Subject: Science **Class: VIII**

CHAPTER 1

Crop Production and Management

SOLUTIONS:

Sci. Quest (Page 2)

1. Can you name some crops which are neither Kharif nor Rabi?

Ans. Watermelon, pumpkin, gourd are neither kharif nor rabi.

State True or False for the following statements: (Page 4)

1. True
2. False : Tilling allows the roots to penetrate deep into the soil.
3. False : Potato is a rabi crop.
4. False : Soil contains minerals, water, air and living organisms like microorganisms, earthworm, etc.
5. True

Write one word for each of the following: (Page 5)

1. Seed drill 2. Broadcasting 3.Transplantation 4. Rice 5. Seed drill

Let us try (Page 7)

S.No.	Commercial name	Mineral nutrient(s)
1.	Urea	Nitrogen, Phosphorous and potassium
2.	Superphosphate of lime	Calcium dihydrogen phosphate and calcium sulphate (gypsum)
3.	Diammonium phosphate	Phosphammite and biphosphammite
4.	Calcium ammonium nitrate	Calcium carbonate, calcium oxide and magnesium carbonate

Sci. Quest (Page 8)

1. Can you name two crops used in crop rotation in North and South India respectively?

Ans. In North India, crops like wheat and rice are used in rotation with pea and groundnut to replenish the nitrogen content. In south India, crops like rice, bamboo are used in rotation with Jowar and lentils.

A. Select the odd one out:

1. Potash: Green manure, animal manure and compost are types of manure while, potash is a fertiliser.

2. Step farming: Field fallow, crop rotation and mixed cropping are natural methods of replenishing soil nutrients, while step farming is a method of soil conservation.

3. Compost: NPK, urea and ammonium hydrogen phosphate are fertilisers, while compost is a manure.

B. Match the columns:

S.No.	Column I	Column II
1.	Field fallow	Leaving field free for one or more seasons
2.	Crop rotation	Cultivating 2-3 crops alternatively in the same field
3.	Intercropping	Growing two crops simultaneously in the same field at the same time in different rows
4.	Mixed cropping	Growing two or more types of crops together in the same field at the same time

Fill in the blanks: (Page 11)

1. Weeds 2. Dhekli, Rahat 3. Sprinkler 4. Khurpi, hoe 5. Frost, dry hot air currents

Sci. Quest (Page 12)

1. Can you name the source from which vitamin D rich cod liver oil is obtained?

Ans: Liver of fishes

Book Exercise

Objective Questions (Page 14-16)

A. Select the correct option:

1 (b): Gram 2. (a) : Earthworms 3. (d) : Seed drill 4. (d) : Urea 5. (d) : Drip system

B. Fill in the blanks:

1. Weedicides 2. Sickle 3. Winnowing 4. Neem leaves 5. Seafood

C. Match the column:

S.No.	Column I	Column II
1.	Barley	Cereal
2.	Sweet potato	Root crop
3.	Coffee	Plantation crop
4.	Jute	Fibre crop
5.	Alfalfa	Feed crop

D. State True or False for the following statements:

1. True
2. False : Plants contain nearly 90% water.
3. True
4. False : Plough contains a strong triangular iron strip called ploughshare.
5. True :

E. Complete the given analogy:

1. Drip system 2. Groundnut 3. Cash crop 4. Seed drill

F. Circle the odd one out:

1. **Cotton:** Tea, rubber and coconut are plantation crops, while cotton is a fibre crop.
2. **Trowel:** Moat, sprinkler and tubewells are methods of irrigation, while trowel is used for mechanical weeding.
3. **Plough:** Thresher, buffalo and combine are used for threshing the crops, while plough is used for loosening and turning the soil.
4. **Silk:** Cotton, jute and flax are fibres obtained from plants, while silk is a fibre obtained from animal.

Subjective Questions

A. Very Short Answer Questions

Q-1 What is weeding?

Ans. The process of removing weeds from a field is called weeding. Examples of weeds are Amaranthus and Chenopodium.

Q-2 Name some agricultural tools used by farmer for loosening and turning of soil.

Ans. Agricultural tools used by farmer for loosening and turning of soil are plough, hoe and cultivator.

Q-3 What is the temperature range in cold storage?

Ans. In cold storage the temperature is maintained between 0° C- 4° C. At this temperature, bacteria and fungi cannot multiply.

Q-4 Name the crops that are grown in rainy season.

Ans. Kharif crops are grown in rainy season. Example: rice, jute, maize and cotton etc.

Q-5 What is meant by broadcasting?

Ans. Sowing of seeds through hands by scattering them is known as broadcasting.

Q-6 Why should farmers use organic manure?

Ans. Farmers should use organic manure for the following reasons:

i. It enhances the water holding capacity of the soil.

ii. It provides humus to the soil thereby improving physical and chemical properties of soil.
iii. It makes soil porous due to which soil becomes well aerated.
iv. It increases the number of soil friendly microbes.
v. It improves the texture of the soil.

B. Short Answer Questions

Q-1 Why is it necessary to sow seeds at an appropriate depth?

Ans. Seeds should be sown at adequate depth so that they are not eaten by birds and rats and at the same time seedlings can easily germinate.

Q-2 Define animal husbandry. Name any three products of daily use provided by animals.

Ans. The breeding, feeding and caring of domestic animals for food and other purposes is called animal husbandry. Three products of daily use provided by animals are milk, meat and honey.

Q-3 What are the natural methods, apart from providing manures, that are used to replenish nutrients to the soil?

Ans. Apart from manures some natural methods used by farmers to replenish the soil with nutrients are as follows: field fallow, crop rotation, mixed cropping, intercropping, etc.

Q-4 Write a short note on fertilizers.

Ans. Fertilisers are chemical compounds that are manufactured in industries. Fertilisers are nutrients specific, *e.g.*, NPK fertiliser contains nitrogen, phosphorus and potassium. Some other fertilisers commonly used are urea, ammonium sulphate, super phosphate and potash. Fertilisers improve soil fertility.

Q-5 Differentiate between manures and fertilizers.

Ans.

S.No.	Manures	Fertilisers
1.	These are natural organic substances	These are inorganic salts made by humans.
2.	These are rich in humus	These do not contain humus
3.	These are prepared in fields	These are prepared in factories
4.	These remove general nutrient deficiency of the soil and are not nutrient specific	Fertilisers are nutrient specific and provide specific nutrients to the soil
5.	These are not soluble in water.	Fertilisers are soluble in water.
6.	Manures do not cause pollution	Fertilizers cause soil and water pollution

Q-6 If rice is sown in winter season, what would happen?

Ans. Rice is a kharif crop. It is sown in the rainy season between June and July. Rice crop is dependent upon the south-west monsoon as it needs substantial amount of water. If rice is sown in winter season, the seeds will not germinate properly as there will not get adequate sunlight and water. Generally there is no or very little rainfall during winter season.

C. Long Answer Type Questions

Q-1 Briefly describe various agricultural implements used to prepare soil before sowing of seed.

Ans. Various tools used for loosening and turning of soils are plough, hoe and cultivator.

Plough: It is made of wood and is drawn by a pair of bulls or other animals (horses and camels). It contains a strong triangular iron strip called ploughshare. The main part of the plough is a long log of wood which is called a plough shaft. There is a handle at one end of the shaft. The other end is attached to a beam which is placed on the necks of two bulls.

Hoe: It is a simple tool which is used for removing weeds and for loosening and turning the soil. It has a large bent iron blade attached to an iron rod or wooden shaft. The blade helps in tilling the soil. It can also be pulled by animals.

Cultivators: These days ploughing is done by cultivators driven by tractors. A cultivator consists of many ploughshares by which a large area of soil can be dug up in comparatively less time. Thus, by using these mechanised tractors we can save time and labour.

Q-2 What are crop plants grown in India on the basis of food they provide.

Ans. The same kind of plants that are grown, cultivated and harvested in the field on a large-scale for profit or livelihood are known as crop plants. Following are the types of crops grown in India.

S.No.	Crop plants	Examples
1 .	Cereals	Wheat, paddy (rice), maize, barley, ragi
2 .	Pulses	Gram, pea, bean
3 .	Oil seeds	Mustard, groundnut, sunflower
4 .	Root crops	Sweet potato
5 .	Tuber crops	Potato, tapioca
6 .	Sugar crops	Sugarcane, beetroot
7 .	Plantation crops	Tea, coffee, rubber, coconut

Q-3 What is Irrigation? Why is irrigation needed in the fields? Descirbe one modern method of irrigation?

Ans. The process of water supply to the crop fields by different sources is known as irrigation. Irrigation is needed in the fields because :

i. Irrigation provides water to the plants for their various activities like photosynthesis, transpiration, ascent of sap, etc.

ii. Water helps in the absorption of minerals and nutrients from the soil.

iii. Water is essential for germination of seeds and elongation of roots.

iv. Water is needed for the growth of plants.

v. Plants contain 90% water of their bulk.

vi. Water protects crops from frost or from dry hot air currents.

The two main modern ways of irrigation are sprinkler system and drip irrigation.

Drip system: This system of irrigation involves the use of pipes or tubes with very small holes to deliver water drop-by-drop directly at the base of each plant near the roots. It is the best technique for watering fruit plants, gardens and trees. There is no wastage of irrigating water. It is a boon in regions where availability of water is poor.

Q-4 Write a brief note on harvesting and different methods of crop storage.

Ans. Harvesting: The cutting of matured crops for collecting grains is called harvesting. It is done manually by sickle or by a machine called harvester. In the harvested crop, the grain seeds are separated by a process called threshing. Threshing is followed by winnowing. Winnowing which involves the separation of the grain from chaff can be done manually, or by using a winnowing machine.

Methods of crop storage:

Gunny bags : Gunny bags are jute bags. They are filled with food grains and are stacked in large godowns on wooden platforms. They are stored at about 10-15 cm above the ground and about 70 cm away from the wall. The godowns are made free of microbes, insects and rodents by spraying pesticides and insecticides.

Silos: Silos are tall cylindrical containers used for bulk storage of grains. These are used specially by government agencies like Food Corporation of India (FCI). Grain silos facilitate easy inspection, fumigation, protection from pests and temperature control.

Granaries : Granaries are large buildings where grains are stored inside gunny bags, etc. Dried neem leaves may also be used for storing food grains at home. They can be stored in cold storage where the temperature is maintained between 0℃- 4℃. At this temperature, bacteria and fungi cannot multiply.

Q-5 With the help of an activity, describe how healthy seeds can be separated from the spoiled ones.

Ans. Take a beaker and fill half of it with water. Put a handful of wheat seeds in the beaker. Stir well and leave them undisturbed for some time. You will observe that some grains settle down at the bottom of the

beaker while some float on the surface of the water. The floating seeds maybe defective damaged or eaten by pests. They become hollow and lighter. Such seeds cannot germinate. The healthy seeds settle at the bottom and should be taken for sowing.

Page 16-17 Subject Enrichment

B. Practical Based Question

Q1. Which irrigation method will you suggest to be followed in dry state like Rajasthan? Justify your answer.

Ans. In a dry state like Rajasthan, drip irrigation method must be followed.

