

**ADDITIONAL**  
**PRACTICE**

**SCIENCE 9**

Answer Key

**WORKSHEET 1**

**Q.I Multiple Choice Questions:**

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

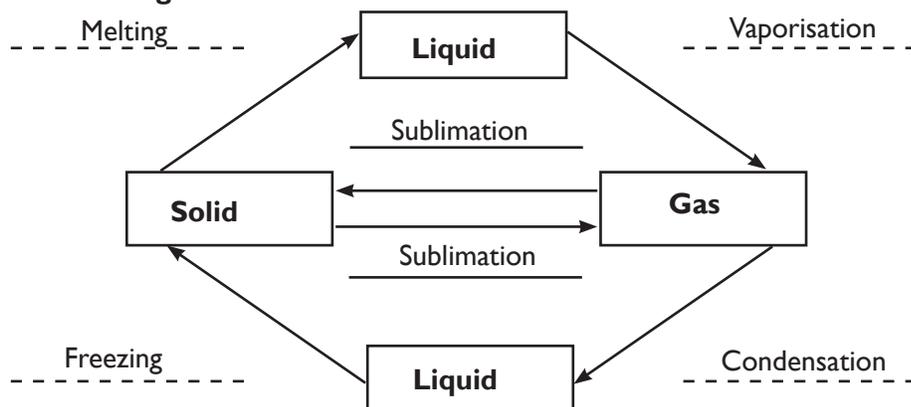
**Q.II Fill in the blanks using the suitable words given in the brackets:**

1. particles 2. cooling 3. Sublimation 4. melting point 5. increases

**Q.III State whether the following statements are true or false:**

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

**Q.IV Complete the flowchart given below:**



**Q.V Give one word for the following:**

1. Fluidity 2. Gas 3. Rigidity 4. Humidity 5. Condensation

**Q.VI Very Short Answer Questions:**

- 373 K.
- A solid will have more density as the particles are closely packed and the inter-particle forces are strong enough to hold the particles together as compared to a liquid.
- The clothes take more time in drying on a rainy day because the humidity in air is high. Due to high percentage of water vapour in the air, the rate of evaporation decreases and the drying of clothes is delayed.
- Physical state of water at –
  - 25°C – liquid
  - 100°C – both liquid and gas (steam)
- Conversion of temperature from Kelvin to Celsius scale–
  - 300K = 300 – 273 = 27°C
  - 573K = 573 – 273 = 300°C
- Two methods to convert a gas into a liquid–
  - Condensation method by decreasing the temperature of the gas.
  - By applying high pressure on the gas to convert it into liquid.
- The particles of water are held together by forces of attraction. But these forces of attraction are not very strong. Therefore, by applying greater force, a diver can cut through water in a swimming pool by overcoming

the weaker force of attraction present among the particles of water. Also, there are spaces between the particles of water. This observation shows that particles of matter attract each other and have space between them.

8. If a substance has no mass, it cannot be considered as a matter because a substance must have some mass to be called a matter.
9. After a heavy exercise, the temperature of our body tends to rise. Due to increase in temperature, our body starts sweating. When the sweat evaporates, it absorbs heat from our body. By losing heat, our body feels cool.
10. The state of a substance can be determined by the attractive force and kinetic energy of its particles. The intermolecular force of attraction tends to draw the particles together while the kinetic energy tends to keep the particles moving apart.

Order of force for attraction:

Solid > Liquid > Gas

Order of kinetic energy:

Solid < Liquid < Gas

11. The temperature of steam is higher than boiling water as it absorbs heat to change state from liquid to a gas. Even if the temperature of water and steam be the same at  $100^{\circ}\text{C}$ , the steam will contain more heat energy as it has latent heat of vaporisation.
12. 1 kg ice at  $0^{\circ}\text{C}$  has strongest intermolecular forces of attraction.

