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NEW VISION OF SCIENCE

Teachers Manual

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CHAPTER - 1 : CROP PRODUCTION AND MANAGEMENT

A. 1. c, 2. a, 3. c, 4. b, 5. d, 6. b, B. 1. Kharif crops, 2. Leveller, seed drill, 3. broadcasting, 4. levelled, 5. manuring, 6. traditional, **C.** 1. Agriculture, 2. Cereals, 3. Levelling, 4. Plough, 5. Ammonium phosphate, 6. Sprinkler irrigation, 7. Nitrification, 8. Agricultural Implements, **D. 1.** The practice of growing crops is called agriculture. **2.** There are two main crop seasons in India–Rabi season and kharif season. Crops grown in kharif season are called **kharif crops**. Crops grown in rabi season are known as **rabi crops**. **3.** The tools which are used in cultivation of plants are known as **agriculture implements**.

Name of implement	Uses
Leveller	For levelling and pressing the soil
Seed drill	For sowing the seeds
Wooden plough	For loosening and turning the soil
Khurpa spade	For removing the weeds

4. The unwanted plants growing along with the main crop in a field are known as **weeds**. Weeds may be removed either by uprooting them or by cutting them with the help of tools like handfork, trowel (khurpa) and harrow. They can also be removed by chemical and biological means. **5.** Irrigation refers to artificial application of water to the soil for assisting the growth of crops. **6.** Nitrogen fixation is the process of converting free nitrogen gas of the atmosphere into nitrogen compounds making. **7.** Grains should be dried before storage as the moisture present in the grains will spoil them. **8.** The breeding, feeding and caring of domestic animals for food and other useful purposes is known as **animal husbandry**. **E. 1.** Advantages of ploughing in agriculture are: • It allows the roots to reach deeper into the soil. This helps to fix the plant more firmly to the ground. • It helps in trapping air in the soil, which is necessary for roots to 'breathe'. • It helps the soil to retain moisture for a longer duration. • It helps in bringing nutrient-rich soil to the top. • It helps the soil to mix well with fertilizers. • It helps in the removal of undesirable plants called **weeds**. 2. Crops are attacked by rodents (rats) and insects (locusts, weevils and termites which eat or damage the crops, are called **pests**. Crops are also attacked by **bacteria**, **fungi** and **viruses** which reduce yield by causing several diseases. Pests and microorganisms can be controlled by using two methods–chemical control and biological control. **Chemical Control:** Chemical control involves spraying of chemical substances which kills the pests. Spraying can be done by a sprayer or by a low flying aircraft.

Pesticides : The chemical substances which kills the pests are called pesticides. Following are common pesticides used for different types of pests: **Rodenticides** used to kill rodents. Zinc phosphide and warfarine, are common rodenticides. **Insecticides** used to kill insects. DDT, BHC and Malathion are common insecticides. **Fungicides** used to kill fungi. **3.** To maintain the fertility of soil, farmers add fertilizers to the soil. A fertilizer is a man-made inorganic compound which supply specific nutrients to the soil. The nutrients they supply are nitrogen (N), phosphorus (P) and potassium (K). There are three main types of fertilizers. (a) **Nitrogenous fertilizers:** Nitrogenous fertilizer is a nitrogen containing fertilizer. For example, ammonium nitrate , potassium nitrate, urea, etc. (b)**Potassium fertilizers :** Potassium fertilizer is a potassium containing fertilizer. For example, potassium sulphate , potassium nitrate, etc. (b) **Phosphatic fertilizers :** Phosphates fertilizer is a phosphate containing fertilizer. For example, ammonium phosphate , super phosphate, etc. **4.** The main practices of crop production are : • Selection of soil • Preparation of soil (by ploughing, levelling and applying fertilizes) • Selection of seeds and sowing • Manuring • Irrigation • Weeding • Crop protection • Harvesting • Storage of grains **5.** Some of the methods of sowing seeds are discussed below: **Broadcasting:** Sowing seeds manually by directly scattering them into the soil is called **broadcasting**. It is the traditional method used in most parts of the country. It results in unequal distribution of seeds over the area and wastage resulting in reduced crop yield. **Seed drill :** Seed drill is a sowing device that sows the seed precisely in the soil at proper depth and distance and then covers them with soil. It protects the seeds from birds and also saves time and labour. **6.** Nitrogen and oxygen combine in the atmosphere during lightning to form nitrogen oxides. The same happens during combustion in factories or in engines of motor vehicles. These oxides react with rain water to form dilute nitric acid. The nitric acid reacts with minerals in the soil to form nitrates. Plants take in these nitrates through their roots and convert them into proteins. Animals obtain proteins they need by eating plants or by eating flesh of other animals. When plants and animals die, the nitrogen compounds are broken down to give ammonia. This process is known as **ammonification**. Nitrifying bacteria convert ammonia into nitrates. This process is called **nitrification**. Nitrates may be stored in humus or leached from the soil and carried to lakes and streams. They may also be converted to free nitrogen by denitrifying bacteria through a process called **denitrification**, and returned to the atmosphere. This process of circulation of nitrogen between the atmosphere, soil, plants and animals is called the **nitrogen cycle**. **7.** Irrigation refers to artificial application of water to the soil for assisting the growth of crop. Methods of irrigation can be considered under two main

categories–traditional and modern methods. (a) Traditional methods: Canal irrigation, furrow irrigation, chain pump, moat (pulley system), dhekli and rahat (water wheel) are some of the traditional methods of irrigation. These methods are cheaper, but often lead to wastage of water. (b) **Modern methods:** Modern methods of irrigation help in saving water. Some modern methods of irrigation are–sprinkler irrigation and drip irrigation. (a) Sprinkler irrigation: This method involves pumping water under pressure through nozzles and spraying it over soil like artificial rain. This method is particularly effective for irrigating uneven land and areas having sandy soil. (b) Drip irrigation: This method involves the use of pipes or tubes with very small holes to deliver water drop by drop directly at the base of each plant. This method is very useful for areas having shortage of water supply. **8.**

Manure	Fertiliser
1. Manure is formed from dead plants and animals wastes by the action of microbes.	Fertiliser is produced in factories from chemicals.
2. Manure is not nutrient specific.	Fertiliser is nutrient specific.
3. It is not harmful to the environment.	It is harmful to the environment.
4. It is a difficult to transport.	Light and easy to transport.
5. It is prepared in fields.	It is prepared in factories.
6. It is organized in large amount.	It is required in small quantities.
7. Biodegradable	Non-biodegradable
8. It is not absorbed quickly by the plants.	It is soluble in the water and absorbed in the water.

HOTS: 1. Farmers grow pea plant with wheat crops because crops like wheat use up a lot of nitrogen from the soil this lost nitrogen is replaced when pea plant, a leguminous plant which transfers nitrogen in soil, **2.** Drip irrigation will be preferred if there is shortage of water as this method involves the use of pipes and tubes with very small holes to deliver water drop by drop directly at the base of each plant.

CHAPTER : 2 – MICRO ORGANISMS

A. 1. c, 2. b, 3. c, 4. a, 5. c, 6. a, **B.** 1. Lacto bacillus, 2. Mushroom, 3. Amoeba, Paramecium, Euglena, 4. Microscope, 5. Germs, 6. Yeast, **C.** 1. T, 2. F, 3. T, 4. T, 5. F, 6. F, **D.** 1. Bacteria, 2. Ringworm, 3. Yeast, 4. Chlamydomonas, 5. Tobacco mosaic virus, 6. Virus, **E. 1.** There are five major groups of microorganisms. These are as follows: (a) Bacteria(singular: bacterium) (b) Algae (singular: alga) (c) Protozoa (singular: protozoan) (d) Fungi (singular: fungus) (e) Viruses (singular: virus) **2.** The different types of bacteria are: (a) Spiral (Spirilla) (b) Spherical (Cocci) (c) Curved (Commas) (d) Rod Shaped (Bacilli) **3.** Algae are plants like organism which contain chlorophyll and can make their own food. Algae may be unicellular or multicellular. They also exist in the form of colonies. Apart from the green pigment, algae also have other coloured pigments. Some varieties of algae are Chlamydomonas, Volvox, Chlorella. **4.** Some of the bacteria and fungi are used in the manufacture of medicine called **antibiotics**. Antibiotics are also used to control microbial diseases in plants and also animals. **5.** Mostly bacteria and fungi are the microbes that damage food. They make poisonous compounds called **toxins** which when consumed make us ill. This is called **food poisoning**. **6.** 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. **F. 1.** Microorganisms may occur as a single cell or a collection of cells. They are found everywhere–in air, in water, in soil, and also inside the bodies of living organisms. They can survive in severe conditions in snow, hot springs (temperature of 100°C), marshlands, salt water and at the bottom of the sea. **2.** Microorganisms like bacteria and fungi are used to make **vaccines**, which protect humans and other animals from several diseases. Diseases such as cholera, typhoid, tuberculosis, hepatitis, chickenpox and smallpox can be prevented by vaccination. Vaccines consist of dead or weakened microbes. When these are swallowed or injected into the body of a patient, the body produces **antibodies** to fight them. The antibodies remain in the body and protect it from any future attack of the disease germs. The body is then said to have developed **immunity** against the disease. Vaccination is therefore called **immunization**. **3.** Fungi spoil food due to fermentation and by releasing toxins in the food. Fungi damage stored books, papers, leather and shoes particularly during the rainy seasons. Fungi spoil our crops by causing diseases like blight of potato and rust of wheat. Fungi cause diseases in human beings like food poisoning and skin diseases like ringworm, eczema and athlete's foot. **4.** Virus does not have a cellular structure like other microorganisms. Viruses cannot reproduce by themselves, respond to changes or use energy or grow. This seems to indicate that viruses are not living organisms. However, when a virus enters the living cell of an

organism, say a human, it is able to reproduce. It uses the energy of the host cells for this purpose. **5.** Food can be preserved by the following methods: Refrigeration : Freezing stops the growth and multiplication of microbes but does not kill them. Frozen food after it is removed from the refrigerator should not be left in the open for long as the microbes will start multiplying again. Adding sugar : Fruits and vegetables can be preserved in the form of jams and jellies by adding sugar. Sugar removes water from cells and hence prevents the growth of microbes. **Salting**: Fruits and vegetables can be preserved by using salt and then drying. Salt prevents the growth of microbes. Pickling : Raw mangoes, lemons, gooseberries and vegetables like cauliflowers, onions and cucumbers are preserved in vinegar or brine to give it a sharp spicy flavour and eaten with other fruits. **Sun drying**: Microbes cannot grow in dry conditions. So, water is removed from some vegetables like cauliflowers and fruits like mangoes by drying them in the sun. **Canning:** Canning is done to pack or preserve food or drink by putting it in sealed, airtight containers. **Boiling**: Boiling liquid food items can kill microbes. Milk and water are boiled to kill harmful microbes present in them. **HOTS: 1.** We should wash our hands before and after taking food to protect ourselves from diseases caused by microorganisms present in our hands. **2.** Curd sets faster in summer than in winter as high temperature is favourable for the growth of Lactobacillus bacteria which is involved in the process fo making curd.