Rajasthan is called a dry state because it has scarcity of water throughout the year. Hence, drip irrigation method is suitable for this state.

Q2. Why it is important to keep the silos clean and dry?

Ans. It is important for silos to be clean and dry because moist and unclean conditions attract moulds and insects. They may damage and contaminate the whole lot of grains that are kept there. Dry and fumigated silos do not allow moulds and pests to attack the grains.

D. Value Based Questions

Q- A farmer is using excessive fertilizers in his fields to increase the crop yield. Is this practice good or bad for the health of people? Express your views in the class related to the upcoming shortcomes of such practice.

Ans. Using excessive fertilisers in the crop field can yield good results in a short span of time but is harmful for the environment in long run.

i. Overuse of fertilisers can damage the soil by making it highly acidic or alkaline.

ii. Being soluble in water, fertilisers can get washed away in water bodies and harm aquatic life.

iii. Overuse can also suppress the useful activities of soil microorganisms.

Page 17

HOTS Questions

Q-1 If you consume vegetables and fruits without washing will you incure disease?

Ans. Yes, there are high chances of incurring diseases, if we consume vegetables and fruits without washing. The fruits and vegetables that reach our home are handled by multiple people on their way from crop fields to our homes. It means they may be contaminated with dust and germs, which may cause gut related issues, if we consume them without washing.

Q-2 When too much water accumulates around the roots it leads to waterlogging. How this condition leads to crop damage? Think and answer.

Ans. When too much water accumulates around the roots, it leads to waterlogging. In such condition, the air present between the soil particles escapes out and this space is filled with water due to which the plant becomes unable to breathe through its roots. Excessive accumulation of water around the roots may cause rotting of the root resulting in death of the plant.

CHAPTER 2

Microorganisms : Friend and Foe

SOLUTIONS

Page 21

State True or False for the following statements:

1. True 2. True
3. False: Cocci are spherical shaped bacteria and bacilli are rod shaped bacteria.
4. True
5. False: *Chlamydomonas* is a unicellular alga.

Page 23

Sci. Quest

Q- Can you name the first antibiotic discovered?

Ans. Penicillin

Page 24

Fill in the blanks:

1. Alcohol 2. Antibiotic 3. Bacteria (*Lactobacillus*) 4. *Rhizobium* 5. Methane

Page 26

Sci. Quest

Q- Can you name the scientist who discovered bacteria that cause anthrax disease?

Ans. Robert Koch

Page 27

A. Match the columns:

S.No.	Column I	Column II
1.	Malaria	Protozoan
2.	Typhoid	Bacterium
3.	Ringworm	Fungus
4.	Chickenpox	Virus

B. Complete the given analogy:

1. Fish 2. Malaria 3. Yellow vein mosaic 4. Typhoid

Page 29

Sci. Quest

Q- Can you name any other method of food preservation?

Ans. Smoking serves to preserve food. Meat products are usually smoked to preserve them for longer period.

Write one word for each of the following:

1. Preservative 2. Jams 3. Salt 4. Pasteurisation 5. Sodium benzoate

Page 31-33

Exercise

Objective Questions

A. Select the correct option:

1. (c) : Dysentery **2.** (d) : Virus **3.** (a) : *Lactobacillus* **4.** (b) : Yeast **5.** (d) : Hepatitis B

B. Fill in the blanks:

1. Fungus 2. Microorganisms 3. Sodium benzoate, sodium metabisulphite
4. Salt, oil 5. Rhizobium

C. Match the column:

S.No.	Column I	Column II
1.	Louis Pasteur	Fermentation
2.	Alexander Fleming	Penicillin

3.	Edward Jenner	Vaccine for smallpox
4.	Rhizobium	Nitrogen fixation
5.	Robert Köch	Bacillus anthracis

D. State True or False for the following statements:

1. False: Typhoid is caused by bacteria.
2. True
3. True
4. False: Atmospheric nitrogen cannot be taken directly by plants and animals.
5. True

E. Complete the given analogy:

1. Mushroom 2. Tuberculosis 3. Yellow vein mosaic of *bhindi*
4. Jellies 5. Yeast

F. Circle the odd one out:

1. **Canning:** Salt, sugar, oil and vinegar are preservatives while canning is a method of preservation.
2. **Anthrax:** Ringworm, common cold, typhoid and cholera commonly occur in humans, while anthrax occurs in livestocks.
3. **Amoeba:** Chlamydomonas, seaweeds and *Spirogyra* are algae, while *Amoeba* is a protozoan.
4. **Tetracycline:** Housefly, *Anopheles* and *Aedes* are carriers of diseases, while tetracycline is an antibiotic.

Subjective Questions

A. Very Short Answer Questions

Q1. Name the gas released by yeast during fermentation.

Ans. Carbon dioxide

Q2. Name two blue-green algae which can fix atmospheric nitrogen.

Ans. Nostoc, Anabaena,Cynobacteria.

Q3. Name any two food items that are prepared using yeast.

Ans. Bread and wine

Q4. What are preservatives?

Ans. Ingredients or chemicals that are used to preserve food properly in order to prevent them from being spoilt, while maintaining their nutritional value are called preservatives.

Q5. Give any two medicinal uses of microorganisms.

Ans. (i) Microorganisms are used for producing antibiotics, *e.g.*, streptomycin.

(ii) Microorganisms are used for producing vaccines, *e.g.*, hepatitis vaccine.

B. Short Answer Questions

Q1. What is nitrogen fixation? How do leguminous plants help in nitrogen fixation?

Ans. The process of converting nitrogen gas of atmosphere into compounds of nitrogen is called nitrogen fixation. Some nitrogen-fixing bacteria live freely in the soil whereas other nitrogen-fixing bacteria (*Rhizobium*) live in the root nodules of leguminous plants such as gram, pea, bean, etc.

Q2. Mention some preservative methods you will use to preserve fish and meat.

Ans. Meat and fish can be preserved by

i. using salt, oil and vinegar.
ii. refrigerating at low temperatures.

Q3. Write a short note on food poisoning.

Ans. The food poisioning is an illness caused by eating contaminate food or drinks. It is usually caused by bacteria and viruses.The symptoms of food poisoning are vomiting, Stomach cramps, high temperature.

Q4. Write a note on bacteria.

Ans. Bacteria are single-celled (unicellular) organisms. Bacteria are found everywhere. They are found inside and outside our body, in the air, in soil and in water. Bacteria are of different shapes like rod-shaped (bacilli), spherical (cocci), comma-shaped (vibrio) and spiral (spirilla). Bacteria are also classified on the basis of their respiratory patterns. The bacteria which require oxygen for their respiration are known as aerobic bacteria. The bacteria which can survive in the absence of oxygen are known as anaerobic bacteria.

Q5. Name any four communicable disease in human beings, their modes of transmission and causative pathogens.

Ans.

S.No.	Disease	Name of the pathogen	Mode of transmission
1.	AIDS	Virus	Direct contacts through infected body fluids
2.	Tuberculosis	Bacterium	Airborne
3.	Cholera	Bacterium	Contaminated water and food
4.	Sleeping sickness	Protozoan	Insect bite

C. Long Answer Questions

Q1. How are Bacteria useful for us? Explaining giving five examples.

Ans. Bacteria are useful to us in the following ways:

i. The bacterium Lactobacillus promotes the formation of curd.

ii. Idli and dosa are prepared from a mixture of dal and rice, which has been ground to a fine paste. The mixture is allowed to stand for a few hours. As fermentation occurs naturally (due to bacteria present in the mixture).

iii. Bacteria like Rhizobium are able to fix nitrogen from the atmosphere to enrich soil with nitrogenous compounds and increase its fertility.

iv. Some bacteria contribute to the natural cleaning of our environment by decomposing dead organic wastes from plants and animals and converting it to simple substances.

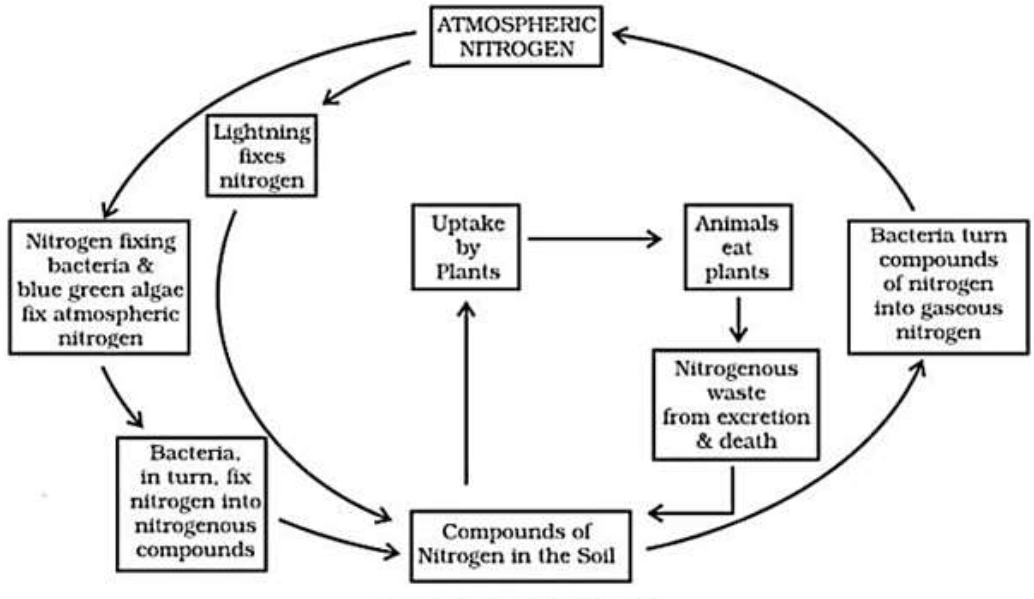
v. In villages, animal waste, leafy waste from crops, etc., is decomposed by bacteria in the absence of oxygen to produce methane gas, which is used as a fuel.

Q2. What is nitrogen cycle? Explain with a well- labeled diagram.

Ans. The cyclic movement of nitrogen element between living and non-living components of the biosphere is called nitrogen cycle. The main steps of nitrogen cycle are as follow:

1. **Nitrogen Fixation:** Atmospheric nitrogen is fixed into nitrogen compound such as nitrates and made available to plants.
2. **Nitrogen assimilation:** Plants absorb inorganic nitrogen compound that is nitrates and ammonium salt from the soil and use them in the form of amino acids, proteins, nucleic acid and other nitrogenous compounds.
3. **Ammonification:** The process of decomposition of protein and other nitrogen compounds into ammonia is called ammonification.
4. **Nitrification:** The process of conversion of ammonia and ammonium salt into nitrates is called nitrification. This is carried out by nitrifying bacteria such as Nitrosomonas and Nitrobacter.
    - Ammonia is oxidized to nitrates by Nitrosomonas.
    - Nitrites are further oxidized to nitrates by Nitrobacter.

5. **Denitrification:** The conversion of nitrates present in the soil or water into free nitrogen is called denitrification. The bacteria that carry out this conversion is called denitrifying bacteria. Pseudomonas is a denitrifying bacterium.