### Q.VII Short Answer Type Questions:

1. Two factors which determine the rate of diffusion of a liquid in another liquid are –
  - i) Temperature : It affects the rate of diffusion, as the temperature rises, the rate of diffusion increases.
  - ii) Density : If any liquid has more density, the rate of diffusion will be lesser. In other words, rate of diffusion of liquids is inversely proportional to their density.
2. When ice at 273 K melts to form water, it absorbs heat energy equal to the latent heat of fusion from the surroundings. Hence, ice at 273 K has less heat energy than the water at 273 K as the water contains latent heat of fusion. Hence, ice is more effective in cooling than water at the same temperature.
3. The rate of evaporation is directly proportional to the temperature. Higher the temperature, higher will be the rate of evaporation.
4.
  - (a) Camphor is a volatile solid. It undergoes sublimation slowly at the room temperature. As a result, solid camphor gets converted into vapours which become a part of the air around us. Therefore, camphor disappears without leaving any solid remains.
  - (b) Wet clothes do not dry easily on a rainy day because of the high humidity in the air. The water vapours present in the air slows down the rate of evaporation from the clothes.
  - (c) We sweat more on a humid day. In hot and humid weather, the air around us already has a high percentage of water vapours, therefore, the sweat does not evaporate easily and gives us a sticking and uncomfortable feeling.
5. **Activity** : To show that gases are more easily compressible than the liquids and the solids.
  - (a) Take three 100mL syringes and close their nozzles by rubber corks.
  - (b) Remove the piston from all the syringes.
  - (c) Leaving one syringe untouched, fill water in the second and pieces of chalk in the third.
  - (d) Insert the piston back into the syringes. You may apply some Vaseline on the pistons before inserting them into the syringes for their smooth movement.

(e) Now try to compress the contents by pushing the piston in each syringe.

**Discussion :**

- (a) The syringe which was left untouched is the first syringe which contained air. The piston was easily pushed in.
- (b) The piston of the second syringe which contained water was pushed only a little while the piston of the third syringe which contained chalk pieces could not be pushed at all.
- (c) Thus, air is easily compressible, water is almost incompressible while chalk pieces are completely incompressible.
- (d) This shows that gases are more compressible than the solids and the liquids.

6. (a) Latent heat of fusion : It is the energy required to convert 1 kg of solid into liquid at its melting point at atmospheric pressure.  
The latent heat of fusion of ice is  $3.347 \times 10^5$  J/ kg (80 kcal/kg). This means that  $3.347 \times 10^5$  Joules of heat is required to change 1 kilogram of ice into water at its melting point, i.e., 273K ( $0^\circ\text{C}$ ). Thus, at  $0^\circ\text{C}$ , both ice and water exist together.
- (b) Latent heat of vaporisation : The amount of heat energy that is required to change 1 kg of a liquid into vapours at atmospheric pressure at its boiling point is called latent heat of vaporisation.  
The latent heat of vaporisation of water is  $22.59 \times 10^5$  J/kg or 540 kcal/kg. This means that  $22.59 \times 10^5$  Joules of heat is required to change 1 kg of water at its boiling point, 373K ( $100^\circ\text{C}$ ) into steam at the same temperature 373K ( $100^\circ\text{C}$ ). Thus, at  $100^\circ\text{C}$  both water and steam exist together.
7. The graph in part (d) represents the correct results. This is because, initially the heat supplied will be absorbed by ice to change into water and the temperature will remain constant. Once, all the ice is converted into water, the temperature of the mixture will start to rise.

**Q.VIII Long Answer Questions:**

1. (a) Three characteristics of particles matter:
- (i) Particles of matter have space between them.
  - (ii) Particles of matter are continuously moving and the movement of particles of matter depends on their kinetic energy. The solids have the least kinetic energy in their particles.
  - (iii) Particles of matter attract each other. Particles of matter have a force acting between them. This force keeps the particles together.

When we add some sugar or salt in a beaker containing water, after sometime it gets dissolved and form a homogeneous mixture or solution.

We also observe that there is not detectable rise in the level of water. This shows that spaces are present in between the particles of water. These are called interparticle spaces or wide.

- (b) When ice is melted, water is produced and when water is heated, steam is produced. Conversely, when steam is cooled, water is produced and when water is cooled further, ice is produced. Therefore ice, water and steam are the three states of a substance and not different substances.
2. (a) Ice is being converted into water. Melting is going on over A to B.
- (b) From B to C, temperature of water is being raised while its state remains the same. From C to D, water is being converted into steam, i.e., vaporisation is occurring while the temperature remains the same.
- (c) A =  $0^\circ\text{C}$ , B =  $0^\circ\text{C}$ , C =  $100^\circ\text{C}$ ,  
D =  $100^\circ\text{C}$ .