CHAPTER : 3 – SYNTHETIC FIBRES AND PLASTICS

A. 1. a, 2. c, 3. d, 4. a, 5. a, 6. a, **B.** 1. Rayon, 2. Nylon, 3. Acrylic, 4. Thermosetting, Thermosplastic, 5. Bakelite, Melamine, 6. Terylene, **C.** 1. Fibre, 2. Synthetic polymers, 3. Rayon, 4. Nylon, 5. Polyester, 6. Acrylic, **D. 1.** A polymer is a long chain-like unit consisting of a large number of smaller molecules joined to each other by chemical bond. **2.** The process of combining the monomers to form a polymer is called **polymerization**. **3.** Rayon is called **regenerated fibre** because the original raw material, cellulose, is broken and then reformed. This makes it stronger and easier to dye in a variety of colours. **4. Uses of Nylon :** • Garments such as sarees are made from nylon. Since it is wear-resistence, garments made from it last for a long time. • Since it is a strong material, hence it is suitable for making tracksuits, stockings and socks. • Nylon ropes are used to climb on the mountain. **5. Properties of Polyester** • Polyester is compact and do not occupy much space. • The fabric can be washed and also dried quickly. **6.** Advantages of synthetic fibres • Mostly fibres can handle heavy loads without breaking. • They dry up quickly. Disadvantages of synthetic fibres: • Some fabrics made from synthetic fibres, catch fire easily and it is dangerous to wear them near a source of fire. • They do not absorb water or

sweat and are not comfortable to wear during summers. **7.** Thermoplastic can be given desired shape by melting when desired. They can be repeatedly heated and then moulded into any desired shape. Thermosetting plastics : A plastic substance which does not soften much on heating and can be mouled only once is called a thermosetting plastic. They cannot be given another shape by melting again. They are hard plastic. **E. 1.** The polymers which occur in nature are called **natural polymers**. For example, cellulose, silk, wool, proteins, etc. are natural polymers. The polymers which are made in laboratories and factories are called **man-made** (or **synthetic**) polymers. For example, nylon, polythene, polyvinyl chloride and teflon are some synthetic polymers. **2.** Rayon was prepared towards the end of the nineteenth century. Rayon is made from cellulose obtained from wood pulp. Wood pulp is first dissolved in an alkaline solution. The thick liquid produced is then passed through tiny holes to make fibres. The fibres are hardened by passing them into a bath of sulphuric acid. The fibres are then spun into yarn and woven into cloth. Rayon is called regenerated fibre because the original raw material, cellulose, is broken and then reformed. This makes it stronger and easier to dye in a variety of colours. Properties of Rayon: (a) Rayon does not melt. (b) Rayon is lustrous and shiny. (c) Rayon burns at a high temperature . (d) Its absorbs sweat. (e) Its is an extremely absorbent fibre. Uses of Rayon : (a) It is soft and comfortable like cotton. Its a good fibre for clothing. (b) It is used for making ties, suits, shirts, blouse, jackets, stockings, etc., (c) Rayon mixed with wool is used for making carpet. (d) Home furnishing like blankets, bed sheets , table cloth, etc. are made from rayon fibres. **3.** Nylon was the first synthetic fibre to be made entirely of chemicals. It was first produced in 1930 by the scientist at the Du Pont from coal, air, and water. It is a polymer made from two monomers by a process called **condensed polymerization**.

Properties of Nylon: • Nylon is strong and elastic. • It is light, wrinkle-resistant and easy to wash. • It dries quickly. • It is not attacked by moulds. • Nylon absorbs very little water. **4.** Acrylic is a light, soft warm synthetic fibre like wool. It is cheap, does not shrink wrinkle resistant. It is obtained by polymenisation of Acrylic nitrate monomer. It is used for making shawls, carpets, blankets, etc. Acrylic paints are used for painting. **5. Properties of Polyester:** • Polyester is compact and do not occupy much space. • The fabric can be washed and also dried quickly. • Polyester is not attacked by moulds. • Polyester is strong, lightweight, unaffected by water and resistant to sea salts. • It is resistant to stretching and shrinking. **Uses of Polyester** • Being lightweight and unaffected by water and seasalt, polyester is used for making sails for boats. • It is also used to make jackets, pants, shirts and other garments. Its water resistant property makes it ideal for garments and jackets that are to be in wet and damp environment. • PET is a form of polyester used to make bottles, utensils, wires, etc. • Polyester films are

used for making tapes in audio cassettes and floppy disks. **6.** Plastic refers to a material that could be moulded into desired shapes. Plastics are also polymers like synthetic fibre. There are two types of plastics: • Thermoplastic, • Thermosetting plastics.

Thermosetting plastics and thermoplastics differ from each other in following ways:

Thermosetting plastic	Thermoplastic
1. Thermosetting plastics are the polymers in which chains get highly cross-linked on heating.	1. Thermoplastics are long chain polymers with no cross-linking. Heating also does not produce any cross-linking between the chains.
2. Once moulded, thermosetting plastics cannot be reprocessed. Example; Bakelite, Melamine-formoldehyde resin.	2. Thermoplastics can be processed repeatedly. Example: Polythene, PVC, Polystyrene, Nylon, Polyesters, etc.

HOTS: 1. Do it yourself, 2. Nylon is a thermoplastic material-meaning it is a solid when cool but becomes moldable above a specific temperature, plastic like material, it melts on heating.

CHAPTER : 4 – METALS AND NON-METALS

A. 1. c, 2. d, 3. b, 4. d, 5. a, 6. d, **B.** 1. Metals, non-metals, metalloids, 2. non-metal, metal, 3. ductile, malleable, 4. silver, 5. Mercury, 6. Copper oxide. **C.** 1. Copper, 2. Water gas, 3. Iron, 4. Sodium, 5. Bronze, 6. Statues, medals, **D. 1.** "The minerals from which metals can be profitably extracted are called **ores**". **2**. Wires are used to match electric cables because they are good conductors of electricity. **3. Differences between Metals and Non-metals**

Physical Property	Metals	Non-metals
1. Ductility	Mostly metals are ductile.	Non-metals are not ductile.
2. Hardness	Most metals are strong and hard.	Non-metals are brittle and not so strong and hard.
3. Luster	All metals are lustrous.	Non-metals are not lustrous except graphite and iodine.

4. Malleability	Most metals are malleable.	Non-metals are not malleable.
5. Conductance of heat and electricity	Metals are good conductor of heat and electricity	Non-metals are bad conductors of heat and electricity.

4. Iron reacts with moisture and oxygen to form brown flaky substance called **rust**. **5.** An arrangement of metals in decreasing order of reactivity is called the reactivity series of metals. **6.** Copper is used for making electrical wires, utensils, etc. Copper is a good conductor of electricity. Copper coils are used in electrical transformers and motors. It is a reddish brown metal.

E. 1.

Physical Property	Metals	Non-metals
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5. Conductance of heat and electricity	Metals are good conductor of heat and electricity	Non-metals are bad conductors of heat and electricity.

2. Corrosion is the process of slow eating away of a metal due to its reaction with moisture and oxygen. (a) Iron reacts with moisture and oxygen to form brown flaky substance called rust. (b) Copper reacts with oxygen in air to form copper oxide. When it is exposed to moist air in the atmosphere for long time, copper vessels acquire a greenish layer on them. This green material is a mixture of a copper hydroxide $\{Cu(OH)_2\}$ and copper carbonate ($CuCO_3$).

$$2Cu + \underbrace{H_2O + CO_2 + O_2}_{\text{moist air}} \longrightarrow \underbrace{Cu(OH)_2 + CuCO_3}_{\text{malachite green}}$$

Silver objects get blackened and lose their shine after sometime. This happens because silver reacts with hydrogen sulphide, present as a pollutant in air, to form a black coating of silver sulphide. **3. (a) Reaction with oxygen** Metals**:** Metals combine with oxygen to form metal oxides. (a) Sodium reacts vigorously with oxygen present in air to form sodium oxide. As a result, it catches fire if left in open.

$$\underset{\text{Sodium}}{4Na(s)} + \underset{\text{Oxygen}}{O_2(g)} \longrightarrow \underset{\text{Sodium oxide}}{2Na_2O(s)}$$

To prevent this reaction, it is stored in kerosene. Magnesium on heating burns in air with dazzling flame to form magnesium oxide.

$$\underset{\text{Magnesium}}{2Mg} + \underset{\text{Oxygen}}{O_2} \longrightarrow \underset{\text{Magnesium oxide}}{2MgO}$$

4. Reaction with water: Metals: Most metals react with water to form hydroxides or oxides and hydrogen.
Sodium, calcium and potassium react with water to form hydroxides along with hydrogen gas.

$$\underset{\text{Sodium}}{2Na(s)} + \underset{\text{Water}}{2H_2O(l)} \longrightarrow \underset{\text{Sodium hydroxide}}{2NaOH(aq)} + \underset{\text{Hydrogen}}{H_2(g)}$$

Magnesium reacts with warm water to form magnesium hydro oxide.

$$\underset{\text{Magnesium}}{Mg(s)} + \underset{\text{Hot Water}}{2H_2O(l)} \longrightarrow \underset{\text{Magnesium hydroxide}}{Mg(OH)_2(aq)} + \underset{\text{Hydrogen}}{H_2(g)}$$

Aluminum too forms an oxide but this oxide forms a protective layer over the metal.

$$\underset{\text{Aluminium}}{2Al(s)} + \underset{\text{Water}}{3H_2O(g)} \longrightarrow \underset{\text{Aluminium oxide}}{Al_2O_3(s)} + \underset{\text{Hydrogen}}{3H_2(g)}$$

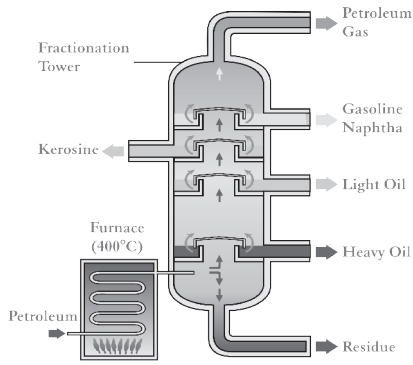
Iron react with steam when it is heated strongly.
Non-metals: Non metals do not react with water or steam. **5. Uses of copper :** Copper is used for making electrical wires, utensils, etc. Copper is a good conductor of electricity. Copper coils are used in electrical transformers and motors. It is a reddish brown metal. **Uses of zinc:** Zinc is used in coating iron sheets to prevent rusting of iron. It is used to make electrodes of dry cell. **Uses of aluminium:** Aluminum is very light in weight. It is used in packing of medicines and food material. **Uses of iron:** Iron is a very strong metal. It is extensively used in the construction of bridges, factory equipments, buildings and other engineering works. **Uses of oxygen:** It is used in the breathing support system by patients . **Uses of nitrogen:** It is used in the manufacture of ammonia, nitrogenous fertilizers, nitric acid, explosives, etc. **6.** An alloy is a mixture of two or more metals or a metal and a non-metal. Alloys are made to improve upon the characteristics of metals. **Advantages of making alloy are:** (a) Alloys are

stronger, harder, resistant to corrosion and better conductors. For example, iron is strong but corrodes easily. When alloyed with chromium and nickel in stainless steel, it does not corrode. (b) The composition of alloys can be altered according to the requirement. For example, iron mixed with a small amount of carbon gives steel used for making screws and nails. But stainless steel is used to make cooking utensils. **HOTS: 1.** Mercury is a liquid at room temperature. Jewellery are made of gold and not of mercury because mercury is reactive while gold is a noble metal and does not react. **2.** Electronic wires are not made of silver though silver is a good conductor of electricity because silver is expensive. **3.** Sodium reacts vigorously with water to form sodium hydroxide. As a result, it catches fire if left open. Hence it is stored in kerosene.