Q3.What are carriers? How does a housefly transmit diseases?

Ans. The insect which transmits disease causing microorganisms to humans (without itself suffering from them) is called a carrier. Houseflies are a common carrier for many pathogens. When houseflies sit on dirt, germs stick to their bodies. After this when they sit on eatable food items they transfer the germs to it. The person consuming this food can become sick.

Q4. a) Define food preservation.

b) Explain two chemical methods of food preservation.

c) In What ways can you preserve jams and jellies at home?

Ans. (a) Food preservation is the process of treating and handling food with an aim to stop or slow down its spoilage, while maintaining its nutritional value, texture and flavour.

(b) Two chemical methods of food preservation are:

(i) **Salt :** It checks the growth of bacteria by forcing microorganisms to lose water by a process called osmosis. It is used for preserving meat, fish, pickles, chips, etc.

(ii) **Oil and vinegar :** They provide an environment in which microorganisms cannot grow. They are used to preserve vegetables, fruits, fish, meat and pickles.

(c) Jams and jellies can be preserved by using sugar. Sugar inhibits the growth of bacteria and is used as preservative. It also makes microbes lose water by osmosis.

Page 33-34

Subject Enrichment

B. Practical Based Questions.

Q1. If you get the chance to visit a village, go out and explore the surroundings wheat field. Try to find out any diseased wheat plant and observe its symptoms. Note them down and discuss in your class. On the basis of the symptoms observed, Identify the name of the disease.

Ans. Name of few common plant diseases caused by pathogens are as follows:

S.No.	Plant Disease	Causative organism	Symptoms
1.	Rust of wheat	Fungus	Orange-brown pustules that are raised above the leaf surface are formed. They can be rubbed off leaving an orange-brown mark on a finger

2.	Loose smut of wheat	Fungus	In the affected plants the kernels are converted into black mass of powdery spores and no grains are formed.

C. Diagram Based Questions

Q1. Observe the given figure and answer the following questions.

a) Name the disease.

b) What is its mode of transmission?

c) Name the causative pathogen.

Ans. a) The disease shown in the given figure is citrus canker.

b) Its mode of transmission is air.

c) It is caused due to a bacterium *Xanthomonas citri*.

D. Value Based Questions.

Q- If a family in our neighbourhood is suffering from a communicable disease, will you help them or ignore their ill health? If yes, what are the things you could do to help this family? What preventive measures would you take to keep yourself safe while helping them?

Ans. If a family in our neighbourhood is suffering from a communicable disease then we must help them by taking full precautions so we may not get affected by it. We can do the following things for them:

(i) Get medicines for them if they cannot go out.

(ii) Send food for them if they face difficulty in cooking.

(iii) Call them regularly to ask about their health.

(iv) Arrange an appointment with doctor if they are not able to do it.

(v) Offer for any further help, if required.

Preventive measures that can be taken to keep yourself safe while helping them are:

(i) Always wear a mask as some communicable diseases spread though air.

(ii) Wear gloves on hands when come in touch as few communicable diseases spread through touch.

(iii) Sanitise the hands and fomites that come in contact with them.

(iv) Never accept any edible thing from them when they are infected.

(v) Avoid close proximity with them when they are sick.

Page 34

HOTS Questions

Q1. It is always suggested not to eat anything from street hawkers. Why?

Ans. It is always suggested not to eat anything from street hawkers because most of them keep their food exposed to the environment. Flies, birds, rodents, etc., may come in contact with the food and contaminate it. When contaminated food is consumed, it gives rise to communicable disease. Street hawkers also lack proper food handling and water disposal practices. Due to these poor hygiene practices we may fall sick, if we consume such food.

Q2. Why do your mother ferment the idli/dosa batter?

Ans. Because Idli and dosa gives a porous texture to the idli and makes it soft and fluffy. This is the reason for fermentation of idli batter.

CHAPTER 3

Coal and Petroleum

SOLUTIONS

Page 37

Sci. Quest

Q. Fossil fuels were obtained from dead plants and trees that used solar energy during photosynthesis. So, what is the real source of energy of fossil fuels?

Ans. The real source of energy of fossil fuel is the light energy obtained from the Sun.

Page 40

Fill in the blanks:

1. Exhaustible 2. Carbon dioxide 3. Fossils 4. Coal tar 5. Coke

Page 42

Sci. Quest

Q. Since the hydrocarbons present present in LPG have no smell, c compound is added to it to detect any leakage of the gas. Name the compound.

Ans. A compound named Ethyl Mercaptan is added to detect any leakage of the gas.

Page 45

Sci. Quest

Q. What is green hydrogen? How is it useful?

Ans. The hydrogen produced during electrolysis of water is known as green hydrogen. It is used to generate electricity from renewable sources.

State True or False for the following statement:

1. True
2. True
3. False : Diesel is used as a fuel in heavy motor vehicles. It is also used to run pumps for irrigation in agriculture and in electric generators to produce electricity on a small-scale.
4. False: Natural gas consists of a hydrocarbon methane (almost 95%) with ethane and propane.
5. True

Page 47-49 Exercise

Objective Questions

A. Choose the correct option:

1. (d) : Methane **2.** (d) : Paraffin wax **3.** (b) : Coal tar

4. (c) : Hydrogen **5.** (d) : Sunlight

B. Fill in the blanks:

1. Carbonisation 2. Butane 3. Anthracite 4. Refining 5. Coke

C. State True or False for the following statement:

1. True
2. False: Coke reacts with steam and air to give two important fuels called water gas and producer gas. Water gas is a mixture of carbon monoxide and hydrogen.
3. True
4. True
5. False: Carbon content in coal increases with increased pressure.
6. False: In the oil wells, natural gas floats over crude oil which in turn floats over water.

D. Complete the given analogy:

1. Fossil fuels 2.Bitumen 3.Coal 4.Butane 5.Petrol

E. Match the columns:

S.No.	Column I	Column II	Column III
1.	Brown coal	Lignite	Low carbon content
2.	Gasoline	Fractional distillation	Petroleum
3.	Coke	Destructive distillation	Coal

4.	Butane	Cooking gas	LPG
5.	Natural gas	CNG	Clean fuel

Subjective Questions

A. Very Short Answer Questions

Q1. Name two renewable energy sources.

Ans. Air and water are renewable resources as they are always being renewed.

Q2. Define exhaustible natural resources. Give one example.

Ans. The resources which are limited in nature and can be exhausted by human activities are called exhaustible natural resources. For example, forests.

Q3. Write the names of the various products formed during destructive distillation of coal.

Ans. Coke, coal tar and coal gas are the products obtained during destructive distillation of coal.

Q4. What are petrochemicals?

Ans. Petrochemicals are the substances obtained from petroleum and natural gas. They are used in the manufacturing of detergents, synthetic fibres and plastics.

Q5. Name two products which are obtained above 400oC in fractional distillation of petroleum.

Ans. Lubricating oil and fuel oil.

Q6. Which is the most common variety of coal? Also write its one use.

Ans. Bituminous is the most abundant variety of coal. It is mainly used for power generation.

B. Short Answer Questions

Q1. Describe the process of formation of coal.

Ans. The coal was formed million of years ago by the process of carbonization remains of dead plants and trees which were accumulated in the swamps by the action of heat and pressure, they were turned into coal. Coal contains mainly carbon.

Q2. 'Natural gas is considered an environmental friendly fuel.' Explain the statement in two points.

Ans. Natural gas is considered an environment friendly fuel because it burns without producing any smoke and does not cause air pollution. It has high calorific value.

Q3. What is a fossil fuel? Give three examples.

Ans. Fuels formed by the remains of living organisms (fossils) are known as fossil fuels. Coal, petroleum and natural gas are fossil fuels because they are formed from fossilised remains of plants and animals.

Q4. Write difference between peat and bituminous coal.

Ans.

S.No.	Peat	Bituminous
1.	It is fibrous, light brown in colour.	It is hard, black and glossy.
2.	It has 40-60% carbon content.	It has 80-85% carbon content.
3.	It burns with a sooty flame, producing foul smelling gases with a large amount of ash.	It gives more heat than peat due to high carbon content.

Q5. Differentiate between renewable and non-renewable resources. Give one example of each.

Ans.

S.No.	Renewable resources	Non-renewable resources
1.	These resources are renewed within a short amount of time.	These resources can not be renewed within a short amount of time.
2.	These are inexhaustible resources.	These are exhaustible resources.
3.	Example : Air, water, Sun.	Example : Coal, petroleum, natural gas.

Q6. What are the measures given by PCRA for saving petrol or diesel?

Ans. In India, the Petroleum Conservation Research Association (PCRA) advises people on how to save petrol/diesel. Their tips are as follow:

(i) drive at a constant and moderate speed as far as possible.

(ii) switch off the engine at traffic lights or at a place where you have to wait.

(iii) ensure correct tyre pressure.

(iv) ensure regular maintenance of the vehicle.

C. Long Answer Questions

Q1. Describe the process of formation of petroleum. How is refining of petroleum carried out? List all the products obtained during refining. Also mention one use of each of the products obtained.

Ans. Formation of Petroleum: Petorelum was formed from the remain of dead animals and plants that live in the see millions of yeas ago. They accumulated and got buried in the deeper layer of sand, slit and clay. In the absence of air and by the action of heat and pressure, these dead organisms slowly changed into petroleum.

Refining of Petroleum:- Petroleum is a black liquid also called crude oil. It contains many useful substance like petroleum gas , petrol , diesel , oil etc. These various constituents of petroleum are separated by a process called petroleum refining.

The products of fractional distillation of petroleum with their uses are:

Petroleum gas : Petroleum gas is used as a fuel in homes and industry. It is used as a fuel in the form of Liquefied Petroleum Gas (LPG).

Petrol : Petrol is used as a fuel in vehicles ,for dry cleaning.

Kerosene : Kerosene is used as a fuel in gas stoves to cook food, in jet aeroplanes.

Diesel : Diesel is used as a fuel in heavy motor vehicles like buses , cars, ships, trucks etc.

Lubricating oil : Lubricating oil is used for lubrication in machines and engines.

Paraffin wax : Paraffin wax is used for making candles, vaseline, ointments, wax paper and grease.

Bitumen : Bitumen is used for road surfacing ,water-proofing the roofs of buildings and for making black paints.

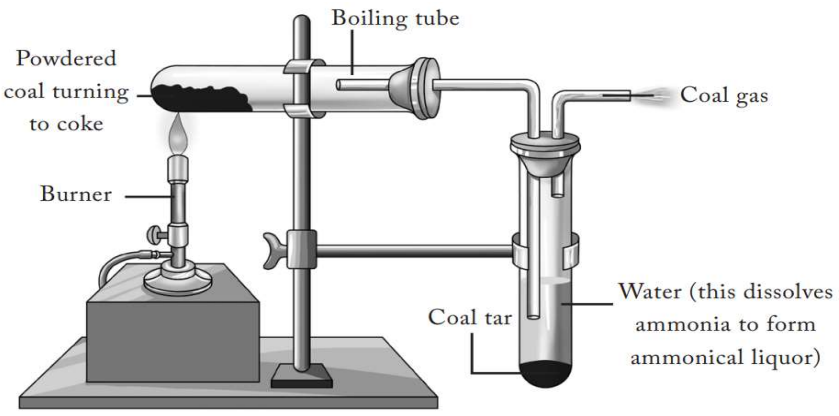
Q2. What is destructive distillation of coal? What are the products obtained? List the characteristics and uses of each of the products obtained.