**WORKSHEET 2**

**Q.I Multiple Choice Questions:**

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

**Q.II Fill in the blanks using the suitable words given in the brackets:**

1. evaporation      2. humidity      3. cotton      4. Plasma      5. Iodine

**Q.III State whether the following statements are true or false:**

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

**Q.IV Match the followings**

Quantity	Units
1. Temperature	(d) K
2. Length	(c) m
3. Mass	(b) kg
4. Volume	(e) m <sup>3</sup>
5. Density	(f) kg/m <sup>3</sup>
6. Pressure	(a) pascal

**Q.V Match the followings**

Complete the given wheel with the properties of particles of matter.

(make same wheel as given in the book. Fill it with the following points:

Particles have space between them Particles attract each other Particles are in continuous motion)

**Q.VI Match the followings**

1. If vapour pressure increases then boiling point decreases. Since liquid A has more vapour pressure than B, so liquid A has lower boiling point.
2. Gas – It is defined as that form of matter which possesses fluidity but is highly compressible and hence has neither definite shape nor definite volume.
3. Evaporation :- The phenomenon of changing of a liquid into vapours at any temperature below its boiling point is called evaporation.
4. Iodine and naphthalene can sublime.
5. When sugar is heated, it does not vapourise, instead it becomes brownish and then later it becomes black. But when ammonium chloride is heated, it gets sublimated and colourless vapours are formed.
6. (a)  $-40^{\circ}\text{C} = (-40) + 273.16 = 233.16\text{ K}$   
(b)  $-100^{\circ}\text{C} = (-100) + 273.16 = 173.16\text{ K}$
7. LPG and oxygen are the two gases which are supplied in compressed form in homes and hospitals, respectively.
8. If the food is being cooked in the kitchen, its smell spreads and reaches us by the process called diffusion.
9. (a) Water exists at  $100^{\circ}\text{C}$  – can be either liquid or gas  
(b) Water exists at  $0^{\circ}\text{C}$  – can be either a solid or liquid.
10. Kelvin scale temperature is 270 K then Celsius scale temperature is  $= 270 - 273\text{ K} = -3^{\circ}\text{C}$
11. (a) LPG Or Liquefied Petroleum Gas.  
(b) Decrease in pressure results in conversion of liquid LPG into gas.
12. No, the water is not pure as pure water must boil at  $100^{\circ}\text{C}$ . Also, this water will not freeze at  $0^{\circ}\text{C}$  but at a slightly lower temperature.

**Q.VII Short Answer Type Question:**

1. Take a certain volume of a gas in a cylinder provided with a piston. Now compress to a small volume. Consequently, interparticle distances decrease and gas particles come so close to each other that they start attracting one another strongly to form a liquid. In this way, the gas gets liquefied by application of pressure two liquefied gases used in daily life are LPG and CNG.

