The person who has myopia as a defect in the eyes cannot see the distant objects clearly while the nearby objects can be clearly seen. In order to correct this defect, a diverging or concave lens is used to create an extra divergence so that the images get formed on the retina.

   Hypermetropia (Long-sightedness): The person who has hypermetropia as a defect in the eyes cannot see the nearby objects clearly while they can see the distant objects clearly. The reason for this defect is that the focal length of the eye lens is too long or the eye ball is too short. Thus, nearby objects are brought to focus at a point behind the retina. In order to correct this defect, convex or converging lens is used since the rays require an extra convergence to meet at a lesser distance.

G.



H. (i) (c) both
(ii) (b) non-luminous objects
(iii) (a) sun
(iv) (a) the light it emits

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

J.

Across	**Down**
3. RETINA	1. CATARACT
4. BRAILLE	2. PUPIL
6. SCLERA	5. ANTIOXIDANT
7. HYPERMETROPIA	8. MYOPIA
9. IRIS	
10. LENS	

Think & Answer (HOTS)

1. Carrots, broccoli, butter, and egg yolk are rich in Vitamin A, which helps produce rhodopsin in the retina, improving vision in low light and reducing night blindness.
2. A rainbow forms after rainfall due to sunlight refracting, reflecting, and dispersing through water droplets, splitting into its colors.

Life Skills

Yes, Abi is correct. We should not look at sunlight directly because it can damage the eyes. The intense brightness and ultraviolet (UV) rays from the Sun can harm the retina and lead to permanent eye damage, a condition called solar retinopathy. It's important to protect the eyes from direct sunlight, especially during midday when the Sun is strongest.

Project

Do it Yourself

Assessment Paper – 1

A. 1. (b) Oxygen 2. (a) oil fire 3. (d) cell membrane
4. (c) Plough 5. (a) X and Y

B. 1. adolescence 2. yolk 3. Petroleum 4. viral 5. nutrients

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

D. **Column A** **Column B**

1.	Anopheles and Aedes	d.	Malaria and dengue
2.	Khurpi (Trowel)	c.	Weeding
3.	Non-combustible	a.	Sand
4.	Sound box	e.	Adam's apple
5.	Mammary glands	b.	Milk producing gland

E. 1. Agriculture is the practice of farming, including growing crops and raising animals.
2. Thermoplastics and thermosetting plastics
3. Diamond and graphite
4. Combustion is a reaction with oxygen that produces heat and light.
5. No, newborns are fed breast milk or formula milk.

F. 1. Cell division is the process by which a single cell divides to form two or more cells. There are two main types of cell division: mitosis and meiosis.
   - Mitosis is the division of a somatic cell (non-reproductive cell) to produce two identical daughter cells. It involves stages like prophase, metaphase, anaphase, and telophase, followed by cytokinesis (division of the cytoplasm). Mitosis is crucial for growth, repair, and asexual reproduction.
   - Meiosis, on the other hand, occurs in reproductive cells (like sperm and eggs). It reduces the chromosome number by half, resulting in four genetically diverse cells. This process is important for genetic diversity and sexual reproduction.

   Importance of cell division:
   - Growth: It allows organisms to grow by increasing the number of cells.
   - Repair: Damaged tissues can be repaired by replacing dead or damaged cells.
   - Reproduction: It facilitates both asexual reproduction (mitosis) and sexual reproduction (meiosis).
   - Genetic diversity: Through meiosis, genetic variation is introduced, which is essential for evolution.

2. Combustion is a chemical reaction between a fuel and oxygen, producing heat and light. The three conditions necessary for combustion are:
   - Fuel: There must be a substance that can burn, such as wood, gasoline, or natural gas.
   - Oxygen: A source of oxygen is needed to support the combustion process. Typically, oxygen from the air is sufficient.
   - Heat: The fuel must reach its ignition temperature to begin the combustion reaction.

   If any one of these elements is missing, combustion will not occur. For example, smothering a fire removes oxygen, which extinguishes it.

3. Natural gas is a fossil fuel that is used widely as a source of energy. Some advantages include:
   i. Cleaner burning: Natural gas produces fewer pollutants (such as sulfur dioxide, carbon dioxide, and nitrogen oxides) compared to coal and oil.
   ii. Efficient: It is more efficient in heating and electricity generation due to its higher energy content.
   iii. Versatility: It can be used in various sectors, including electricity generation, industrial processes, heating, and transportation.
   iv. Abundant: It is relatively abundant and accessible compared to other fossil fuels.
   v. Cost-effective: It is often cheaper than other forms of energy like electricity or heating oil in certain regions.