CHAPTER : 5 – COAL AND PETROLEUM

A. 1. a, 2. c, 3. b, 4. c, 5. a, 6. a, B. 1. natural, 2. fossil, 3. fuels, 4. carbonization, 5. fractional distillation, 6. coal, C. 1. T, 2. F, 3. T, 4. F, 5. T, 6. F, D. 1. Natural resources, 2. renewable resources, 3. non-renewable resources, 4. LPG, 5. carbonization, 6. fossil fuels. **E. 1.** Sunlight, air, water, soil and minerals are called natural resources because all these are obtained from nature for human needs and comforts. **2.** Fossil fuels are carbon-rich deposits, such as coal, petroleum and natural gas, made over millions of years by slow decomposition of remains of ancient plants and animals on the earth. **3.** The slow process of conversion of wood into coal is called **carbonization**. **4.** On the basis of carbon content in coal, it can be classified into four main varieties. • Anthracite has highest carbon content up to 96 per cent of carbon and is regarded as the best variety of coal. It is hard, black and lustrous. • Bituminous coal has about 65 per cent carbon. It is used for domestic purpose and in steel and iron industries. • Lignite has about 40 per cent carbon. It is generally used as power plants to produce electricity. • Peat has the lowest carbon content. It is soft and easily compressed. **5.** Some common use of coal are given below: • Coal is used as a fuel. • Coal is used for the manufacture of coke, coal tar and coal gas. • Coal is used for the manufacture of synthetic petrol and synthetic natural gas. **6.** Petroleum was formed due to the decomposition of the organisms living in the sea under high temperature, high pressure and in the absence of the air. The remains of the dead organisms sank to the bottom of the sea. Gradually these were covered by sand and clay. Over a period of millions of years, these remains got converted into petroleum under the combined effect of high temperature, high pressure and bacteria in the absence of air. The petroleum so formed passed through porous rocks until it got trapped between some impervious (non porous) rocks. **F. 1.** Renewable resources : Renewable resources are those that will never run out, or those that are replaced within a reasonable period of time through natural processes. For example, sunlight

is a renewable resource which will never run out as the sun is expected to last for billions of years. Oxygen is also renewable resource because it is replaced in the atmosphere as plants give out oxygen during photosynthesis. **Non-renewable resources:** Non-renewable resources are those which once used up cannot be replaced within a short period of time. They need to be used cautiously as their supply is limited. For example, fossil fuels like coal, petroleum and natural gas take millions of years to form. Therefore, once used up, these resources cannot be renewed before millions of years. Similarly, topsoil takes hundreds of years to form. Once the topsoil is eroded it will not be replaced immediately. **2.** The breaking up of coal by heating it 1000-1400° C in the absence of air (or oxygen) is known as the **destructive distillation of coal**. The products obtained from destructive distillation of coal are: **Coke :** The residue left behind when destructive distillation of coal is carried out is coke. It is an almost pure form of carbon. It is a good fuel and burns with no smoke. It is also used to reduce metal oxides, such as iron and zinc oxides, to get the metals. **Coal gas:** It is a mixture of hydrogen, methane, carbon monoxide and other gases. It was earlier used for domestic cooking and lighting, but is not much in use nowadays. **Coal tar:** Coal tar contains several carbon compounds. On fractional distillation, it produce many important compounds like benzene, toluene, naphthalene, phenol, etc. **Ammoniacal solution:** It is a solution of ammonia and its compounds and sulphur compounds. It is obtained as a byproduct in the destructive distillation of coal. It is used for the production of fertilizers. **3.** Petroleum consists of a large number of hydrocarbon mixed with sea water, and silt (fine clay). The various hydrocarbons present in petroleum have different boiling points. As the number of carbon atoms of hydrocarbon increases, its boiling point also increases. This property is used to separate the different components of petroleum by fractional distillation. Fractional distillation is a method of separating a mixture of substances with different boiling points to obtain a number of components with similar boiling points. These components are called fractions.



Fractional distillation of petroleum

4.

Fraction	Boiling point	No. of carbon atoms	Products obtained/Uses
Petroleum gas	Below 40°C	1-4	LPG (liquefied petroleum gas)
Gasoline and naphtha	40°-170°C	4-10	Petrol- motor fuel, aviation fuel, Solvent for dry-cleaning.
Kerosene	150°-240°C	10-16	Kerosene- domestic fuel, jet engine fuel
Diesel oil	220°-350°C	16-20	Automobile fuel
Lubricating oil	Above 350°C	30-40	Waxes and polishes

5. Natural gas can be compressed under high pressure to obtain Compressed Natural gas (CNG). The CNG can be easily transported through pipelines. CNG is now being used as a fuel for automobiles, in cars, buses and scooters, etc. On burning, CNG does not produce any smoke. Its products on burning are carbon dioxide and water. It leaves no ash on burning. Therefore, CNG is a clean (or environment friendly). **HOTS: 1.** No, fossil fuels are non-renewable energy resources and take millions of year to form. We cannot make them in a laboratory. **2.** Non-renewable resources are exhaustible because they cannot be renewed on their own once they are exhausted.

CHAPTER : 6 – COMBUSTION AND FLAME

A. 1. c, 2. d, 3. b, 4. b, 5. d, 6. b, **B.** 1. sand, glass, 2. combustible substance, 3. sodium bicarbonate, 4. dark zone, 5. low, 6. solid, **C.** 1. T, 2. T, 3. T, 4. T, 5. T, 6. T, **D.** 1. carbon dioxide, 2. hydrogen, 3. 50000KJ/kg, 4. Non-luminous zone, 5. wax, 6. SO_2 (Sulphur dioxide) **E. 1.** The process of burning of substances in air with the release of heat and light is known as **combustion**. **2.** A substance that does not burn in air to produce heat and light is called a **combustible substance**. Wood, paper, kerosene and LPG are examples of combustible substances. A substance that does not burn in air or oxygen are called **non-combustible substances**. Water, sand, glass and cement are examples of non-combustible substances. **3.** There are certain conditions necessary for combustion which are as follows : (a) Presence of a combustible substance (b) Presence of a supporter of combustion, i.e., oxygen (c) Attainment of ignition temperature of a combustible substance. **4. Luminous flame:** A yellow flame which produces heat and appreciable amount of light is called luminous flame. **Non luminous flame:** A blue coloured flame which produces very little light at the base of the flame is called non-luminous flame. **5.** Calorific value of a fuel can be defined as the amount of heat liberated when one kilogram of the fuel is completely burn in sufficient supply of oxygen. **6.** Combustible Substance such as wood, coal, gas, or oil which are burned to produce heat or power are known as fuels. **F. 1.** Combustion can be divided into three types: rapid combustion,

explosion and spontaneous combustion. · Rapid Combustion: In this type of combustion large amount of heat and light are released in a very short spam of time. · Explosion: This type of combustion is characterized by sudden release of heat, light and sound accompanied by the liberation of large amount of gas. Spontaneous Combustion: In this type of combustion, substances catch fire on their own, without the application of heat. For example white phosphorous. **2.** The method of extinguishing the fire involve the following: (i) Removing the combustible substance : This may not be possible at times it the combustible material is already burning. However, other combustible materials can be removed from the vicinity of the fire to prevent it from spreading. (ii) Cooling the substance to below its ignition temperature: This can be done by pouring water over the fire, water evaporates, taking away heat from the fire, which in turn cools down the burning material well below its ignition temprature. (iii) Cutting of the supply of air: This can be done by pouring sand or water over the fire. Sand cover the combustible substance and cut off the air supply. Water evaporates on heating and water vapour surround the combustible substance and cuts off the supply of air. **3.** Do it yourself, **4.** The flame has main zone depending on the amount of air it receives. The zone have different colours. (i) Non luminous zone : It is the outermost zone of the flame. It is also known as the zone of complete combustion and is the hottest part of the candle flame. (ii) Luminous flame : It is the zone of incomplete combustion and is moderately hot. The wax vapour do not burn completely as the supply of oxygen in inadequate. (iii) Dark Zone: It is the innermost zone of the flame. It is the zone of no combustion and is the least hot. (iv) The lowest blue zone: This zone is located at the base of the flame. The blue colour of this zone is due to the burning of the carbon monoxide produced in the dark zone due to incomplete combustion. **5**. Characteristics of good fuel: (i) It should be easy and safe to transport handle and store. (ii) It should have a high calorific value. (iii) Its ignition temperature should be neither too low nor too high. (iv) It should be cheap and readily available. (v) It should be not leave behind any solid residue upon burning. (vi) It should not cause air pollution. The closest to an ideal fuel is the natural gas. **Q.6.** Impact of Burning fuels on the environment. (i) Burning of a fossil fuel release ash and fine particles of unburnt carbon in air. Suspended particulate matter are also released which cause respiratory problems. (ii) Incomplete combustion of fossil fuels produces carbon monoxide. It is a lightly poisonous gas. (iii) Coal and diesel on burning release sulphur dioxide (SO_2) in the atmosphere. **HOTS:** 1. Combustible substances which are burned to produce heat & power are known as fuels like wood, coal, gas etc. But Combustible substances like paper or cloth though Combustion cannot be used for producing heat for cooking or other useful works like driving cars & engines. Hence all combustible substances are not fuel. 2. Green leaves contain a lot of water and hence prevents it from reaching ignition temperature easily. Hence it is difficult to burn green leaves.