Ans. Heating of coal in the absence of fear is called destructive distillation of coal.

The products are obtained from coal are given below:-

Coke : It is a tough, porous and black solid substance. It is an almost pure form of carbon (98%). Coke is used for manufacturing of steel and extraction of metals. Coke is also used in the prepration of a fuel gases like producer gas ($Co + N_2 + H_2$) and water gas ($Co + H_2$).

Coal tar : It is a black, thick liquid having an unpleasant smell which is obtained by heating coal in the absence of air. Coal tar is used for making synthetic fibres, drugs, perfums, pants, pesticides, dyes, photographic materials and roofing materials etc.



Destructive distillation of coal

Coal gas : It is a gaseous fuel which is obtained by the strong heating of coal in the absence of air during the processing of coal to get coke. It is mainly a mixture of methane and hydrogen and carbon monoxide. It is used as a fuel in industries when coal gas burns.

Q3. Why do we need alternative sources of energy? Give two reasons. Name some of the alternative energy sources. Which is the most common alternative energy source? Explain it briefly.

Ans. We need alternative sources of energy because :

i) Burning of fossil fuels releases greenhouse gases which causes global warming.

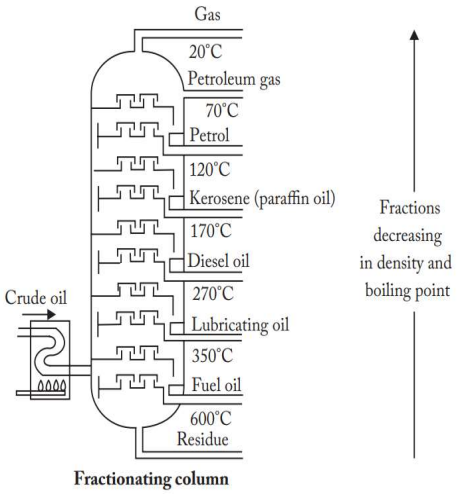
ii) Fossil fuels required millions of years to be formed but they will be exhausted in a few hundred years. We need to shift from our dependence on fossil fuels to alternative energy sources.

Wind energy: Wind energy is a renewable energy source. It can be produced from small-scale windmills or wind turbines

Solar energy: Solar energy most commonly refers to the use of photovoltaic cells (or solar cells) to create energy. On a small scale, you may see a few solar panels on a house roof used to produce energy for just that one home. On a larger scale, you may see a solar farm used as a power plant to produce electricity for their consumers.

Q4. What is the basis of the process of fractional distillation of petroleum? How does fractional distillation separate various constituents of crude oil? Describe the process briefly with the help if diagram.

Ans. The process of separating various constituents is called refining. At a refinery, petroleum is separated into several compounds by a process called fractional distillation. Crude oil is obtained from the oil well is a mixture of many liquids. Each liquid boils and changes into vapour at a different temperature. The crude oil, heated to a temperature of 400℃, is fed in at the bottom of the fractionating column and heated further. The liquid that has the lowest boiling point changes into vapour first and rises upwards. The next volatile liquid changes into its vapour state at a higher temperature and rises. At different parts of the column, as the vapours rise, they cool and condense separately into liquids on a tray and are collected separately. A few gases reach the top of the column .The products of fractional distillation of petroleum are: petroleum gas, petroleum, kerosene, diesel, lubrication oil, bitumen and paraffin wax.



Fractionating column

Q5. Why should fossil fuels like coal, petroleum and natural gas be conserved? How can we conserve these natural resources? List any five ways.

Ans. Fossil fuels like coal, petroleum and natural gas should be conserved because they are non – renewable resources.They take millions of years to form and cannot be replenished if we continue using them at our present rate. Therefore, it is important to conserve them.

Few measures to manage and conserve our natural resources are :

(i) for cooking purpose : Use pressure cooking.

(ii) Less use of electercity.

(iii) Turn OFF the car at traffic signals

(iv) Reduce the use of plastics.

(v) Alternative sources of energy should be utilized.

Page 49-50

Subject Enrichment

B. Practical Based Questions

Q1. Close the half of the world's population are exposed to household air pollution from cooking fuels. Burning solid fuels such as coal and wood for cooking can pose health hazards. How does burning coal and wood in the kitchen affect us?

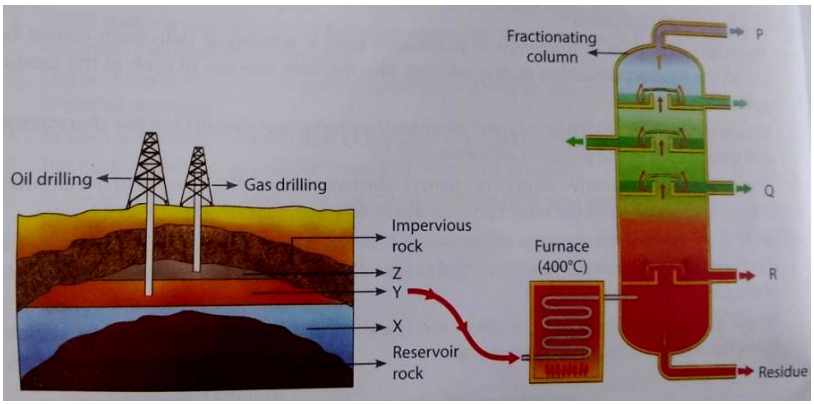
Ans. The burning of coal and wood in kitchen causes release of harmful gases like sulphur dioxide, nitrogen oxides, particular matter, smoke, etc. which can cause eyes, nose, and throat irritation leading to headache, nausea, acute bronchitis and lung cancer also in some cases.

Q2. Why is coke preferred over coal in the metallurgical (metal extraction) processes?

Ans. Coke is preferred over coal in metallurgical processes because it is a better reducing agent and fuel than coal. It does not produce smoke on burning and also produces more heat on burning as compared to coal.

C. Diagram Based Question

Q. Look at the diagram given below. It shows large deposits deep inside the earth's crust. Y is a mixture of various useful hydrocarbons which are separated at refinery. Y is forst heated to about 400°C in a furnance.



Answer the following questions.

a) Identify the labeled parts X , Y and Z. Why are the layers of Z and Y above that of X?

b) Arrange the fractions P , Q and R in order of decreasing boiling points.

c) Among P , Q and R, Identify the fractions that condense first and last.

d) Why do different gases condense to liquids on different trays in the fractionating column?

Ans. (a) X -Water, Y-Crude oil, Z-Natural gas

As oil and gas are lighter than water thus these are present above water and do not mix with it.

(b) P < Q < R.

(c) R will condense first and P will condense last.

(d) The refining of petroleum into different fractions is based on the fact that the different fractions of petroleum have different boiling point ranges. The lighter fractions have lower boiling points and they are obtained towards the top of the column.

Page 51

HOTS Questions

Q1. The rate at which energy is consumed has been very high and uncontrollable. Our demands are continuously increasing day – by – day. It is possible that someday most of the non – renewable resources will be exhausted and we will have to switch over to alternate energy sources. How can we

conserve energy in the kitchen and in the rest of the house? Also write the ways to conserve energy outside the house at public places.

Ans. Energy conservation is a reduction in consumption of energy. A secondary benefit of energy conservation is that it can result in increased environmental quality, and monetary savings. To conserve fuels we should avoid direct and indirect wastage of energy by following certain simple practices such as :

(i) Use pressure cooking

(ii) Less use of electricity.

(iii) Turn OFF the car at traffic signals.

(iv) Reduce the use of plastics

Q2. Substance X is formed from the dead remains of plant that lived millions of years ago by the process of carbonization. It mainly consists of carbon. When it is subjected to destructive distillation, it produces various useful products. Product Y contains about 98% carbon and is used to manufacture steel and extract many metals from their ores. When steam is passed over Y , it produces gas Z which is a fuel gas. When air is passes over Y, it produces gas W. Another product V obtained on destructive distillation of X, is a mixture of various substances which are used in the manufacture of dyes, perfumes, explosives, paints, etc.

a) Identify the substance X.

b) What are the products Y and V?

c) Identify the gases Z and W. Write their compositions also.

Ans. (a) X $\longrightarrow$ Coal

(b) Y $\longrightarrow$ Coke, V $\longrightarrow$ Coal tar

(c) Z $\longrightarrow$ Water gas, W $\longrightarrow$ Producer gas

$C + H_2O \rightarrow CO + H_2$

Coke Steam Water gas

$2C + O_2 + 4N_2 \rightarrow 2CO + 4N_2$

Coke Air Producer gas

CHAPTER 4
Combustion and Flame

SOLUTIONS

Page 56

Sci. Quest

Q. Why do we need to take special care for storing kerosene oil?

Ans. We need to take special care for storing kerosene oil because it has low ignition temperature which means they can catch fire easily.

Page 57

Sci. Quest

Q1. Why is it difficult to burn a heap of green leaves rather than dry leaves which catch fire easily?

Ans. Because green leaves have higher ignition temperature than dry leaves because of less water content.

Q2. Why is it dangerous to sleep in a closed room with a burning or smouldering coal fire in it?

Ans. It is dangerous to sleep in a closed room with burning or smouldering (Burns slowly) coal fire in it because burning of coal produces carbon monoxide gas. This poisonous gas has the affinity to mix with the haemoglobin present in our blood and forms carboxyhaemoglobin. This carboxyhaemoglobin decreases the oxygen carrying capacity of blood in our body. Thus the brain gets deprived of oxygen.

Page 60

A. State True or False for the following statements:

1. False : Burning of wax in a candle is an example of rapid combustion.
2. True
3. True
4. False : Complete combustion of methane results in the formation of carbon dioxide, water vapours and energy.
5. True

B. Match the column:

S.No.	Column I	Column II
1.	Solar Energy	Nuclear reactions
2.	Fireworks	Explosion
3.	Respiration	Slow combustion
4.	Glass	Non-combustible
5.	Cow-dunk cake	Combustible

Page 61

Sci. Quest

Q. Why does a candle flame always point up?

Ans. A candle flame always points upward because the heat generated by the flame warms the surrounding air , making it less dense and causing it to rise, creating a convection current.