5. Corrosion is the deterioration of metals due to chemical reactions, often with water and oxygen. Rusting of iron is a common example, where iron reacts with oxygen and water to form iron oxide (rust), damaging the metal.
6. i. Fermentation (production of alcohol, bread)
   ii. Biodegradation (breaking down waste)
   iii. Medicine (producing antibiotics)
   iv. Agriculture (fixing nitrogen)
   v. Enzyme production (used in detergents, food processing)

Assessment Paper – 2

A. 1. b. different 2. d. joule 3. c. mantle
4. b. Carrots 5. a. Dhruv Tara

B.

Column A	**Column B**
1. Bird	e. Wind instrument
2. Audible sound	a. 20 hz to 20,000 hz
3. Violin	c. Fluid friction
4. Electroscope	b. Detects charges
5. Carrots, spinach, butter	d. Rich in vitamin A

C. 1. Myopia (Short-sightedness): The person who has myopia as a defect in the eyes cannot see the distant objects clearly while the nearby objects can be clearly seen. In order to correct this defect, a diverging or concave lens is used to create an extra divergence so that the images get formed on the retina.

   Hypermetropia (Long-sightedness): The person who has hypermetropia as a defect in the eyes cannot see the nearby objects clearly while they can see the distant objects clearly. The reason for this defect is that the focal length of the eye lens is too long or the eye ball is too short. Thus, nearby objects are brought to focus at a point behind the retina. In order to correct this defect, convex or converging lens is used since the rays require an extra convergence to meet at a lesser distance.

2. Global Warming: It refers to the long-term increase in Earth's average temperature due to human activities, especially the release of greenhouse gases like CO2.

   Greenhouse Effect: It is a natural process where gases in Earth's atmosphere trap heat from the sun, keeping the planet warm enough to support life. However, human activities have amplified this effect, leading to global warming.

3. Audible Sounds: These are sounds that can be heard by the human ear, typically within the frequency range of 20 Hz to 20,000 Hz.

   Inaudible Sounds: These are sounds that are outside the human hearing range, either below 20 Hz (infrasound) or above 20,000 Hz (ultrasound).

4. Lightning: It is the flash of light caused by the discharge of electricity in the atmosphere, usually during a thunderstorm.

   Thunderstorm: It is a storm with thunder and lightning, often accompanied by heavy rain, strong winds, and sometimes hail.

D. 1. Earthquake-prone areas in India include Himalayan regions, North-Eastern states, parts of Jammu & Kashmir, Gujarat, and Andaman & Nicobar Islands.

2. A periscope is used to view objects from a concealed or submerged position, typically in submarines, allowing users to see above the water's surface.

3. A satellite is an object that orbits a planet. It can be natural (like the Moon) or artificial (like communication satellites). Satellites help in communication, weather forecasting, and navigation.
4. Sources of water pollution include industrial waste, sewage, agricultural runoff (fertilisers and pesticides), and plastic waste.
5. Sound is produced when an object vibrates, creating sound waves that travel through a medium (air, water, or solids) to the ear.

E. 1. Various applications of pressure are:
   - Hydraulic systems (lifts, brakes)
   - Atmospheric pressure (weather patterns)
   - Cooking (pressure cookers)
   - Engineering (building design, dams)
   - Medical (blood pressure, decompression chambers)
   - Aerospace (aircraft cabin pressure)

2. Fluid friction is the resistance an object experiences when moving through a fluid (liquid or gas). It depends on the speed, viscosity of the fluid, surface area, and shape of the object. Example: swimmers face resistance in water.
3. Sound is produced when air from the lungs causes the vocal cords to vibrate in the larynx. The shape of the mouth, tongue, and lips modify these vibrations to form speech.
4. The solar system consists of:
   - The Sun
   - Planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune)
   - Moons, dwarf planets (e.g., Pluto), asteroids, comets, and meteoroids.
5. Water pollution causes:
   - Health issues (diseases like cholera)
   - Ecosystem damage (harm to aquatic life)
   - Bioaccumulation (toxins in the food chain)
   - Loss of biodiversity
   - Agricultural and economic impact

F. 1. Force is a push or pull on an object that causes it to move, change direction, or alter its shape. It is measured in newton.
2. Pressure is the force applied per unit area on the surface of an object.
   It is calculated as: Pressure = Force/Area and is measured in pascals (Pa).
3. Reflection is the bouncing back of light, sound, or other waves when they hit a surface that they cannot pass through. For example, when light hits a mirror, it bounces back, allowing us to see our reflection.