CHAPTER : 7 – CONSERVATION OF PLANTS AND ANIMALS

A. 1. b, 2. a, 3. b, 4. d, 5. c, 6. d, **B.** 1. deforestation, 2. Madhya Pradesh, 3. Red, 4. 92, 5. Poaching, 6. Extinct, **C.** 1. T, 2. F, 3. T, 4. F, 5. T, 6. F, D. 1. Flora, 2. National parks, 3. Afforestation, 4. wildlife sanctuaries, 5. Gir forest, 6. Poaching, **E. 1.** The variation of the forms within a given ecosystem, biome or the entire earth is called biodiversity. **2.** The preservation and careful management of plants and animals species in order to prevent their extinction is called **conservation**. **3.** It is the planting of new trees in destroyed forest area to restore green forests. **4.** Deforestation is done for the following reasons: (a) For mining of minerals like coal, petroleum, ores, etc. (b) For building homes, factories, roads, railways tracks, dams, etc. (c) For forest products like wood, rubber, honey, etc. Wood is used in construction and for making furniture. **5.** The species that remain confined to a specific geographical area. **6.** These species have sufficient number of individuals in their natural habitat. **7.** Some of the threatened and protected species of India are : • Marsh crocodile • Monal pheasant • Bharat swamp deer • Gharial • Python • Albino snow leopard. **8.** A biosphere reserve is a specified area in which multiple use of land is permitted for preserving biodiversity plants, animals, wildlife and the traditional life of the tribal living in that area. **F. 1.** Deforestation has an adverse effect on our environment. It has following consequences: (a) In that causes carbon dioxide is increasing in the atmosphere because the absorption of carbon dioxide by plants is reduced and contributing to global warming. The higher temperature can affect the water cycle and many result in lower rainfall and drought. (b) Removal of forest leads to increased erosion of topsoil by wind and water. The soil thus loses its fertility gradually a fertile land gets converted into desert, this is called desertification. (c) Deforestation increases the pollution level on the earth and brings about climate changes. **2.** It is a group of population. The International Union for Conservation of Nature and Natural Resources (IUCN) or World Conservation Union (WCN) has identified the species of plants and animals, assessing the conservation status of various species and subspecies on a global scale. Plants and animals have been evaluated to have low risk of extinction are classified are given below : (a) Extinct Species, (b) Endangered Species, (c) Vulnerable Species. **3.** The International Union for Conservation of Nature and Natural Resources (IUCN) assesses conservation of species around the world. Information on population status of the endangered species provides in the Red Data Book. The IUCN maintains a Red list, which is compilation of endangered species. The Red Data Book and Red list show the risk of extinction of wildlife. The first Red Data Book based of animals was compiled in 1991. The Red Data Book species are classified into many categories, for example, critically endangered, vulnerable and endangered. The IUCN adopted a revised set of Red list categories in 1994. **4.** Killing of wild animals for hide, tusk, food, horn and musk. Hunting of rhinos, whales, seals, leopards, elephants and tigers, etc., have been in practice since time immemorial. Strict laws have

now been implemented to regulate hunting and fishing. Hunting, trapping and destruction of its natural habitat are the main causes of extinction of many animals. Illegal hunting of animals is called **poaching**. The hunting of endangered species is not allowed. Also, hunting of tigers is completely banned in India. Despite the ban, they are being regularly killed as their skin and bones fetch large amount of money. Effective implementation of such laws is therefore of extreme importance. **5.** One of the largest conservation programmes was launched in April 1973, for the purpose of saving the tiger population from extinction in India. In the beginning, nine reserves were identified Palamau (Bihar), Corbett (Uttarakhand), Melghat (Maharashtra), Manas (Assam), Kanha (Madhya Pradesh), Ramthambore (Rajasthan), Bandipur (Karnataka), Simlipal (Orissa), Sundarban (West Bengals). In these sites were protected for animals and plants. In India, the population of wild tigers was about 40000 at the turn of the century. By the government of India with the help of International agencies such as World Wildlife Fund was launched the project of conservation of tiger population. **HOTS: 1.** Both zoo and wildlife, sanctuary are natural environment. But in zoo they are not free to roam about, kept in cages and fed a specific food while in wildlife sanctuary they are free. **2.** No, because they are extinct.

CHAPTER : 8 – CELL : STRUCTURE AND FUNCTIONS

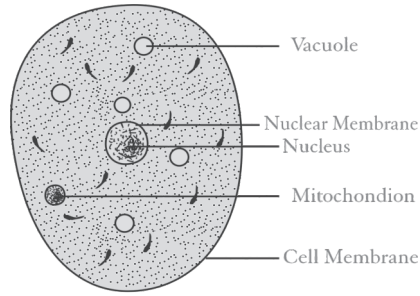
A. 1. d, 2. a, 3. a, 4. d, 5. a, 6. a, **B.** 1. cells, 2. naked, microscope, 3. powerhouses, 4. chloroplast, 5. cellulose, 6. multicellular, **C.** 1. cells, 2. pseudopodia, 3. organ, 4. hen's egg, 5. chromoplasts, 6. chromosomes, **D. 1.** An English scientist **Robert Hooke** discovered the cell in 1665. **2.** Organisms that are made up of a single cell and perform all their vital activities are called **unicellular organisms**. Organisms that are made up of more than one cell are called **multicellular organisms**. **3.** A group of cells that have similar structure and function constitute a tissue. **4. Prokaryotic cells** are the cells which do not possess definite nucleus but the nuclear material is in the form of a nucleoid dispersed in the protoplasm of the cell. Membrane bound organelles are absent in these cells, e.g., Bacterial cell, Blue-green algal cell, etc. **Eukaryotic cells** are the cells with well defined nucleus and distinct nuclear membrane. Organelles dispersed in the cytoplasm are membrane bound organelles, e.g., Animal cells and Plant cells. **5.** It is a jelly-like fluid present between the nucleus and the cell membrane. **6.** Plastics are the organelles especially present only in plants and certain bacteria like cyanobacteria. **E. 1.** An English scientist Robert Hooke discovered the cell in 1665. Robert Hooke looked at a thin slice of cork under the microscope that he had discovered, and saw that it was made up of many small box-like structures. The boxes were separated from each other by a partition. He called these boxes, cells. What Hooke actually observed were dead cells in the cork. However, the scientists of that period did not appreciate the importance of his work. Later, in 1838, two German biologists Mathias Schleiden and Theodor Schwann put forward the cell theory of life. **2.** A microscope is an instrument used for magnifying and observing things that our naked eyes cannot see. A microscope uses lenses that enlarge the size

of an image. A microscope can magnify objects more than a simple hand lens can. A microscope has two or more lenses and has special devices for lighting and focussing. The electron microscope is a more recent discovery that can magnify objects much more than a normal microscope. Electron microscopes have revealed the fascinating world inside the cell.

3. Difference between Plant cells and Animal cells is as follows:

Plant Cells	Animal Cells
1. Plant cells are almost straight that is quadrangular or hexagonal in shape.	Animal cells are round in shape.
2. Plant cells possess distinct cell walls which are protective in function.	Animal cells do not have any cell walls.
3. Plant cells possess special structures called as plastids. Plastids help plants to synthesis and store their food.	Animal cells do not have any plastids.
4. Lysosomes are absent or scanty in plant cells. In plant cells, vacuole is mostly one and large in size.	Lysosomes are mainly found in animal cells. In animal cells, vacuoles are many and smaller in size.
5. Cilia and flagella are absent in plant cells.	Cilia and flagella are present in animal cells.
6. Plasmodesmata provide connections between adjacent plant cells.	Strands of connective tissue provide connections between animal cells.
7. Higher plants do not possess centrioles in their cells.	Animal cells contain centrioles which help in cell division process.

4. STRUCTURE OF A CELL :



Structure of cell

5. The nucleus is the control centre of the cell as it controls all its activities. The nucleus is surrounded by a membrane called **nuclear membrane** and is filled with semisolid substance called nucleoplasm. The nucleoplasm contains thread-like structures called **chromosomes**. Chromosomes are organised structures of DNA and protein found in cells. They are single pieces of coiled DNA containing many genes. These are considered to be the vehicles of heredity as they carry genes. Genes are small points on the chromosome responsible for one character of an individual. Genes on chromosomes help in the inheritance or transfer of characteristics from the parents to the offspring. Chromosomes also contain DNA-bound proteins, which serve to package the DNA and control its functions. There is a nucleolus a round granule in nucleus, which contains a network of fibrous material called chromatin fibres. **6.** The process by which new cells are formed is known as **cell division**. Human beings and other multicellular organisms develop from a fertilized egg, or zygote, which is a single cell. After a cell grows to its maximum size, it divides and form two cells. These two cells further grow and divide, forming four cells. Thus, cells grow and divide over and over agin to form numerous cells. When plants and animals grow, their cells increase in number by dividing. Typical growth regions are the ends of bones, layers of cells in the skin and root tips and buds in plants. Cell division is also needed to: (a) heal wounds and (b) replace dead cells of skin and worn out red blood cells. **HOTS : 1.** Multicellular are more efficient because they have different organs to carry out different functions. This helps in division of labour and more organised working of various organ systems. **2.** Plant cells need a cell wall because they do not move from one place to another. Hence they require rigidity which is provided by the cell wall. Animal cells have other means of support, e.g., exoskeletons and endoskeletons. Cell wall is absent, animal cells have invased flexibility and advanced cell and specialisation. Plant cell need a cell wall because they do not have any other rigid support.

CHAPTER : 9 – REPRODUCTION

A. 1. c, 2. b, 3. c, 4. a, 5. d, 6. b, **B.** 1. Sperm, egg or ovum, 2. testis Ovary, 3. Menstrual cycle, 4. Metamorphosis, 5. Oviparous, 6. thyroxine and calcitonin, **C.** 1. Zygote, 2. Ovulation, 3. Placenta, 4. Pituitary Gland, 5. Binary fission, **D. 1.** Reproduction is the biological process by which individual organisms are produced. **2.** If the egg is not fertilized, then the egg, the lining of the uterus, blood and tissues are explelled from the vagina. This phase which usually last for 4-6 days, is called or menstruation. **3.** Sometimes fertilization is not possible in a human female due to blockage in the fallopian tube or due to any other reason. The sperm and the egg are made to fuse in a test tube and the fertilized egg is transferred to the

uterus where it grows and develops. This kind of fertilization is called In Vitro Fertilization (IVF). **4.** Hormones are the chemical substances secreted by endocrine glands to regulate many physiochemical functions in the human body. **5.** It involves the longitudinal or transverse splitting of an organism into two equal halves which develop into two separate individuals. **6.** The animals that give birth to young ones are called viviparous animals. The animals that lay eggs are called oviparous animals.
E. 1. Fertilization in humans takes place inside the female's body. Semen is deposited in the vagina and with it the sperm. Sperms move up with the help of a tail, towards the fallopian tubes. A single sperm fuses with a single mature egg. A single matured egg is released in the fallopian tube by one of the ovaries every month. In the fallopian tube, fusion of a sperm and an egg takes place and a zygote is formed. However, fertilization occurs only when the egg is fully mature. The zygote formed as a result of fertilization in the fallopian tube, travels to get implanted in the wall of the uterus. The zygote divides and develops into a ball of cells. The cells then divide further to form tissues and organs of the body. This developing structure is called an **embryo**. **2.** Male reproductive organs : These include a pair of testes, a pair of epididymis, two sperm ducts, a pair of seminal vesicles, urethra and a penis. Male reproductive glands include prostrate gland and Cowper's gland. (a) Testis is an endocrine gland in males. Testes are placed in a bag like structure called scrotum which descends from the abdominal region. Each testis is made up of coiled tubules which produce male gametes, sperms. Testis also secretes a hormone called testosterone which maintains entire reproductive activities that occur in a male. (b) Sperm duct is also known as vas deferens. They are two in number, each one arising from testis placed on either side. They transport sperms into penis. They also collect fluids secreted by different glands. These secretions are rich in proteins to enrich the sperms. Sperms along with these secretions form thick substance called as semen. (c) Penis is a muscular organ which transfers semen into female reproductive tract. Penis receives both urinary tube and sperm duct and serve as a common transporting organ for urine and semen. It opens out through a small tube called as urethra. **3.** These consist of a pair of ovaries, two oviducts, also called fallopian tubes, uterus, vagina and vulva. (a) Ovary is a enedocrine gland which serves as a gonad in females. They are two in number placed on either side of the abdomen. Ovaries are stimulated during onset of puberty and release one ovum in one menstrual cycle. (b) Oviducts or fallopian tubes are thin and long tubes conveying ovum to outside. Fimbriae located at the end of the fallopian tube grab the mature ovum released by ovary. They allow ovum to travel in the tube. (c) Uterus is a hollow muscular organ which has the capacity to bear the child. It is otherwise called womb. (d) Vagina lies at the end of uterus and allows uterus to contact the external environment. It is lubricated with

continuous discharge from the secretory cells lining the reproductive tract.