Page 65

Fill in the blanks:

1. Non- luminous
2. Innermost zone
3. Bright yellow light
4. Sulphur, nitrogen
5. Calorific value, kJ/kg

Page 66-69

Exercise

Objective Questions

A. Choose the correct option:

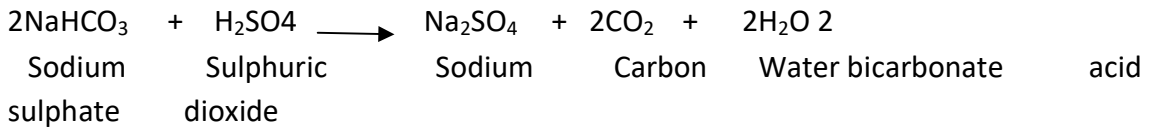
1. (c) : carbon monoxide
2. (d) : LPG
3. (d) : Middle zone
4. (c) : Innermost zone
5. (d) : LPG, petrol, and biogas

B. Fill in the blanks:

1. Slow
2. Oxygen
3. Non-combustible
4. Luminous
5. Outermost zone

C. State True or False for the following statements:

1. False : The hottest zone of a candle flame is a zone of complete combustion.
2. False : When the head of matchstick is rubbed against the rubbing surface, some red phosphorus is converted to white phosphorus which reacts with antimony trisulphide and starts burning.
3. False : In soda-acid type of fire extinguisher, sulphuric acid is kept in a small glass bottle. This is immersed in a sodium bicarbonate solution. On striking the handle or the knob, the glass bottle containing the acid breaks and mixes with the baking soda. The reaction releases large quantity of carbon dioxide.



4. False : Carbon dioxide is heavier than oxygen and thus covers the fire like a blanket. Since the contact between the fuel and oxygen is cut off, the fire is controlled.
5. True

D. Complete the given analogy:

1. Crackers 2. Petrol 3. Non-luminous flame
4. Innermost zone 5. Glass

E. Give reasons:

1. A burning matchstick can produce sufficient heat to reach the ignition temperature of the splinter of wood, therefore a matchstick can light a splinter of wood directly. On the other hand, due to high ignition temperature log of wood does not catch fire easily.
2. A paper cup containing water does not catch fire easily because the water absorbs the heat from the flame, preventing the paper from reaching its ignition temperature. While and empty paper cup catches fire quickly because there Is nothing to absorb the heat , allowing the paper to reach its ignition point rapidly
3. Charcoal or any other substance requires oxygen to burn. When a piece of charcoal is covered with a glass vessel, there is no space left to let the air in. After all the oxygen present inside the glass vessel is consumed by the burning charcoal, it stops burning as there is no oxygen supply for it to burn.
4. In spontaneous combustion, the substance suddenly bursts into flames and starts burning without the application of any apparent cause at room temperature. The burning of white phosphorus on its own at room temperature is an example of spontaneous combustion. That is why phosphorus is stored in water. Similarly, sodium is kept immersed in kerosene as it is a very reactive metal. If it is kept exposed in air, it catches fire and if comes in contact with water, it reacts easily.
5. In case of electrical fires or fires involving electrical equipments, water should not be used. Water may conduct electricity and cause further damage and also harm those trying to put out the fire. Water is also not preferable for fires involving oil and petrol. As water is heavier than oil, it sinks below and oil keeps burning on top. In such cases, carbon dioxide gas is the best choice.

Subjective Questions

A. Very Short Answer Questions

Q1. Define combustion.

Ans. Combustion is a chemical process in which a substance reacts with oxygen to give heat *i.e.*, burning of a substance in presence of air. *e.g.*,

$$\underset{\text{Carbon}}{\text{Coal}} + \underset{\text{Oxygen}}{O_2} \longrightarrow \underset{\text{Carbon dioxide}}{CO_2} + \text{Heat}$$

Q2. Define calorific value. How is it measured?

Ans. The amount of heat energy produced on complete combustion of a unit mass of fuel in oxygen is called calorific value of that fuel. It is measured in kilojoules per kilogram *i.e.*, kJ/kg.

Q3. What is ignition temperature?

Ans. The minimum temperature at which substance catches fire is called ignition temperature.

Q4. Define explosion.

Ans. A combustion in which a large amount of heat, light and sound are produced in the reaction is called an explosion.

Q5. Why do some materials burn with flame while others not?

Ans. Those substances which burn and vapourise produce flame. The combustible substance and the supporter of combustion both should be in gaseous state to produce a flame.

Q6. What are inflammable substances? Give example.

Ans. The substances which have very low ignition temperature and can easily catch fire with a flame are called inflammable substances. For example, petrol, alcohol, kerosene oil, liquefied petroleum gas, etc.

B. Short Answer Questions

Q1. What are the necessary conditions for combustion to take place? Explain briefly.

Ans. The necessary conditions for combustion to take place are the following :

(i) **Combustible substance** : Presence of a combustible material is the primary condition for combustion. These substances are also called fuels.

(ii) **Presence of Air or Oxygen**: A substance which helps in combustion of the fuel is a supporter of combustion. Oxygen is a supporter of combustion.

(iii) **Ignition temperature** : It is the temperature at which a combustible substance catches fire. Below the ignition temperature, even if a combustible substance is present along with oxygen, it will not burn. For example a matchstick does not start burning on its own.

Q2. What is meant by an ideal fuel? List any three characteristics of a good fuel.

Ans. An ideal fuel is widely available, cheap, easy to transport and readily combustible fuel. A good fuel is the one which has the following characteristics :

(i) It has high calorific value.

(ii) It has a moderate ignition temperature (neither too low nor very high).

(iii) It should not leave residue after burning and should not cause pollution.

Q3. Differentiate between rapid combustion and spontaneous combustion. Give one example of each.

Ans. The combustion in which heat and light are produced in a short period of time is called rapid combustion. When we bring a lighted matchstick near a gas, the gas burns very rapidly.

The substance suddenly bursts into flames without any external source of ignition is called spontaneous combustion. The burning of white phosphorus on its own at room temperature is an example of spontaneous combustion.

Q4. Why does kerosene burn with a blue flame in wick stove but produces a yellow flame when burnt in lamp?

Ans. During a complete combustion, fuel burns with a blue flame having high temperature while during an incomplete combustion, fuel burns with a yellow flame having low temperature. Thus, due to complete combustion, kerosene burns with a blue flame in wick stove. While, a yellow flame is produced due to incomplete combustion of kerosene, when it is burnt in a lamp.

Q5. Why is hydrogen not used as a fuel though it has the highest calorific value?

Ans. Hydrogen is not easily available and cost of production is high. Unlike other gases, hydrogen is not readily available in atmosphere. It requires process like electrolysis of water for its production which is a very costly and time consuming.

Q6. Define luminous and non – luminous flames. Write their characteristics properties.

Ans. luminous flame: This is the flame where the wax vapour starts burning.

Characteristics : The flame is yellowish as the oxygen is not available in this region. The wax vapour does not burn completely. The temperature here is about 1200°C.

Non – luminous flame : This is the flame where the wax vapour burns completely .

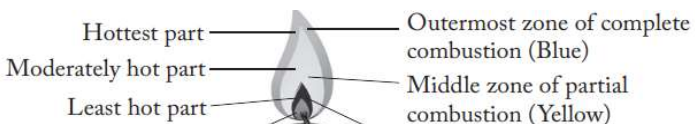
Characteristics : The flame is blue in colour and appear non-luminous the temperature here is about very high i.e 1400°C.

C. Long Answer Questions

Q1. Define the term flame. Name the various zones of a candle flame. With the help of a well – labeled diagram, describe the structure of a flame.

Ans. A flame is the visible gaseous part of a fire.

A flame consists of mainly three zones:- Innermost zone, middle zone and outermost zone.



(i) **Innermost zone :** It is the dark zone. It consists of unburnt wax vapours produced by the melting of wax a black colour to this region. It is least hot.

(ii) **Middle zone :** It is the luminous zone. It gives a bright yellow light. It is moderately hot. This zone is the major part of a candle flame.

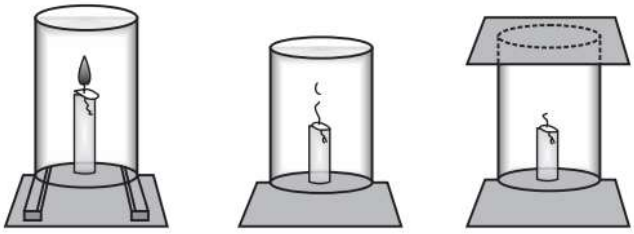
(iii) **Outermost zone :** It is the non-luminous zone or zone of complete combustion because of adequate supply of oxygen. No residue is left in this zone. It gives a blue flame. It is the hottest zone of a candle flame.

Q2. Demonstrate an experiment to prove that air is necessary for combustion.

Ans. To show that air is necessary for combustion :

Materials required : Candle, match box, glass chimney, glass plate, wooden block.

Procedure : Take a candle, light it and fix it on a table. Put a glass chimney over the candle and rest it on wooden blocks in such a way that air can enter through the chimney.



Remove the block and let the chimney rest on the table. After some time, put a glass plate over the chimney.

Observations :

(i) In the first case, when the candle is placed on the wooden blocks, the candle continues to burn.

(ii) In the second case, when the candle is placed on the table, the candle stops burning after some time.

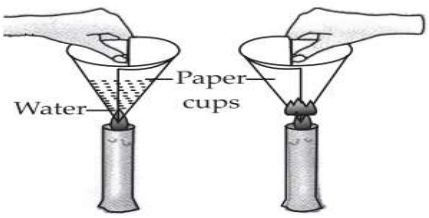
(iii) In the third case, when the chimney is covered with a glass plate, the candle stops burning immediately.

Conclusion : Air is essential for combustion of a fuel.

Q3. How will you prove that, it is essential for a substance to reach ignition temperature to burn? Demonstrate it by an experiment?

Ans. To show that it is essential for a substance to reach ignition temperature to burn :

Materials required : Paper cups made by folding a sheet of paper, water, two burning candles.



Procedure : Take two paper cups. Take some water in one cup and keep the other cup empty. Heat both the cups with the help of burning candles. Keep heating the cup with water for some time.

Observations : Empty cup starts burning immediately but the cup containing water does not burn. When we continue to heat the cup containing water, water in the cup starts boiling.

Conclusion : The heat supplied to the cup is transferred to water by conduction. So in presence of water, the ignition temperature of paper is not reached hence, it does not burn.

Q4. What is a fire extinguisher? Describe the working of

a) Dry powder type fire extinguisher.

b) Foam type fire extinguisher.

Ans. Fire extinguishers are the devices or substances which put off fire through the following ways:

(i) Cutting off the supply of oxygen to the combustible substance.

(ii) Reducing the temperature of the combustible substance below its ignition temperature.

(iii) Removing the combustible substance.