2. (a) **Incompressible, no fixed shape:**  
Liquids are incompressible and have no fixed shape, because the particles have spaces between them due to which they do not have the fixed positions.
- (b) **Incompressible, high melting point:**  
Solids are incompressible and possess high melting points. It is because of the small interparticle distances and strong interparticle force of attraction.
- (c) **Compressible, no definite volume:**  
Gases are compressible and have no definite volume. It is due to the high interparticle spaces, which can be easily compressed.
- (d) **Incompressible, highly fluid:**  
Liquids are incompressible and possess high fluidity. It is because of the larger interparticle distances and weaker force of attraction as compared to that of solids. Thus, liquids are not rigid but possess fluidity. Liquids have definite volume and they are incompressible.
3. Liquids like ether and acetone are kept in a cool place because these liquids have low boiling points. ( $E_{\text{ther bp}} = 308 \text{ K}$  and  $\text{Acetone}_{\text{bp}} = 329 \text{ K}$ ) and also have weak force of attraction. Such liquids are called volatile liquids and will evaporate if kept in hot places.
4. The boiling point of a liquid is the temperature at which its vapour pressure becomes equal to the atmospheric pressure. Since the atmospheric pressure is lower on mountains (Shimla) than on plains (Delhi), therefore, the vapour pressure of water becomes equal to the atmospheric pressure at a lower temperature between particles in Shimla than in Delhi. As a result, boiling point of water is lower in Shimla than in Delhi.
5. (a) Due to the presence of much smaller spaces amongst the particles of solids and liquids as compared to those in gases, the solid and the liquid states are collectively called the condensed phase of matter.
- (b) At  $0^\circ \text{C}$ , the solid and liquid state of state of water exist together.
- (c) Gases are compressible because of the low forces of attraction and large spaces in the gaseous particles. On the other hand, liquids are incompressible because they have fixed volume due to the more force of attraction and minimum interparticle spaces. Thus gases are more compressible than the liquids.
6. **Melting point:** The temperature at which a solid melts to become a liquid at atmospheric pressure is called its melting point. Each pure solid has a fixed melting point which is a measure of the strength of the force of attraction between its constituent particles. Higher the melting point, stronger are the forces of attraction.
- (b) The common substances which undergo sublimation are:  
(i) Naphthalene (ii) Ammonium chloride (iii) Camphor (iv) Anthracene

7. Difference between Boiling and Evaporation

Boiling	Evaporation
a. Boiling takes place at a particular temperature when the liquid is heated.	a. Evaporation occurs on its own at all temperatures.
b. Boiling is a bulk phenomenon. It involves the formation of bubbles of the vapours form bulk (whole) of the liquid.	b. Evaporation is a surface phenomenon. It takes place only from the surface of the liquid.
c. No cooling is caused during boiling.	c. Evaporation always causes cooling.

8. (a) The gas jar containing air also becomes completely reddish-brown. It is due to the movement of reddish-brown vapours of gaseous particles of bromine from one vessel into another as they possess kinetic energy. It is because the gaseous particles have least or almost no forces of attraction between them. That's why this happened.
- (b) The process involved here is called diffusion. It is the intermixing of the particles of different substances of matter on their own.

**QVIII. Long Answer Type questions:**

1.

<b>Property</b>	<b>Solid</b>	<b>Liquid</b>	<b>Gas</b>
<b>a. Interparticle force of attraction</b>	Interparticle force of attraction are the strongest.	Interparticle forces of attraction are weaker than the solids but stronger than those of gases.	Interparticle forces of attraction are the weakest.
<b>b. Density</b>	They have high density.	They have density lower than solids but more than gases.	They have generally very low density.
<b>c. Kinetic energy of particles</b>	These particles have the least kinetic energy.	These have kinetic energy less than the gases and more than the solids.	They have the highest kinetic energy.
<b>d. Diffusion</b>	Generally, they do not show the diffusion although some rare examples are known.	They show the property of diffusion.	They diffuse very rapidly.
<b>e. Fluidity</b>	They do not possess fluidity as they are rigid.	They possess fluidity that is why they can flow.	They have the highest fluidity.

2. The diagram shows that solids have very little inter particle space and particles are arranged in an orderly fashion. This allows no or very little movement of particles. Hence solids have only vibratory motion in their particles.

Liquids have inter particle spaces and are randomly arranged. This allows their particles to move and hence they are fluids. Gases have large inter particle spaces and particles are arranged randomly. Hence, these particles can move randomly in different directions and can occupy as much space as available. They have high fluidity.

# Chapter 02 IS MATTER AROUND US PURE?

## WORKSHEET 1

### Q.I Multiple Choice Questions:

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

### Q.II Fill in the blanks using the suitable words given in the brackets:

1. compound      2. any      3. compound      4. homogeneous      5. evaporation

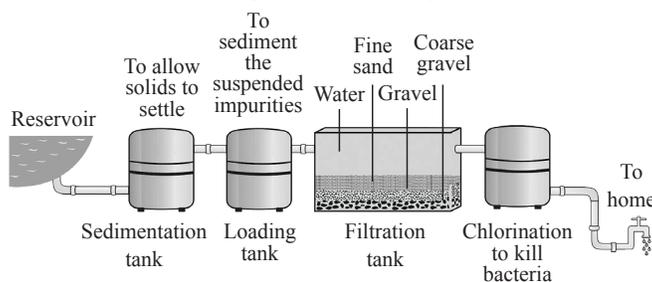
### Q.III Classify the following as physical or chemical changes:

1. Chemical change      2. Chemical change      3. Physical change      4. Chemical change      5. Physical change

### Q.IV Classify the following as homogeneous or heterogeneous mixtures:

Homogeneous	Heterogeneous
	gasoline
iron nail	dirt
aerosol spray	smog
steel	air
alcohol	sea water

### Q.V Label the given diagram for the water purification system in water works.



Water purification system in water works

### Q.VI Very Short Answer Questions:

- Mercury and bromine.
- Water and carbon dioxide gas.
- Brass is a mixture because brass is an alloy of zinc and copper.
- (i) Sugar and sand      (ii) Sand and water
- Ethyl alcohol = solute, water = solvent
- Yes, naphthalene has a property of sublimation, i.e., solid converting directly into vapour. Thus, naphthalene having lower sublimation temperature than camphor, disappears with time first, leaving behind camphor.
- It indicates that the ink drop consisted of a mixture of three different coloured dyes and is not just a single dye. Hence, ink is a mixture and not a pure substance.
- Oil from water is separated by using separating funnel. The technique is based upon the principle that when a mixture of two immiscible liquids is allowed to stand, they separate out in two separate layers depending upon their densities.

9. Only colloidal solutions show the Tyndall effect as the practical size is large enough to scatter the particles of light. Salt water is a true solution, so it does not show the Tyndall effect. However, milk in water is a colloidal solution which shows the effect.
10. The wool being knitted into a sweater is a physical change because no new substance is formed.
11. It will be a mixture as it contains two different types of particles, i.e., of sugar and beetroot.
12. Distillation can be used for this purpose. As the boiling point of water is much less than that of water, it will evaporate and get collected in the separate beaker earlier, leaving behind the solution of water and salt.

### QVII. Short Answer Type Questions:

1. Volume of solution = Volume of solute + Volume of solvent  

$$= 50 + 150$$

$$= 200 \text{ mL}$$

Concentration of solution =  $\frac{\text{Volume of solute} \times 100}{\text{Volume of solution}} = \frac{50 \times 100}{200} = 25\%$
2. By distillation, we can check if it is pure water or a solution of salt or sugar. Only pure water will boil at  $100^\circ\text{C}$  while a solution of salt or sugar in water will boil at a higher temperature
3. Total mass of solution = mass of solute + mass of solvent  

$$= 36 + 100$$

$$= 136 \text{ g}$$

Mass by mass percentage =  $\frac{\text{Mass of solute} \times 100}{\text{Mass of solution}}$   

$$= \frac{36 \times 100}{136}$$

$$= 26.47 \%$$
4. Air is a homogeneous mixture of number of gases such as oxygen, nitrogen, carbon dioxide, inert gases (mainly argon), water vapour. This is because all these gases in the air exist independently and their concentration may vary from place to place. In a compound, composition is constant and substance does not exhibit properties of its constituents which is not the case in air. Hence, it is not a compound.
5. **Sol:** A sol is a colloidal solution which has a particle size that ranges between 1 nm to 100 nm.  
**Solution:** A solution is a homogeneous mixture of two or more substances. The major component of the solution is called the solvent and the minor component is called the solute. The particle size is less than 1 nm.  
**Suspension:** A suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium. The particle size is more than 100 nm.
6. First of all we put a magnet in the mixture of iron filings, sulphur powder and sugar. Now we observe that iron particles are attracted by the magnet and get separated from the mixture. After that, remaining mixture is dissolved in water. During this activity, we can observe sugar soluble in water while sulphur does not. On filtration, sulphur can be obtained on the filter paper, while sugar is recovered from the filtrate by distillation or evaporation.
7. On adding more of substance X in the solution at that temperature, if it dissolves then the solution is unsaturated and if it does not dissolve then solution is saturated.  
 When a saturated solution is cooled down, the solubility decreases and substance comes out from the solution in the form of crystals.