4. Difference between External fertilization and Internal fertilization is as follows:

External Fertilization	Internal Fertilization
1. Fertilization process occurs in the outside environment.	Fertilization occurs inside the female body.
2. Organisms of opposite sexes release their gametes into the same medium such as water.	Male discharges male gametes into the female body during copulation.
3. Development occurs completely in the outside environment.	Development takes place in the female body during gestation period.
4. Fishes and frogs exhibit external fertilization.	Human beings, cows and birds exhibit internal fertilization.

5. Changes in boys : (a) Boys increase in height as legs grow faster than other parts of the body. (b) Development of strong muscles. (c) Shape of the body changes as a result of broadening of shoulders and widening of chest. (d) There is a typical change in the voice due to enhanced growth in larynx forming a protruding structure called Adam's apple. Boys develop deep voice. (e) Active working of sweat glands resulting in the formation of sweat. (f) Sebaceous glands secrete much of oil which makes the skin glowing. Sometimes it also results in acne. (g) Intellectual, emotional and psychological maturity is attained. (h) Development of reproductive organs to produce gametes and secrete reproductive hormones. (i) Growth of facial hair and body hair under arm pits and pubic region. **Changes in girls:** (a) Girls exhibit rapid increase in height due to faster growth of legs. (b) Development of shaped muscles. (c) Development of broad shoulders and narrow waist. (d) Development of high pitched voice. (e) Sweat glands are active secreting lot of sweat. (f) Sebaceous glands secrete lot of oil and leads to development of pimples. (g) Growth of hair in the pubic region and

under arm pits. (h) Ovaries are active in the formation of follicles. They also secrete female sex hormones. (i) Females are mature and active in their reproductive phase. (j) Development of mammary glands under the influence of oestrogen hormone. (k) Females exhibit menstrual cycle during their reproductive phase.

6. Diffrence between Sexual and Aseaxual Reproduction is as follows:

Sexual Reproduction	Asexual Reproduction
1. It is a mode of reproduction which involves two parents in giving rise to offsprings.	It is a mode of reproduction which involves only one parent giving rise to offsprings.
2. Gonads, endocrine glands, bring about the process of reproduction.	Reproductive structures are not involved. Vegetative parts of individuls are used for the process of reproduction.
3. Sex cells develop by the process of meiosis.	Cells taking part do not undergo meiosis.
4. Gametes of opposite sex fuse to form a single cell, the zygote.	Gametes are not formed. Single parent cell gives rise to daughter cells.
5. Zygote undergoes different stages of development to give rise to new individual.	Time period involved in the production of new individual is less.
6. Time period involved in the production of offspring is more.	Single cell develops fast to give rise to new individuals.
7. Offsprings formed do not resemble the parents exactly. They exhibit variability.	Offspring formed are exact individuals of the parents.

HOTS : 1. Dolphin and whales are mammals, hence they give birth to young ones. **2.** No Metamorphosis is a biological process which involves drastic change in an animal's body structure due to cell differentiation.

CHAPTER : 10 – FORCE AND PRESSURE

A. 1. d, 2. a, 3. b, 4. d, 5. b, 6. c, **B.** 1. push, pull, force, 2. stationary, 3. contact non-contact, 4. Gravitational, 5. Electrostatic force, 6. zero, 7. depth, 8. Aneroid, **C.** 1. T, 2. T, 3. T, 4. F, 5. T, 6. F, 7. T, 8. T, **D.** 1. Force, 2. newton, 3. non-contact force, 4. one-sixth, 5. non-contact force, 6. Electrostatic force, 7. Atmospheric pressure, 8. Barometer **E. 1.** A push or pull acting on a body which tends to change its state of rest or of motion is called a **force** (F). **2.** Some forces act on bodies only when they are in contact with the body. These are known as **contact forces**. Muscular force and frictional force are **contact forces**. Some other forces can also act on bodies which are not in contact. These are known as **non-contact forces**. Gravitational force, magnetic force and electrostatic force are **non-contact forces**. **3.** The force caused due to the action of muscles in our body is called **muscular force**. **4.** The force acting between two surfaces in contact which opposes the motion of one body over the other, is called the **force of friction**. **5.** When the resultant of all the forces acting on a body is zero, the forces are **balanced forces**. When the resultant of all the forces acting on a body is not zero, the forces are **unbalanced forces**.**6.** The SI unit of force is **newton**. It is denoted by the letter N. Some other units used for describing force are : = Kilogram force, = Gram force. **7.** Pressure is force per unit area applied to an object in a direction perpendicular to the surface. The SI unit of pressure is newton per square metre (or N/m^2). **8.** The earth is surrounded by a layer of air called the atmosphere. We all live at the bottom of this layer. The air above presses down on us with a force equal to that exerted by a mass of 1 kilogram, on every square centimetre. This is called the atmospheric pressure. **F. 1.** When a force is applied on an objects it may have the following effects on it : (a) Force can change the direction of motion of a moving object : As a batsman hits a ball with his bat, he applies force to change the direction of the motion of the ball. (b) Force acting on a body can change its state of motion or rest : A force can make a stationary body move, e.g., when you hit stationary ball with hockey stick, it moves. A force can stop a moving body e.g., a fielder catches a moving cricket ball to stop its motion. A force can increase the speed of a moving object e.g., A force can decrease the speed of a moving object e.g., (c) Force can change the size and shape of a body by squeezing and pressing, you can change the shape of wet clay, you can pull a spring to extend it, or push the spring to compress it. (d) Force can slow down or completely stop a moving object : A moving toy bus can be made to stop by applying a force. A bicycle can be stopped or slowed down by applying the brakes. In football, the force applied by the goalkeeper stops the ball hit towards the goal. **2.** Many forces act on an object. However, it is the net force acting on the object that causes some effect on the object. This net force is called the resultant force. If two or

more forces act in the same direction, forces add up, so the resultant force is the sum total of all the forces and the object gains speed. Here forces applied by all add up and the person moves. Resultant force, $F = F_1 + F_2$ If two forces act in opposite directions, the total force acting on the object will be the difference of the two forces and the direction of the object moving will be along the greater force. $F = F_1$ (greater force) $- F_2$ (smaller force). When two or more forces act on a body in such a way that the resultant force is zero, the applied forces are called balanced forces and the object does not move. **3.** Given below are some illustrations based on effect of area on pressure. (a) The skiers use flat and long skies to slide on snow. This is because, due to larger area, pressure exerted on the snow will be lesser and the skier can easily slide without sinking into the snow. (b) The sledges are not provided with wheels. This is because wheels have lesser area of contact. Hence, it will exert high pressure on the snow and sink deeper into it. **4.** There are certain characteristics of pressure exerted by a liquid. These are as follows : (a) Pressure at a point in a liquid depends on its depth. (b) Pressure of a liquid is the same in all the directions at the same depth. (c) Pressure of a liquid does not depend upon the shape and size of a container. (d) Pascal's law: Pressure applied to a liquid is transmitted equally in all the directions. **5.** When air is pumped into bicycle tyre the shape of the tyre changes till they become taut. If you continue to pump air beyond this point, the tube may burst. The elasticity of the rubber walls can no more hold the air pressure inside the ball. The pressure is exerted by the air on the walls of the container that is holding it–in this case, the tube . All gases exert pressure on the walls of the container in which they are enclosed. So you can say that air exerts pressure in all directions. **6.** The drinking straw, the dropper, the syringe and different kinds of pumps use the fact that air exerts pressure. When the air inside them is pushed out, atmospheric pressure forces the drink, ink or medicine into their barrels. The atmospheric pressure is maximum at sea level and reduces as you go higher up, since the air becomes thinner. Jet planes fly at heights of about 10,000 m above sea level. At that height, atmospheric pressure is very low, and our blood pressure is much higher. This can result in bursting of blood vessels leading to problems like bleeding from the nose. At that height, the amount of oxygen in the air is also not sufficient for us to breathe. That is why the pressure within an aeroplane is maintained at the normal ground level atmospheric pressure. **HOTS : 1.** This is because the broad tyres reduce the pressure on the road and the tractor could easily move through. **2.** Since the rough surface does not match the surface of the rubber sucker, one cannot be kept out by pressing the sucker. The minor gaps between the rough surface & the surface allows air to enter and hence negative Pressure cannot be created. Thus the air pressure cannot hold the rubber sucker on a rough surface.

3. The air inside the inverted tumbler does not allow water to enter the tumbler and hence it is different to push it down. **4.** At that height the amount of oxygen in the air is also not sufficient to breathe. Therefore the mountaineers nose may start bleeding at great height.

CHAPTER : 11 – FRICTION

A. 1. d, 2. c, 3. a, 4. c, 5. c, **B.** 1. increase, 2. motion, 3. roughness, 4. lubricants, 5. body, **C.** 1. f, 2. e, 3. a, 4. b, 5. c, 6. d, **D.** 1. Coiled spring, 2. Friction, 3. Rolling friction, 4. Lubricant, 5. Aeroplane, **E. 1.** When a body slides (or rolls) over a rough surface, a force starts acting on a body in direction opposite to the motion of the body, parallel to the surface in contact. This force is called the frictional force or the force of friction. **2.** The bodies of birds and fishes have streamlined shape to reduce friction with the air and water respectively. The shapes of racing cars, boats and aeroplanes are so designed that is, streamlined, to reduce friction so that the resistance offered to their movement is less. **3.** To measure the force of friction acting on an object we use a device called spring balance. It uses the principle that the greater is force, the greater is the extension (stretch) that the forces produce in a coiled spring. **4.** The force of friction between the two surfaces in contact when one of them just slides over the other is called sliding (or kinetic)friction. **5.** The force of friction existing between the two surfaces in contact when one of them is rolling over other is called rolling friction. **F. 1.** Cars and buses are able to move safely on the road because of friction between the treaded tyres and the surface of the road. A matchstick lights up when rubbed against the side of a matchbox, due to heating effect of friction. Rub your hands together and soon afterwards up your face. You will feel your cheeks warm. Heat is produced from nowhere but the friction between your hands. Friction causes nails and screw to hold on to walls. **2.** It is sometimes desirable to increase friction between surfaces, for example, to avoid slipping. This can be done by making the surface rough in the following ways. (a) Friction can be increased by making the moving surfaces rough. Tyres have designs and pattern with grooves on the surface to increase resistance with on the road. (b) Sand and gravel is strewn on slippery ground during the rainy season to increase friction. It is then easier to walk on the ground. **3.** Irregularity between surfaces of the two bodies cause friction. when irregularity/roughness is more friction increases and decreases when the surfaces are smooth or lessened. **4.** Shoes with spikes increase friction and hence the footballers can grip the ground more firmly while running. **5.** A large amount of fuel is wasted while running machines to overcome friction. Friction wears out the rubbing surfaces, for example, sole of shoes, ball bearings, steps of foot over bridges at railway stations. Friction produces heat because the energy that is wasted in overcoming friction gets converted into heat. **HOTS : 1.** When we rub our hands

together, they become warm because friction produces heat. **2.** Friction helps in moving as it offers a grip. If there was no friction, we would slide while moving.