(a) Dry powder type:

These fire extinguishers release a lot of dry powder of chemicals like sodium bicarbonate (baking soda, NaHCO) or potassium bicarbonate. The baking soda decomposes to release carbon dioxide gas. There are various mechanisms by which the dry powder is released over the fire.

$$\underset{\text{Sodium Bicarbonate}}{2NaHCO_3} \xrightarrow{\text{Heat}} \underset{\text{Sodium carbonate}}{Na_2CO_3} + \underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{Water}}{H_2O}$$

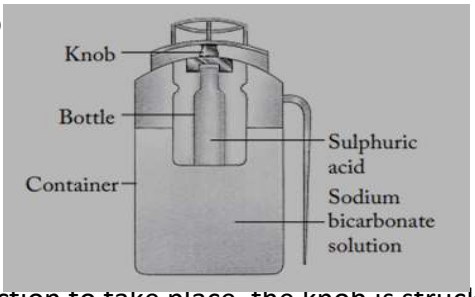
(b) Foam type:

In this type of fire extinguisher, a solution of aluminium sulphate is kept in the glass bottle instead of sulphuric acid. On hitting the knob, it releases a large quantity of carbon dioxide foam. The foam completely covers the burning object. Foam type fire extinguishers are very useful in controlling fires caused by burning oil.

$$\underset{\text{Sodium bicarbonate}}{6NaHCO_3} + \underset{\text{Aluminium sulphate}}{Al_2(SO_4)_3} \longrightarrow \underset{\text{Sodium sulphate}}{3Na_2SO_4} + \underset{\text{Aluminium hydroxide}}{2Al(OH)_3} + \underset{\text{Carbon dioxide}}{6CO_2}$$

Q5. Explain the construction and working of a soda – acid type fire extinguisher with the help of a labeled diagram.

Ans. Construction: It contains sodium bicarbonate solution. The small bottle contains sulphuric acid. This bottle is attached to the kno



Working : For a chemical reaction to take place, the knob is struck. The bottle breaks and sulphuric acid reacts with sodium bicarbonate liberating large amount of CO_2 gas with great force.

$$\underset{\text{Sodium bicarbonate}}{2NaHCO_3} + \underset{\text{Sulphuric acid}}{H_2SO_4} \rightarrow \underset{\text{Sodium sulphate}}{Na_2SO_4} + \underset{\text{Water}}{2H_2O} + \underset{\text{Carbon dioxide}}{2CO_2}$$

It forms a blanket around the fire, cutting off the air supply, due to which the fire gets extinguished.

Page 69-71

Subject Enrichment

B. Practical Based Questions

Q1. Arrange a thin glass tube as shown in the given diagram. Place a candle in such a way that its wick points one end of the glass tube. Light a candle. Now bring a lighted matchstick near the other end of the glass tube.

a) In which zone of a candle flame, one end of the glass tube is introduced, so that the other end is burst into flame when a lighted matchstick is brought near its mouth?

b) What is it that produces a flame?

c) What do you conclude from the above demonstration?

Ans. a) The glass tube is introduced into the dark zone of a candle flame.

b) The wax in the dark zone of the flame near the heated wick melts and the vapours rise up the glass tube. These vapours burst into flame when a lighted matchstick is brought near its mouth.

c) The above demonstration concludes that the dark zone has unburnt wax particles.

Q2. Why do goldsmiths blow upon a particular part of the flame in their work?

Ans. The goldsmiths blow upon the outermost zone of the candle flame because it is the hottest zone. Due to the high melting point of gold (1064°C) and silver (961.8°C) the goldsmith uses the hottest zone of candle flame.

C. Diagram Based Question

Q. Observe the following diagram and answer the questions that follow.

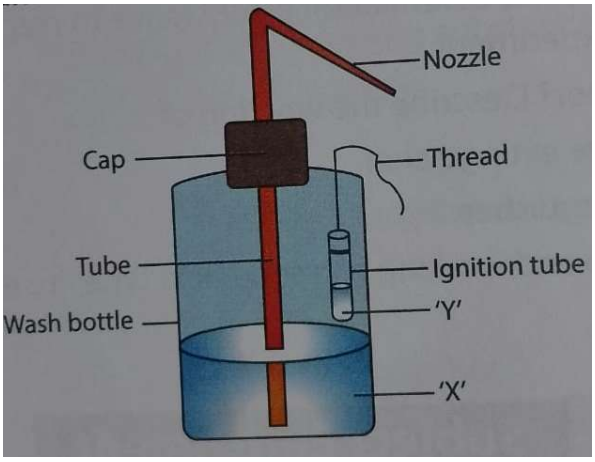
a) Identify the solutions 'X' and 'Y'.

b) Write down the reaction involved during the process.

c) What type of fire extinguisher is shown in the above diagram?

d) What is the principle behind the working of this type of fire extinguisher?

e) Which types of fires are extinguished by this fire extinguisher?



Ans. (a) Solution X is sodium bicarbonate solution and solution Y is sulphuric acid.

(b) $2NaHCO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + 2CO_2 + 2H_2O$

Sodium bicarbonate — Sulphuric acid — Sodium sulphate — Carbon dioxide — Water

(c) Soda-acid type fire extinguisher

(d) In soda-acid type of fire extinguisher, sulphuric acid is kept in a small glass bottle. This is immersed in a sodium bicarbonate solution. On striking the handle or the knob, the glass bottle containing the acid breaks and mixes with the baking soda. The reaction releases large quantity of carbon dioxide.

(e) This type of extinguisher acts on all types of fire except fire due to electrical and inflammable liquids.

D. Value Based Questions

Q1. CNG is now being widely used in India as a substitute of petrol. But everyday Ridhi goes to office by driving her own car which runs on petrol.

a) How does the use of petrol in the automobiles affect the environment? Why is CNG considered as a better fuel than petrol?

b) Suggest her some ways of conserving the natural resources like petrol.

Ans. (a) Fuels like diesel and petrol produce sulphur dioxide (SO) and different oxides of nitrogen.

CNG is a cleaner fuel. It burns completely without leaving any residue. It has a higher calorific value and low ignition temperature. However, it has handling and safety issues.

(b) Same ways to conserve petrol are :

i) Increase the use of public transport.

ii) Educate people about the importance and origin of natural resources.

iii) Use of electric vehicles.

Q2. While going back to his hometown on the weekend , Anurag observed many villagers using traditional chullas for cooking purposes.

a) What are the harmful effects of using traditional chullas over smokeless chullas?

b) How will you persuade villagers who burn wood for cooking to use LPG?

Ans. a) Traditional *chullas* have a higher risk of health hazards. It increases indoor air pollution, so it effects the health of householders. It takes more time for cooking as it is very difficult to handle.

b) LPG has many advantages over wood as it is less harmful to the living organisms. LPG is a gaseous fuel while wood is a solid fuel. LPG has a higher calorific value than wood and therefore it is a better fuel than wood. LPG is a cleaner fuel and does not give smoke when burnt. It can be easily transported through pipelines.

Page 71

HOTS Questions

Q1. In an experiment 9.5 kg of fuel X was completely burnt. The heat produced was measured to be 1,90,000 kJ.

a) What is the calorific value of the fuel X?

b) Which is a better fuel – fuel X or methane (calorific value : 50,000 kJ /kg) ?

c) Arrange the fuels in increasing order of their calorific values: Biogas , cow – dung cake , Fuel X

Ans. (a) Calorific value of fuel = $\frac{1{,}90{,}000\ kj}{9.5\ kg}$ = 20,000 kJ/kg

(b) Higher the calorific value, better is the fuel. Therefore, methane with calorific value (50,000 kJ/kg) is a better fuel than fuel X with calorific value (20,000 kJ/kg).

(c) Cow-dung cake , Fuel X , Biogas.

Q2. Now a days, for running automobiles like cars, trucks and motorbikes, internal combustion engines are being used.

a) What are internal combustion engines?

b) How does internal combustion engine work?

c) What are the advantages of using it?

Ans. (a) An engine in which the ignition and combustion of the fuel occur within the engine itself is called internal combustion engine.

(b) In the process of internal combustion, the entire combustion process takes place within the engine. After that, the engine converts the released energy into work. There is a moving piston and a fixed cylinder in the engine. When the combustion gas expands, it pushes the piston and as a result, the crankshaft starts rotating. Eventually, through a gear system in the powertrain, the engine of the vehicle is driven by the created motion.

(c) **Advantages of internal combustion engine :**

(i) The size of the engine is very small as compared to external combustion engine.

(ii) It is safer to operate.

(iii) Its starting time is very less.

(iv) It has high efficiency than external combustion engine.

CHAPTER 8
Force and Pressure

SOLUTIONS

Page 122

Sci. Quest

Q. Every object exerts a gravitational force on every other object. If this is true, then why don't two objects in a room move towards each other due to this force?

Ans. In order to notice the gravitational force of attraction that act between the two subjects, it is necessary that one of the objects should have extremely large mass as compared to the other. The two objects in a room do not move towards each other because they have small mass and so the gravitational force of attraction between them is very week.

A. State True or False for the following statements:

1. True
2. False : The shape of an object is also changed by external or internal force.
3. False : Gravitational force is the force that acts on all bodies on the Earth at all times.
4. False : Electrostatic force is also used to control air pollution by separating solid pollutant particles from smoke given out from factories.

B. Fill in the blanks:

1. Rest 2. Pull 3. Contact 4. Magnetic

C. Match the columns:

S.No.	Column I	Column II
1.	Animals use muscles to pull carts and plough fields	Muscular force
2.	Paper clips attracts towards the U- shaped magnet	Magnetic force
3.	Force between a negative and positive charge	Electrostatic force
4.	Falling of an apple from a tree	Force of gravity

Page 125

Sci. Quest

Q. What is the upwards force in a liquid called?

Ans. Buoyant force or up thrust

Page 126

Sci. Quest

Q. At higher altitudes, fountain pens start leaking. Why?

Ans. At higher altitudes, fountain pens start leaking due to the low atmospheric pressure.

Page 127

A. State true or false of the following statements:

1. True 2. True 3. True 4. True
5. False: Narrow strap will put more pressure due to small surface area.

B. Fill in the blanks:

1. Directly 2. Bottom 3. Atmosphere 4. High 5.Pascal (N/m2)

Page 129-130 Exercise

Objective Questions

A. Choose the correct option:

1. (c) : Force cannot change the chemical properties of a body.
2. (a) : Greater than at sea level
3. (a) : In the direction of applied force
4. (d) : All forms of matter exert pressure.
5. (a) : Increase the area of contact and reducing pressure on their heads.

B. Fill in the blanks:

1. Contact 2. Decrease 3. Friction 4. Speed 5. Barometer

C. Match the columns:

S.No.	Column I	Column II
1.	Pressure	Force/Area
2.	Manometer	Liquid pressure
3.	Frictional force	Contact force
4.	Magnetic force	Non-contact force
5.	Barometer	Atmospheric pressure

D. State true or false of the following statements:

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

E. Circle the odd one out:

1. **Knife :** All other works on the principle of pressure.
2. **Volume :** Pressure is Force/Area.
3. **Fall :** All other are forms of push or pull.
4. **Frictional force :** It is a contact force, while rest are non-contact forces.

Subjective Questions

A. Very Short Answer Questions

Q1. Does a force acting on a body always cause a change in its state of motion?

Ans. A force does not necessarily cause motion. Force must be sufficient to move the object.

Q2. What do you call the force which can act from a distance?

Ans. Non-contact forces do not need physical contact between objects. They can act from a distance.

Q3. What will be the resultant force when two forces act in opposite directions on an object?

Ans. When two forces act on an object in opposite directions, then the magnitude of the net force acting on the object will be the difference between the two forces. This net force will act in the direction of the larger force.

Q4. What will happen in tug – of – war match when two teams pull equally hard?

Ans. In a tug-of-war, when two teams pull equally hard, then neither team will move, and it will be a tie.