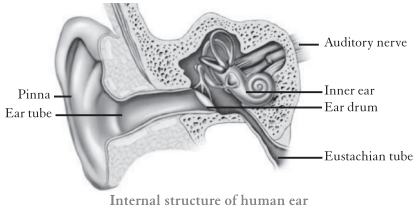
CHAPTER - 12 : SOUND

A. 1. d, 2. d, 3. d, 4. c, 5. a, 6. b, 7. c. **B.** 1. Solids, 2. Sound waves, 3. Hertz, 4. Solid, liquid, 5. Ear drum, 6. 20°C. C. 1. False, 2. False, 3. True, 4. False, 5. True, 6. True, 7. True, 8. False. **D.** 1. Vibration, 2. Frequency, 3. Pinna, 4. 1500 m/s, 5. Larynx, 6. 1450 to 1498 m/s, 7. Inaudible sound, 8. Sonar. **E. 1.** The maximum displacement of a bob from its mean position during oscillation is called amplitude. **2.** Echo is the reflection of sound. 3. The time taken to complete one oscillation is called the time period. Its SI unit is second. 4. The number of oscillations per second is called frequency of the oscillation. Its SI unit is hertz (Hz).

5. Difference between Musical sound and Noise

Musical sound	Noise
a. It is pleasant to our ears.	Noise is harsh to our ears
b. It is produced by periodic vibrations.	It is produced by irregular succession of disturbances.
c. There is no sudden change in amplitude of sound waves.	The amplitude of the wave change suddenly.

6. Percussion instrument— tabla, dholak. Wind instruments— flute, trumpet. **F. 1.** Sound can be reflected or absorbed. These properties of sound have many applications in our daily activities. We are all familiar with the echo. It is simply the reflection of sound by a hill or a large building some distance away. Sound is reflected from a surface in the same way as a ball bounces from a wall. The human ear can hear two sounds separately, only if they reach the ear at an interval of 1/10th of a second. If the two sounds reach us in less than 1/10th of a second, then the two sounds cannot be heard distinctly.



Internal structure of human ear

Thus, an echo can be heard only when: a. The minimum distance between the source of sound and the reflecting surface is around 17m. b. There is a high wall or high size building which can act as a reflecting surface. c. The sound is loud enough, so that it can be heard after reflection. When a sound

gets reflected for a number of times, its loudness gradually decreases. This overlapping of echoes is called reverberation. When sound waves fall on soft objects like wood, curtains, carpets, etc., part of it gets absorbed and do not reflect . This is called absorption of sound. **2.** How our ears catch sound : The ear has three main parts–the outer ear, the middle ear, and the inner ear. a. Outer ear : The part of the outer ear that is visible to us is called pinna. The pinna collects sound waves and directs them to the ear tube. At the end of the ear tube is the ear drum. The ear drum vibrates when sound waves strike it and transmits the sound to the middle ear. b. Middle ear: The middle ear is a cavity with three important ear bones. These three bones are placed in such a way that they move when the ear drum vibrates and, therefore, transmit the vibration to the inner ear. c. Inner ear : The inner ear is connected to the middle ear through a small opening. The inner ear is filled with a fluid. When this fluid vibrates, it excites tiny hair in the inner ear. These hair transform the vibrations into electrical impulses, which are then transferred to the brain via the auditory nerve. This is how we 'hear' a sound. **3.** a. Loudness (intensity) : It is the characteristic by which a loud sound can be differentiated with soft sound. The loudness of sound depends on amplitude. If the amplitude is high, the sound will be louder otherwise it will be a soft one. For example, when you strike a drum softly, it produce a soft sound. If you strike it hard, its skin vibrates with high amplitude and louder sound is produced. b. Pitch : The shrillness of sound, called it pitch. Pitch depends upon frequency of sound . If the frequency is high , pitch is also high . That is why female voice is shriller than a man's voice. c. Quality : It is the characteristic which differentiates between sounds produced by two instruments having same pitch and loudness. For example, sound produced by sitar, guitar and also sound by dholak and tabla are different . We can easily differentiate different sounds of two instruments without seeing them, because different instruments have different quality of sound . The quality of a sound is determined by the frequencies present in it and their relative loudness. **4.** The loudness or intensity of the sound is measured on a special type of scale called decibel (dB) scale.. If the intensity level of sound is in between 10 dB to 30 dB , it is most soothing to our ears. If the intensity level crosses 120 dB , it can cause headache and even permanent damage to our ears. Such loud sounds are called noise pollution. Noise pollution can have many health hazards as given ahead: a. It can cause high blood pressure. b. It can cause heart attack . c. The loud noise can cause permanent damage to ear . d. Too much noise can create headache. e. Lack

of concentration at work . Precautions: Following measures should be taken to control noise pollution: a. The vehicles should have silencers. b. Use of amplifiers and loudspeakers should be restricted. c. Sound absorbing materials like heavy curtains, cushions, etc., should be used in homes and offices. d. Enough plants should be planted near the human living area. e. Noise producing factories should be shifted to the outskirts of the cities.

5. $F = \frac{1}{T}$

So, $T = \frac{1}{F}$

$T = \frac{1}{4}$ sec

6.

$F = \frac{1}{T}$

$F = \frac{1}{0.002} = 500$ Hz

HOTS : 1. The frequency of a simple pendulum is less than 20Hz. Hence it does not produce sound. **2.** If you shout on the Moon no sound will be produced as there is no air on the moon.

CHAPTER : 13 – SOME NATURAL PHENOMENA

A. 1. a, 2. a, 3. b, 4. a, 5. a, 6. c. **B.** 1. proton, 2. attract, 3. friction, conduction, 4. Electroscope, 5. Earthquake, 6. Volcanic eruptions, man-made explosions. **C.** 1. F, 2. T, 3. T, 4. T, 5. F, 6. T, **D. 1.** Static charges, 2. negative charge, 3. positive charge, 4. valence electron, 5. conductors, 6. insulators. **E. 1.** Rubbing a ruler or a comb against dry hair develops a kind of force which can attract or repel tiny objects, This is called electrostatic force. The ruler, the comb, the balloons are getting electrically charged when they are rubbed against your hair or wool. These substances acquire electric charges. Since these charges are not flowing but are not stationary on comb or balloon, they are known as static charges. If these charges are not allowed to flow, they are termed as static electricity. **2.** a. Conductors: Substances which have a large number of free electrons on their surfaces and hence allow the current to pass through them are called conductors. b. Insulators: Substances which have only a few number of free electrons on their surfaces and hence do not allow the current to pass through them are called insulators. **3.** To protect the building from any damage from lightning and

thunder, a device called lightning conductor, is used. A lightning conductor is a long metal rod made of either copper or iron. The top end of the rod has many pointed spikes. The charge has a tendency to concentrate maximum near the pointed region. The other end of the copper rod is fixed to a metal plate and put inside the Earth. **4.** The electrons situated in the outermost orbit of an atom are called valence electrons. **5.** During thunderstorm, when a charged cloud passes over an uncharged cloud, the uncharged cloud gets an opposite charge. When two such clouds with opposite charges come closer to each other, the attraction becomes so strong that the electrons from the negatively charged cloud jump across the insulating air to reach the other cloud. This results in the release of huge amount of energy in the form of heat, light and sound, known as lightning. **6.** Every thirty seconds or so, the Earth shakes slightly. These tremors are too mild to be felt by us, but most of these are recorded by sensitive instruments. These instruments detect more than 9,00,000 tremors every year. These tremors are known as earthquakes. **F. 1.** Electronic Theory of Electricity: To understand electricity and its nature, we must understand the nature of matter. All matters consist of tiny units called atoms. An atom consists of three fundamental particles— protons, electrons and neutrons. An electron has negative charge and a proton has positive charge while neutron has no charge. The charge on a proton is equal to the charge on an electron. The atom consists of a centrally located nucleus, which has protons and neutrons. Hence, the nucleus is positively charged. The electrons carrying negative charge move around the nucleus in fixed circular orbits. The electrons which are in the orbits very close to the nucleus are strongly attracted by the nucleus. These electrons are called bound electrons. But as the distance between the nucleus and the orbits (hence electrons) increases, the attractive force gradually decreases. Hence, the electrons situated in the outermost orbit of an atom experience a weak attractive force towards the nucleus. The electrons situated in the outermost orbit are called valence electrons. Generally, in a solid these valance electrons can easily be removed from an orbit to move freely about its surface. These electrons, having almost no force of attraction towards the atom, are called free electrons. The atom as a whole is electrically neutral. But if some electrons are removed, they get positively changed and when added get negatively charged. **2.** (a) Charging by friction: When a body is rubbed with another body, both the bodies develop charge. The process of charging two bodies by rubbing them against each other is called charging by friction. This is a very common method of charging body. During charging by friction one body produces positive charge while another produces negative charge and

this causes attraction between the two. (b) Charging by conduction : Charging by conduction involves the contact of a charged body with a neutral body. Suppose that a positively charged aluminium plate is touched by a neutral metal sphere. The neutral metal sphere becomes charged as a result of the contact. This process of charging a neutral body by touching it with a charged body is called charging by conduction. In this case, the same charge gets transferred from one body to another. This results in repulsion between the two bodies. (c) Charging by induction: When a charged body is brought near another body but not touched, the other body can be charged. This method of charging a body by bringing a charged body near it is called charging by induction. On charging by induction, the charge acquired by the neutral body is opposite to that of the body that induces it, and as a result the two bodies get attracted towards each other. **3.** An electroscope is a device which helps to detect the presence of charge on a body.

Gold Leaf Electroscope : A gold leaf electroscope is an instrument which detects the charge of a body. This electroscope is very sensitive and delicate instrument, and must be handled with care. It consists if a brass rod which passes through an insulated plug inside a glass jar. The top end of the brass rod carries a brass disc also called brass cap while its lower end has two thin gold leaves. The lower part of the glass jar is surrounded by metal foil which is connected to the Earth. The glass jar prevents the air currents to enter inside the electroscope. 4. The outer crust or lithosphere of the Earth is made up of a number of separate plates of rock called tectonic plates. These plates fit together like pieces of a jigsaw puzzle. According to scientists, there are seven large plates and several small ones. These plates float over the hot magma below, and are therefore in continuous slow motion. At many places the movement of the plates against each other is not smooth. The plates may get stuck together at the edges while the rest of each plate continues to move. This causes the rocks along the edges to come under tremendous strain. As the motion continues, the strain builds up to the point where the rocks cannot withstand it. They crack and the two sides move with a jerk. This sends shock waves of energy, called seismic waves, in all directions. When these waves reach the surface they are felt as earthquakes. **5.** Causes of earthquakes: The main causes of earthquakes are: (a) Volcanic Eruptions: Gushing out of molten rocks and hot gases under high pressure through a hole in the earth's crust is called a volcano. The energy released during a volcanic eruption causes vibrations in the crust. These vibrations cause earthquakes in the area around. Such earthquakes occur at the time of eruption or before it. (b) Man-made explosions: Deep underground mining, blasting of rocks using dynamite, nuclear explosions cause very powerful

vibrations. These vibrations cause earthquakes in the area around the site of activity. (c) Dislocation of the crust : Most destructive earthquakes are caused by dislocation of the crust called faults. The crust may first bend and then break and settle to a new position. During the process of breaking, vibration are produced. These vibrations are called seismic waves. These seismic waves travel outward along the surface and through the earth at varying speeds. These seismic waves cause tremors in the earth. Now it has been established that earthquakes occur along faults. Faults are the zones of weakness in the earth's crust. d. Movements of the tectonic plates: Lithosphere is believed to consist of about 12 plates which float over the molten magma in the mantle. Most earthquakes occur at the boundaries where the plates meet. These boundaries are the locations of considerable geological activities. For example : (i) The molten mass (magma) rises up at these points, pushing the two plates apart. This release of energy causes earthquakes. (ii) The two plates might slide past one another. This causes sudden changes in the lithosphere generating earthquakes at shallow depths. (iii) When one of the plates over-rides or subducts another, pushing it downwards into the mantle where it melts.

HOTS: 1. In a tall tree the lightning is more likely to strike since the electrons get concentrated higher up. Hence standing under a tall tree a man is more likely to be struck than a short tree. **2.** same answer as 1

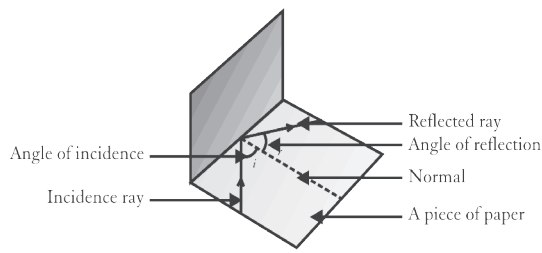
CHAPTER : 14–CHEMICAL EFFECTS OF ELECTRIC CURRENT

A. 1. a, 2. d, 3. a, 4. d, 5. a, 6. b. **B.** 1. Conductors, 2. electrical conductivity, 3. electrolysis, electroplating, 4. electrons, 5. chromium, 6. cathode. **C.** 1. (a), 2. (d), 3. (e), 4. (c), 5. (b). **D. 1.** Anode is the electrode that is connected to the positive terminal of a battery. Cathode is the electrode that is connected to the negative terminal of a battery. **2.** No, **3.** The method of purifying metals by using electricity is called electrorefining. **4.** Pure water is a poor conductor of electricity. But the water that is not pure which is used in our houses) contain small amount of impurities in it which makes it a good conductor of electricity. **5.** Chromium is plated on car and cycle parts, taps, kitchen gas burners, bicycle handle base. It gives shiny look to the object. Zinc is coated on iron to avoid corrosion, in car parts as well as in construction of bridges. **E. 1.** Electrical charge can be made to move in a continuous stream or current. It then becomes much more useful. The movement of electrons constitutes an electric current. To make an electric current flow, two components are necessary. Firstly, a continuous, unbroken path or circuit is needed for the current to flow through. For this, a loop of

copper wire is generally used as it is a good conductor. A switch is inserted in the circuit to make or break the circuit as required. Secondly, we also need a driving force called electromotive force to push the electrons that carry the charge around the circuit. This is provided by an electric cell or a generator. Direction of electric current: We know that electrons flow from a body that has an excess of electrons to one that has a deficit of electrons, i.e., from a body that is negatively charged to a body that is positively charged. Earlier, scientists thought that electric current is the flow of positive charge from a positively charged body to a negatively charged body. They, therefore, took this as the direction of flow of current. Today, we consider the flow of conventional current to be from positive to negative and the flow of electronic current to be from negative to positive. **2.** Extraction of Metals–Electrometallurgy: More electropositive metals, such as sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), aluminium (Al), etc., cannot be obtained by carbon reduction process. These metals can be obtained by the electrolysis of their molten chlorides, hydroxides or oxides. For example, a. Sodium and potassium are obtained by the electrolysis of their molten chlorides and hydroxides. b. Calcium and mangnesium are obtained by the electrolysis of their molten chlorides. c. Aluminium is obtained by the electrolysis of its molten oxide (in the presence of some other compounds). **3.** The process of electroplating involves the following steps : • Clean and wash the object to be electroplated thoroughly. • The object to be electroplated is made cathode. • A sheet of pure metal (to be electroplated) is made anode. • The electroplating tank is filled with the solution of a salt of the metal to be electroplated. • Connect the cathode to the negative (–) terminal and the anode to the positive (+) terminal of the battery. • The current is passed for sometime to deposit a thin layer of the desired metal. **HOTS. 1.** Do your self. **2.** Do your self.

CHAPTER : 15 – REFLECTION OF LIGHT

A. 1. b, 2. b, 3. b, 4. a, 5. c, 6. a. **B.** 1. straight, 2. light, 3. opaque, 4. two, 5. irregular, 6. convex, plane. **C.** 1. T, 2. F, 3. F, 4. T, 5. T, 6. T. **D.** 1. By reflection. Sun. 2. Plane Mirror. 3. Incident ray, reflected ray, angle of incidence, angle of reflection, 4. Kaleidoscope. 5. Plane mirror. **E. 1.** Light travels



in a straight line, when it travels in a uniform transparent medium or in vacuum. This is called rectilinear propagation of light. **2.** Reflection is the phenomenon in which light, on striking a surface, changes its direction and is thrown back into the same medium. **3.** The angle made by the incident ray with the normal at the point incidence is called the angle of incidence. **4.** The angle made by the reflected ray with the normal at the point of reflection is called the angle of reflection. **5.** When a parallel beam of light incident of a surface is reflected back as a parallel beam in one particular direction, then it is called regular reflection. **6.** When a parallel beam of light incident upon a surface is reflected unparallely, i.e., in different directions, then it is called diffused reflection. **7.** Lateral inversion is reversal of the lateral sides of the image as compared to the object. **8.** We get many images of the object because the image formed by one mirror acts as an object for the second mirror. Further images of an image are also formed. This continues, till no more reflection by either mirror is possible. This phenomenon is referred to as multiple reflection. **F. 1.** The angle of incidence and corresponding angles of reflection in Figure. You will see that in each case, the angle of incidence (i) equals the angle of reflection (r). Also, the incident ray, the reflected ray, and the normal at the point of incidence lie on the same plane. These two statements are known as the laws of reflection. a. First law: The incident ray, the reflected ray, and the normal at the point of incidence lie on the same plane. b. Second law: The angle of incidence is equal to the angle of reflection.

2. When the rays of light getting reflected from a mirror actually meet at a point, a real image is formed. A real image can be obtained on a screen. So, the image which can be obtained on a screen is called a real image. A concave mirror gives a real image if the object is placed at its focal point or beyond. When the rays of light after getting reflected from a mirror appear to meet at a point, a virtual image is formed. Such image can only be seen through a mirror but cannot be obtained on a screen. So, the image which can be seen only into a plane and convex mirror but cannot be obtained on a screen is called a virtual image. **3.** Ray diagram for the formation of image by a plane mirror : To construct a ray diagram for the formation of an image follow the following rules : a. A ray of light falling on a plane mirror at 90° (perpendicular) gets reflected back from the mirror by the same path. b. A ray of light falling on a plane mirror at any angle gets reflected from the mirror such that the angle of incidence is equal to the angle of reflection. **4.** Uses of plane mirrors : a. We commonly use plane mirrors in our homes to

look at our reflection. In beauty parlours, plane mirror kept at an angle are used to view the side of the head. Plane mirrors parallel to each other are used to view the back of the head. b. Plane mirrors are used to reflect light on an object. For example, during outdoor shooting of a film, metal sheets are used as plane mirrors to reflect sunlight on the actors. c. They are also used in solar cookers to reflect light on the food being cooked. d. They are used in periscopes. From a submarine under the sea, a sailor can see objects and enemy ships on the surface of the sea by using a periscope. **5.** Kaleidoscope is based on the principle of multiple reflection from a set of three mirrors inclined at each other at 60°. To make a kaleidoscope, you need the following materials: Three thin mirror strips (about 15 cm × 3 cm). A few small pieces of coloured glass or plastic, such as, pieces of broken glass/plastic bangles. Two triangular (3 cm × 3 cm × 3 cm) transparent glass or plastic pieces. Tape the three mirror strips to form a triangular tube. Close one of its ends with one of the triangular glass/plastic pieces using an adhesive. Roll a cardboard around the tube such that the closed end of the triangular tube is about 0.5 cm inside from one of the ends of the cardboard tube. Now place the broken pieces of the coloured glass/plastic on the glass cover of triangular tube. Place the second triangular glass/plastic piece over it and fix it with cellotape or adhesive, to the outer cardboard jacket. Cover the other end of the cardboard jacket with a thick piece of paper and make a peephole at its centre. Your kaleidoscope is ready. Hold the kaleidoscope to the light and observe through the peephole. You will see beautiful coloured patterns. Rotate the kaleidoscope gradually. You will see the changing patterns. **HOTS : 1.** If all objects around us have to reflect light in a regular way, we will not be able to see objects as regular reflection causes, glare and does not spread the light all over the area. **2.** Because plane mirror forms virtual image.

CHAPTER : 16 – REFRACTION AND DISPERSION OF LIGHT

A. 1. a, 2. d, 3. a, 4. b, 5. d. **B.** 1. 2.25×10^8 m/s. 2. lifted up. 3. seven. 4. shadow. 5. sclera. **C.** 1. glass. 2. 2.0×10^8 m/s. 3. angle of emergence, 4. spectrum, 5. rainbow. **D. 1.** The change in the direction of the path of a light ray when it passes from one transparent medium to another is called refraction. **2.** The process of splitting up of white light into many colours is called dispersion. **3.** The band of colours produced when white light is split up is called a spectrum. **4.** The rainbow is a very beautiful natural spectrum on a large scale. It is formed in the direction opposite to the Sun. When there is moisture in the air, the tine droplets of water act as prisms and

disperse sunlight. A rainbow is also observed in the spray of a waterfall or fountain. **5.** The blind spot is the area of the retina which does not have any nerve cells. Therefore an image that falls on this region will not be seen. It is located in the region where the optic nerve leaves the eye on its way to the brain. **E. 1.** A swimming pool appears to be less deep than it actually is, when seen from above the surface of water. This shows that any optically denser material, when seen from an optically rarer material, appears less deep than it actually is. Let us consider a point D at the bottom of a swimming pool. The real depth of the swimming pool is OD. The ray of light DO along the normal does not bend as it emerges from the water. It, therefore, goes along the path OC. The ray of light DA bends away from the normal and takes the path AB. The two emergent rays appear to come from D'. Hence, D' is the virtual image of D. To a person looking into the swimming pool, the bottom of the pool would, therefore, appear to be at depth OD'. This is the apparent depth of the pool. **2.** Everyday examples: The following everyday observations are also due to refraction of light. a. A spoon placed in a glass of water or clear fruit juice appears to be bent at the surface of the liquid. b. If a glass slab is placed on a book, the letters seen through the slab appear to be raised. c. Fish and other objects under water seem to be lifted up. It is difficult to aim and hit objects under water. d. The air in the atmosphere consists of different layers of different densities. The density is maximum near the surface of Earth. Refraction takes place at the surface of each layer. Because of atmospheric refraction, all stars except those directly overhead, appear slightly higher above the horizon than they really are. **3.** Trace the path of light through a glass slab. Fix a sheet of drawing paper on a drawing board. Place a rectangular glass slab in the centre of the paper and draw its outline LMNO. Fix two pins P and Q on one side of the slab as shown in figure. Looking from the opposite side fix pins R and S such that the image of P and Q and the pins R and S appear to be in the same line. Remove the slab. Mark the positions of P, Q, R and S. Join PQ and RS and produce them to meet the sides of the slab at B and C respectively. Then, ABCD is the path of the ray. Draw the normals to the refracting faces at B and C.