Q5. Which force can be used to gather iron nails scattered on the floor?

Ans. Magnetic force exerted by magnets can be used to gather iron nails scattered on the floor.

B. Short Answer Question

Q1.Sudhir applies a force of 20N on a box of area 25cm^2. How much pressure does he exert on the box?

Ans. Force = 20 N, Area = 25 cm^2 = 0.0025 m^2

$$\text{Pressure} = \frac{Force}{Area} = \frac{20\ N}{0.0025\text{m}^2} = 8000\text{Pa} = 8\text{kPa}$$

Q2. If the area of your head is 20cm $\times$ 20 cm, how much air (in weight) would you carry on your head?

Ans. Area = 20 cm $\times$20 cm = 400 $\times$ 10^{-4} m^2,

Atmospheric pressure, $P = 1.01 \times 10^5$ Nm^{-2}

Force = Area $\times$ Pressure

Force = (400 $\times 10^{-4} \times 1.01 \times 10^5$) N

Force = (400 $\times$ 1.01$\times$ 10) N

= 4000 N

Q3. Take a pencil sharpened at one end and hold it between the index fingers of both your hands and press if from both sides. Which end will hurt you more and why?

Ans. The sharpened end will hurt more due to smaller surface area leading to high pressure.

Q.4 Why do deep-sea drivers wear special suits ?

Ans. Sea divers wear special suits to protect themselves from the tremendous pressure of deep water under the sea.

Q5. What is the force ? State various effects of force.

Ans. A push or a pull on an object which tends to change its state of rest or of motion.

Effects of force: (i) A force can move a stationary object.

(ii) It can stop a moving object

(iii) Force can change the speed of a moving object.

(iv) Force can change the direction of moving object.

(v) Force can change the shape or size of an object.

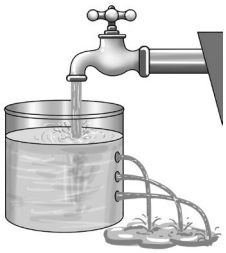
C. Long Answer Questions

Q1. Prove that the pressure exerted by water at the bottom of the container depends on the height of its column.

Ans. To show that liquids pressure varies with depth.

Materials required : A plastic container and water.

Procedure :



(i) Take a plastic container and punch three holes at different heights.

(ii) Now, pour some water into it and let the water flow through these holes.

(iii) Observe the pressure with which water comes out from the holes.

Observation : Water from the lowest hole comes out with the greatest pressure and falls at the maximum distance. On the other hand, water from the topmost hole comes out with the least pressure and falls at the minimum distance.

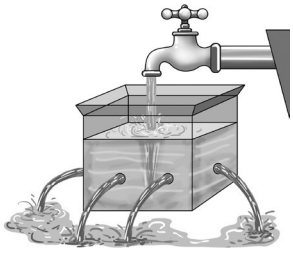
Conclusion : Liquids pressure varies or increases with depth.

Q2. Explain that liquids exert equal pressure at the same depth.

Ans. To show that liquids exert equal pressure in all directions at same depth.

Materials required : A plastic square shaped box and water flowing tap.

Procedure :



(i) Punch four holes in the box at the same height.

(ii) Now, pour some water into it and let it flow through these holes.

(iii) Observe the force with which water comes out from the holes.

Observation : Water comes out from all the holes with the same force and falls at the same distance.

Conclusion : Liquids exert the same pressure in all directions at the same depth.

Q3. What are non – contact forces? Explain different types of non – contact forces.

Ans. Forces that do not in physical contact with the object are called non-contact forces. The various kinds of non-contact forces are as follows :

(i) **Magnetic force :** The force exerted by a magnet on magnetic material like iron, nickel and cobalt is called magnetic force .e.g - Small nails are attracted by a magnet, a magnet attracts to another magnet etc.

(ii) **Electrostatic force :** The force exerted between electric charges is called electrostatic force.

e.g. If we rub a plastic object such as a pen, comb or CD with our dry hair and bring it close to tiny bits of paper etc.

Q4. With the help of an experiment show that air has pressure.

Ans. Take a balloon and we will observe that balloon gets inflated or gets bigger in size when we blow air (mixture of gases) in it with our mouth. But, if we keep on blowing air into the balloon, it will burst because the material of the balloon would not be able to withstand the increasing pressure of air. This shows that air (mixture of gases) exerts pressure.

Q5. Explain the following:

a) School bags are provided with wide straps to carry them.

b) The walls of a dam are thicker near the bottom than at the top.

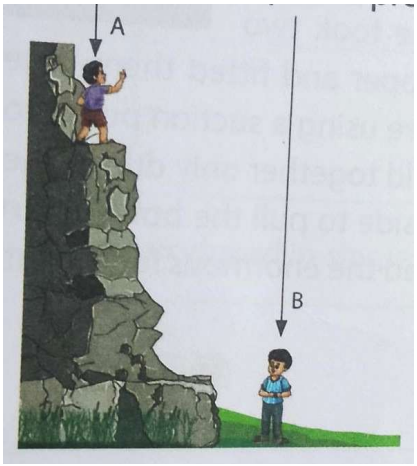
Ans. (a) The school bag has wide strap to increase the surface area in contact with the shoulders and reduce the pressure on the shoulder

(b) The pressure of liquid increases with depth. Therefore, thicker walls near the bottom of a dam is to withstand higher pressure.

Page 131-132 Subject Enrichment

B. Practical Based Questions

Q1. The balloon shown here is filled with water. Ashish wants to make a hole in the balloon so that water comes out with maximum pressure. At which point should he make the hole? Give reason to support your answer.



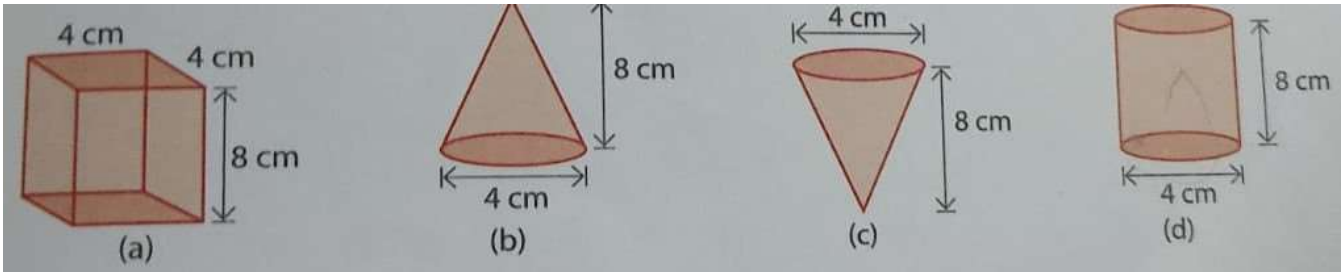
Ans. Here, at the 'S' point of balloon, the pressure will be maximum and water comes out with maximum speed. It is due to water height in balloon.

Q2. At which position in the given figure is the atmospheric pressure more and why?

Ans. According to figure, the atmospheric pressure is more at B than A because as we go upto the height, the air became thin and we feel less air pressure than ground.

C. Diagram Based Question

Q. Which of the following objects exert the maximum pressure on the floor and why? (All objects have the same mass).



Ans. According to all diagrams, diagram (c) has smallest contact area with surface so, it exerts the maximum pressure on the floor.

$$\text{Pressure, } P = \frac{\text{Force } (F)}{\text{Area } (A)}$$

D. Value Based Question

Q. Rani is a student is working on a research program on scrap metal recycling. She visited a garbage area where a heap of garbage from various industries and factories is being collected. She saw how iron objects are picked up from the heap of garbage and segregated for recycling. Can you explain the method used in this situation and which force is utilized in this process?

Ans. The magnetic separation method is used in this situation. The magnetic force is utilised in this process. A big magnet fitted to crane to pick up iron objects from heap of garbage.

Page 132

HOTS Questions

Q1. Would you be able to suck juice with a drinking straw on the moon?

Ans. We can not able to suck juice with a drinking straw on moon because there is no atmosphere and no atmospheric pressure. The working of straw depends on the surrounding pressure of atmosphere to push juice into our mouth.

Q2. Riya says that water exerts pressure on the bottom of a container whereas Priya says water exerts pressure on the sides of the container. What would you like to say?

Ans. Both are right in this situation. Liquids exert the same pressure in all directions at the same depth.

CHAPTER 12

Some Natural Phenomena

SOLUTIONS

Page 179

Sci. Quest

Q. When two identical balls A and B (A having charge of +4e) are touched together. What will be the charge A and B after touching?

Ans. Here, we will assume that body B is initially neutral in charge. When two identical bodies touch each other, their charges will be equally distributed among themselves. *i.e.*, $\frac{4e+0}{2} = \frac{4e}{2} = 2e$

Hence, each body will get a charge of 2*e*.

Sci. Quest

Q. When a charged glass rod comes nearer to paper bits, the paper bits are attracted by glass rod. Why?

Ans. When a charged body is brought near to an uncharged body, the uncharged body is charged. So, when a charged glass rod comes nearer to paper bits, the paper bits acquire an opposite charge to that of the glass rod, and get attracted by glass rod.

Page 180

A. Fill in the blanks:

1. Nucleus 2. Positive, negative 3. Conduction 4. Attract 5. Coulomb

B. State True or False of the following statements:

1. False: They repel each other.
2. True 3. True 4. True 5. True

Page 181

Sci. Quest

Q. Why is it not advisable to lie flat on ground in an open space during lightning?

Ans. It is not advisable to lie on flat ground in an open space during lightning, instead squat low on the ground.

If you squat down, you are minimizing your chances of being struck because it makes you smallest target for lightning.

Page 184

Sci. Quest

Q. As you know that the tectonic plates are in continuous motion then , why don't you feel tremors all the time?

Ans. The tectonic plates are in continuous motion but we don't feel tremors all the time because this movement is very gradual, at a scale that is difficult for humans to perceive.

A. Fill in the blanks:

1. Seismometer 2. Seismic focus 3. Tsunamis 4. Electric discharge 5. Crust

B. State True or False of the following statements:

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

Page 186-188

Exercise

Objective Questions

A. Select the correct option:

1. (c) : More protons than electrons 2. (a) : Charging by conduction. 3. (c) : Induction
4. (a) : Crust and upper layer of the mantle. 5. (b) : Moderate

B. Fill in the blanks:

1. Induction 2. Epicentre 3. Richter 4. Lightening conductor 5. Richter scale

C. State True or False of the following statements:

1. True 2. True 3.True 4.True
5. False : The corresponding magnitude is very severe consequence of earthquake.

D. Match the columns:

S.No.	Column I	Column II
1.	Richter Scale	Magnitude of earthquake
2.	Electroscope	Detect the charge
3.	Electric current	Flow of charges
4.	Tectonic plates	Lithosphere
5.	Lightning Conductor	Copper plate

E. Circle the odd one out:

1. **Electroscope :** It is a device used to detect and measure the electric charge on a body, while rest are the instruments used in earthquake monitoring and measurement.
2. **Insulation :** All other are methods of charging.
3. **Lightning :** All others are the after effects of earthquake.
4. **Atom :** All other have charges.