The angle of incidence is the angle between the incident ray and the normal ($\angle i_1$).

The angle of refraction is the angle between the refracted ray and the normal ($\angle r_1$).

The angle of refraction is the angle between the emergent ray and the normal (⇑). ($\angle r_1$).

LM is the surface of separation between air and glass and ON is the surface of separation between glass and air. Measure $\angle i_1$ and $\angle r_1$ and $\angle r_1$ at LM, and $\angle r_2$ and $\angle i_2$ at ON>

The following observations can be made :

At LM, $\angle i_1 > \angle r_1$ which shows that the refracted ray bends towards the normal.

At ON, $\angle r_2 > \angle i_2$ which means the refracted ray bends away from the normal (at ON, BC is the $\angle i_1 = \angle i_2$ or angle of incidence = angle of emergence.

4. Let us take a triangular glass block called a prism. In the prism PQR, let light be incident on the surface PQ. It bends towards the normal, i.e., towards the base QR. As it emerges from the surface PR, it bends away from the normal. You can see from figure that because of the structure of the prism, the light ray bends more in the same direction, i.e. towards the base QR. You will notice that the incident and emergent rays are not parallel to each other. The emergent ray is deviated from the direction of the incident ray by the angle of deviation marked in figure. **HOTS : 1.** Because glass slab has two refracting surfaces parallel to each other it cannot carry the phenomenon of dispersion. **2.** No, only white light splits into seven colours.

CHAPTER - 17 : STARS AND THE SOLAR SYSTEM

A. 1. d, 2. a, 3. a, 4. d, 5. c, 6. b. **B.** 1. Constellation, 2. 15 million degree celsius, 3. Uranus, 4. Earth, 5. Solar eclipse. **C.** 1. F, 2. T, 3. T, 4. F, 5. T. **D.** 1. Venus, 2. Earth, 3. Star, 4. 9.46×10^{12} km,5. Saptarishi. **E. 1.** Artificial satellites are useful in many ways such as :

(a) In television and radio transmission (b) In telecommunication such as long distance telephone calls, telex and fax. (c) In remote sensing and weather forecasting, such as rainfall, snowfall, storm, etc. (d) In gathering information about heavenly bodies in space. **2.** The sun and the planets along with their natural satellites(moons) constitute the solar system. The sun is at the centre of the solar system and the planets along with their moons, revolve around the sun in fixed paths known as orbits. **3.** The innermost layer of the sun's atmosphere is called photosphere. It is about 550 km thick and it is often referred to as the surface of the sun. The temperature of photosphere is about 6000°C. **4.** The vast unimaginable space, which includes most of the distant stars and the planets is called universe. **5.** The level of the seawater rises and falls usually twice a day

exactly after 12 hours and 24 minutes. This regular rise or fall of the water level of the sea is called tide. **6.** The planets are the celestial bodies which revolve around the Sun. they do not have light of their own. They reflect the light of the sun. The planets which are near the sun move with a faster speed. The sun is the only star in the solar system. The planets of our solar system in order of their distance from the sun are as follows: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. **F. 1.** Some well-known constellations are Ursa Major, Ursa Minor, Cassiopeia, Orion and Scorpius. Ursa Major (Great Bear) It contains seven bright stars arranged in the form of a big spoon. It is called the Big Dipper. This name is derived from the word 'dipper' which in olden days meant a large spoon used for drinking water. It is also called the Great Bear because, along with several other faint stars, it forms the picture of a bear. Its Indian name is Saptarishi. You can locate the Pole Star (Dhruv Tara) with the help of Ursa Major. This star is visible towards the north and is the only star that remains stationary in the sky with respect to the Earth. Before the magnetic compass was invented, sailors used the Pole Star to find the north direction. Ursa Minor (Little Bear) This is also a group of seven bright stars similar to the Ursa Major. The Pole Star is a part of this constellation. Its Indian name is Laghu Saptrishi. Cassiopeia This constellation is visible from the Northern Hemisphere. A few bright stars of the constellation make it look like 'M' or a 'W'. The interesting thing about Cassiopeia is that the constellation contains several star clusters, one of which contains hundreds of stars. It also contains two planetary nebular (clouds of gas). Orion (or the Hunter) Orion is also known as Kalpursh. There are seven bright stars and several faint stars in the Orion. The arrangement of stars in Orion resembles a hunter. The three middle stars represent the belt, and the four bright stars (two above and two below the belt) describe the shoulder and legs of the hunter. Orion is visible in the northern sky in the late evenings during winter. **2.** Lunar Eclipse : When the Earth comes between the sun and the moon, the moon moves in the shadow of the Earth, It is called the lunar eclipse. The Earth forms its shadow on the moon. The total lunar eclipse occurs when the moon lies in the umbral core of the Earth's shadow. If the moon is on the preumbral core partially and the rest in the umbral core, it is called partial lunar eclipse. The lunar eclipse always occurs on a full moon day. Solar Eclipse : When the moon comes between the Earth and the sun, it is called solar eclipse. Due to this, the moon casts its shadow on the surface of the Earth. The portion where the shadow falls, becomes dark during daytime. At the time of the

total eclipse, only the flames of the outer edge of the sun is visible. The rest appears as a dark patch. On a new moon day, when the Sun, the moon and the Earth are in a straight line with the moon in between the two, the moon will cast its shadow on the surface of the Earth. If we are in the shadow region, we will not see that part of the sun which is covered by the moon. It is called the solar eclipse. **3.** Phases of the moon: The moon does not have its own light. It is a non-luminous body. It only reflects the light coming from the Sun. When the light is reflected from the moon, the moon becomes visible to us. When the moon is in between the Sun and the Earth, then the side of the moon facing us neither receives nor reflects any sunlight. Hence, we cannot see the moon as the dark side of the moon faces us on this day. This is called new moon day (amavasya). As the moon moves along its orbit, a small portion of the side facing us gets sunlight and we can see the crescent moon. Within a week, we see half of the moon. This is called the first quarter. In 10 days time, we can see three quarters of the moon, this is called gibbous moon. Full face of the moon is visible on the fifteenth day after the new moon day. This is called the full moon day (Purnima). After the full moon, the bright face of the moon goes on decreasing till another fifteen days and the new moon is formed again. These different shapes of the moon as seen from the Earth are called the phases of the moon. **Hots:** Sound travels through air. As there is no air on the moon, sound waves cannot travel and we cannot hear any sound.

CHAPTER : 18 – POLLUTION OF AIR AND WATER

A. 1. d, 2. a, 3. d, 4. b, 5. d, **B.** 1. acid rain, 2. burning, 3. CO_2 and methane, 4. Non-biodegradable, 5. water, 6. chlorine, **C. 1.** It can be defined as disturbances of natural balances of anything due to adding of any substance. **2.** Pollution, can be divided into the following types. Air pollution, Water Pollution, Land Pollution and Noise Pollution. **3.** Gaseous pollution. Carbon dioxide chlorine gas. Biodegradable pollutant: Clothes, dead bodies, Non-biodegradable pollutant, Insecticides, DDT. **4.** Automobiles are the greatest sources of releasing hydrocarbon and carbon monooxide into the atmosphere. **5.** (a) Presence of Nitrogen oxide and sulphur dioxide into air reacts with water and form nitric acid and sulphuric acid respectively and falls with rain drops. This is called acid rain. It is very harmful for flora and fauna. It pollutes the surface water on the earth. It damages the structure made of marble, cement e.g., historical monument such as Taj Mahal. (b) Trapping of sun's heat by CO_2, methane and CFCs which raises the Earth's temperature is called greenhouse effect. **6.** Effects

of water Pollution: (a) It affects the growth of crops and plants when applied through irrigation. (b) Polluted water becomes unfit for human use specially drinking and causes a number of diseases like skin disease, disease related with digestive system, for example dysentery, etc. **D. 1.** Causes of Air Pollution Burning of fossil fuels and woods: It produces smoke that contains carbon monoxide and other harmful gases. The ash carried by the wind into the atmosphere, is also an important air pollutant. (a) Purpose of burning may be domestic or industrial. Chimney of industries also releases many of the harmful gases into the atmosphere. (b) Antomobiles are the greatest sources of releasing hydrocarbon and carbon monooxide into the atmosphere. (c) Crackers and other fireworks. (d) Agrochemicals are also causing air pollution, when they react with the atmospheric moisture. (e) Deforestation is the important cause as oxygen is reduced and carbon dioxide is increased and due to this. (d) Besides all these, man-made causes air is also polluted due to some natural activities like volcanic eruption. Many harmful gases like SO_2 are released during volcanic eruption. **2.** Effects of Air Pollution: Air pollution has an adverse effect on the environment as well as well as harmful for the human health. Some of them are given below: (a) Ozone layer depletion: It is mainly caused by CFCs and hydro chlorofluorocarbon. Due to this harmful ultraviolet rays of the sun is easily reaching on the earth surface and causing skin diseases to human beings. (b) Global Warming: Increasing percentage of the green house gases like carbon dioxide, methane etc., are causing increase in earth's temperature. Due to this the climatic change is taking place and ice caps and glacier are melting, resulting in the increase in sea level. (c) Health Hazard to Human being : More or less whole body of human being are affected by polluted air, for example nervous system respiratory system, etc. It mostly affects brain, lungs, heart etc. (d) Greenhouse Effect: Trapping of sun's heat by CO_2, methane and CFCs which raises the Earth's temperature is called greenhouse effect. **3.** Causes of Water Pollution: (a) Urban sewage and industrial waste: Most of the urban sewage and pipelines that carry a huge amount of waste are opened into the river water and discharge all the pollutants. Agrochemicals and waste from agricultural sector and animal rearing: Excessive use of pesticides, insecticides and chemical fertilizers in modern industries not only pollute the surface water but also pollute ground water through percolation. Wastes from poultry, pig rearing etc, are also released into the water bodies that pollutes it. (b) Dil-Skill : Release of petroleum through leakage in pipelines, ship or tankers

etc. (c) Radioactive elements : Wastes released from nuclear reactors, nuclear test etc. also cause water pollution. (d) Dead remains of animals, plants and human being also pollute water. **4.** Water from natural sources contains many impurities. To make it fit for drinking, these impurities must be removed. The method used for purifying water depends upon the source of water. People in big cities get purified river or lake water through a network of water pipelines. (a) Removal of suspended Mixtures: Water is pumped from a river or a lake into a large tank. Here, it is mixed with a small quantity of alum and allowed to stand for some time. The suspended particles of clay, etc., settle down slowly at the bottom of the tank. The upper layer of water is then sent for filtration. (b) Filtration: The water after sedimentation is filtered through thick layers of sand and gravel. Here, the five suspended impurities get removed. (c) Aeration: Air under pressure is then blown into the filtered water. The process called aeration, kills harmful micro organisms present in the filtered water. (d) Chlorination: The filtered and aerated water is chlorinated by adding chlorine to it. Chlorine kills all harmful germs. Thus, chlorination of water is done to make it free from all the harmful micro organisms. The purified and chlorinated water is supplied to the users through a network of water pipes. **HOTS. 1.** Do your self. **2.** Do your self.