Subjective Questions

A. Very Short Questions

Q1. Which layer of the Earth is fragmented?

Ans. Crust is the outermost layer of the Earth. It is in the form of fragments called tectonic plates.

Q2. Give names of two states in India where earthquakes are more likely to strike.

Ans. In India, the areas of Kashmir, Western and Central Himalayas, the whole of North-East, Rann of Kutch, Rajasthan and the Indo-Gangetic Plain are most threatened zones of earthquake.

Q3. Name the branch of science which deals with the study of earthquakes.

Ans. The branch of science that deals with the study of earthquakes is called seismology and the scientists who study the behaviour of earthquakes are called seismologists.

Q4. What is meant by earthing?

Ans. Earthing serves as a protective measure against electric shock by providing a pathway for excess charges to flow into the ground.

Q5. What happens when amber is rubbed with fur?

Ans. Amber gets positive charge and fur gets negative charge.

B. Short Answer Questions

Q1. Explain how earthing help us to protect buildings.

Ans. Earthing protects buildings by providing a safe pathway for excess electrical charges to flow into the ground. This helps to prevent the buildup of dangerous currents, reducing the risk of electrical fires and ensuring the safety of people inside the building.

Q2. List some safety measures that protect yourselves from lightning.

Ans. Some of the indoor and outdoor safety measures to be followed during lightning are as follows :

(i) A car or a bus is safe and shut the windows of the vehicle,

(ii) Do not stand on a high ground,

(iii) Do not stand under a tree and take shelter inside a building.

Q3. Explain why an atom is electrically neutral.

Ans. An atom has an equal number of positively charged protons in their nucleus and negatively charged electrons orbiting around the nucleus. The opposite charges balance each other, resulting in no net charge on the atom. Moreover, neutrons present in the atom have no charge. Hence, an atom is electrically neutral.

Q4. Classify the earthquakes on the basis of readings on the Richter scale.

Ans. Earthquake are classified on the basis of the readings on the scale as follows :

(i) 0 - 2 : Unnoticed

(ii) 2 - 4 : Felt but not damaging

(iii) 4 - 6 : Moderate

(iv) 6 - 8 : Severe

(v) 8 - 9 : Very severe

Q5. Enlist some safety measures to be followed during an earthquake.

Ans. Safety measures to be followed during an earthquake are:

(i) We should move to an open space.

(ii) We should not take shelter under trees or buildings.

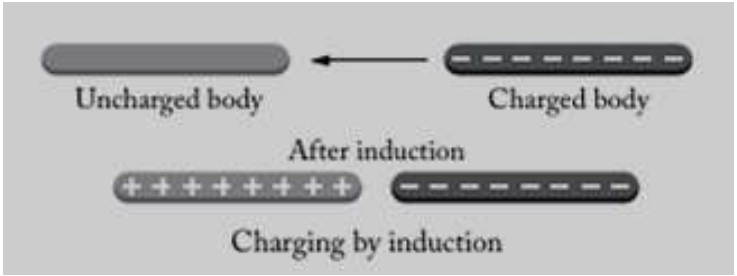
(iii) If we are driving, we should slow down the vehicle and move slowly away from that area to a clear spot.

C. Long Answer Questions

Q1. Explain the process of charging a body by induction. Give the types of charges acquired by two bodies with diagram.

Ans. Charging by induction : When a charged body is bring near to an uncharged body (without touching), the uncharged body is charged. This process of charging is called charging by induction.

In this process, the body which is being charged acquires an opposite charge to that of the body charging it.



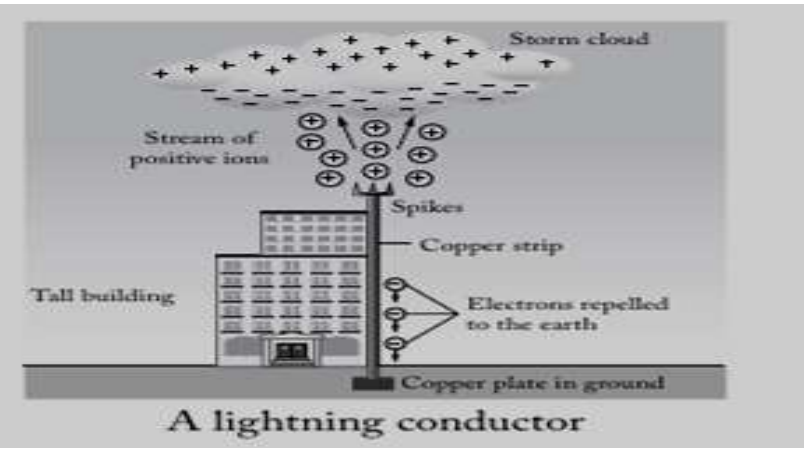
Q2. Explain the mechanism of lightning.

Ans. In development of a thunderstorm, the air currents move, upwards and water droplets move downwards. Due to such movements of air currents and water droplets, the positive and negative charges separate from each other. The positive charges accumulate near the upper edges of the clouds and negative charges accumulate near the lower edges. Due to the induction, a positive charge also accumulate near the ground. As air is poor conductor of electricity, but the charge is quite large so negative charges

meet the positive charges and produces a streak of bright and sparkling light along with loud sound. This phenomenon is called electric discharge and the streak of light is called lightning. Electric discharge can also take place between two clouds of unlike charges and between clouds and earth. It causes damage to property and life.

Q3. Explain the working of a lightning conductor with the help of a labeled diagram.

Ans. During electric discharge or thunder, some charge accumulate on tall buildings, poles, wires and trees by induction. Due to the accumulation of large amount of charge, sometime, it catches fire. So, to protect the buildings from such damage, we use a device called lightning conductor. It is a long metallic rod which is installed in the walls of building during construction. One end of the rod is kept out in air at the top and the other end is deep buried in the ground along with copper plate. It provides a low resistance path to the ground. If lightning strikes, the charge flows to the earth by lightning conductor without damaging the building.



A lightning conductor

Q4. Explain the transfer of charge with the help of an activity.

Ans. To demonstrate the transfer of charge.

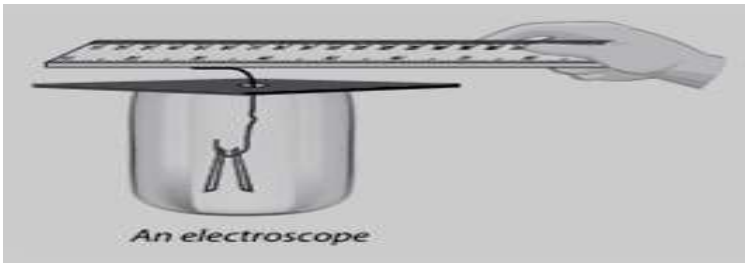
Materials required: An empty glass jar with wide mouth, cardboard sheet, paper clip of metal, aluminium foil, and a plastic scale.

Procedure:

1. Place an empty glass jar on a smooth horizontal surface.
2. Cover its mouth with a cardboard and pierce a small hole in the cardboard sheet.
3. Open the paper clip and insert its one end in the hole as shown in the figure.
4. Take two small pieces of aluminium foil and hang on the paper clip
5. Now, charge the plastic scale by rubbing it with dry hair An electroscope and then touch it with the other end of paper clip.

Observation: The two aluminium foils at the bottom of the paper clip repel each other.

Conclusion : The scale is charged and this charge is transferred to the aluminium foil by paper clip. As the nature of charge is same on aluminium foils, so they repel each other.


An electroscope

Q5. Explain how an earthquake occurs.

Ans. An earthquake occurs when there is a sudden release of energy in the earth s crust, leading to the generation of seismic waves. This release of energy is usually caused by the movement of tectonic plates beneath the earth s surface. The tectonic plates are in continuous motion. When the plates brush past

one another or collide each other, they cause disturbance in the earth s crust, which arises earthquake. As the earthquakes are caused by the movement of plates, the plates are in the weak zones where earthquakes are more likely to occur. These zones are known as seismic zones or fault zones.

Page 188-189 Subject Enrichment

B. Practical Based Questions

Q1. If you rub a plastic pen refill with a polythene or a woolen cloth, will it get charged? Justify your answer with reasons.

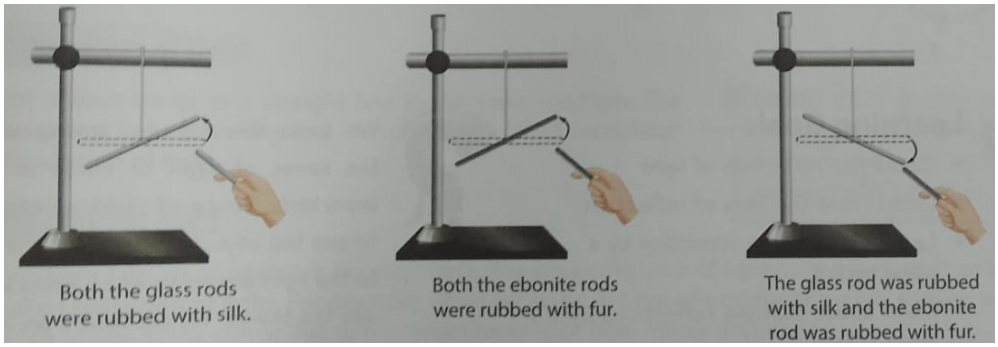
Ans. If we rub a plastic pen refill with a polythene or a woollen cloth, both the plastic refill and the polythene or woollen cloth become charged. If the charges are similar, they will repel each other and the charges are opposite, they will attract each other.

Q2. What will happen if the rod of a lightning conductor accidentally broke?

Ans. If the rod of a lighting conductor accidentally broke, then heavily charged flow through the conductor and it get easily find another conductive path through the building. It can cause a fire and damages of building.

C. Diagram Based Questions

Q. Look at the pictures given below and complete the following sentences.



a) Both glass rods are _____ charged.

b) Both the ebonite rods are _____ charged.

c) The glass rod and ebonite rod had _____ charges.

d) The glass rod and ebonite rod get _____ to each other.

Ans. (a) Positively (b) Negatively (c) Opposite (d) Attracted

D. Value Based questions

Q. One day, Rakesh is sitting in his office and feel that the Earth is shaking that means there is an earthquake. One of his teammate is old aged. What do you think Rakesh do to help his teammate? What he has to suggest to other teammates during earthquake? What first step he has to take just after the earthquake?

Ans. Rakesh should immediately guide his old teammates to stay away from outer walls, windows and hanging objects and seek shelter under study table or desk. He should advise other teammates to do the same. After the earthquake, Rakesh should initiate an evacuation if necessary and check for injuries, ensuring everyone is accounted for and providing first did if needed.

Page 189

HOTS Questions

Q1. Why houses are made up of timber and mud in earthquake prone area?

Ans. Houses are made up of timber and mud in earthquake prone areas because the damage will not be heavy or too much when the structure falls.

Q2. A charged body loses its charge if we touch it with our hand. Why?

Ans. Human body is a conductor of electricity. So, when we touch a charged body, our body conducts its charge to the Earth.