### QVIII. Long Answer Type Questions:

1. (a) **Distillation:** Distillation involves the conversion of a liquid into vapours by heating followed by condensation of the vapours. It is used for the separation of components of a mixture containing two miscible liquids which have sufficient difference in their boiling points (greater than 25 K).
- (b) **Sublimation:** It is a process in which solid directly changes to gaseous state without passing through the intermediate liquid state. Sublimation can be used to separate volatile component from the non-volatile component of a mixture.
- (c) **Chromatography:** It is based on the principle of solubility of different components of a mixture in a given solvent. The more soluble component travels a larger distance on the stationary phase while the less soluble one travels less distance. In this way, components get separated from their mixture.

- (d) **Filtration:** It is based on the principle of particle size of different components. When mixture is allowed to pass through filter paper, the component with larger particle size will remain on the filter paper while that with smaller particle size will pass through the pores of filter paper and get collected as filtrate.
- (e) **Fractional Distillation:** If the boiling point of two miscible liquid differ by less than 25 K, they can be separated by the technique of fractional distillation. Here, a fractionating column is used which condenses the component with lower boiling point and hence the component with higher boiling point is separated first.

2. In 'A', a compound FeS is formed by the reaction between iron filings and sulphur. When dilute HCl is added to it, FeS will react with dilute HCl to form H<sub>2</sub>S gas which has smell of rotten eggs and will turn lead acetate paper black. 'B' is not heated, so B is a mixture of iron filings and sulphur powder. When dilute HCl is added to it, iron filings react with dilute HCl to form H<sub>2</sub> gas which burns with a 'pop' sound if a burning matchstick is brought near it.

## WORKSHEET 2

### Q.I Multiple Choice Questions:

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

### Q.II State whether the following statements are true or false:

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

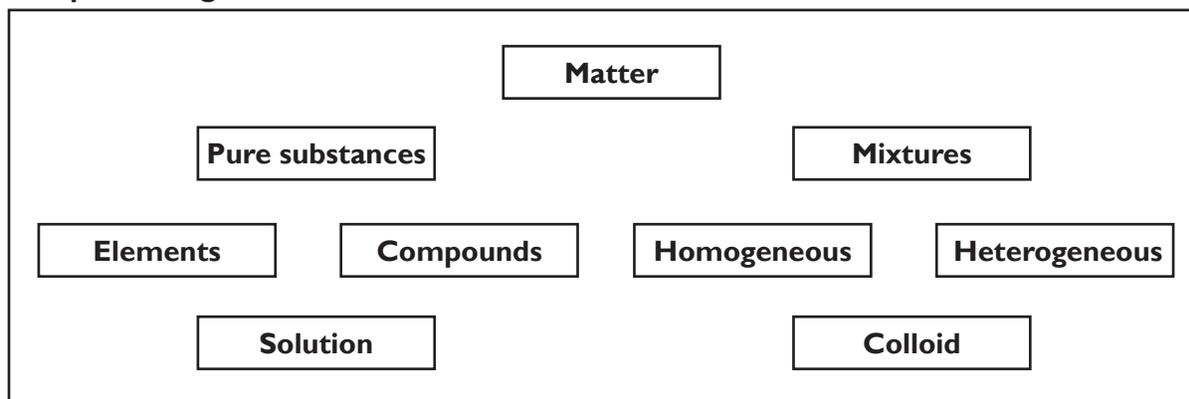
### Q.III. I. Solution                      2. Alloy                      3. Tyndall effect                      4. Milk                      5. Chromatography

### Q.IV. Complete the given table:

**Different Types of Colloids**

Dispersed Phase	Dispersing Medium	Type	Examples
Liquid	Gas	Aerosol	Fog, clouds, mist
Solid	Gas	Aerosol	Smoke, automobile exhaust
Gas	Liquid	Foam	Shaving cream
Liquid	Liquid	Emulsion	Milk, face cream
Solid	Liquid	Sol	Milk of magnesia, mud
Gas	Solid	Foam	Sponge, pumice
Liquid	Solid	Gel	Jelly, cheese, butter
Solid	Solid	Solid sol	Coloured gemstone, milky glass

### Q.V. Complete the given flowchart:



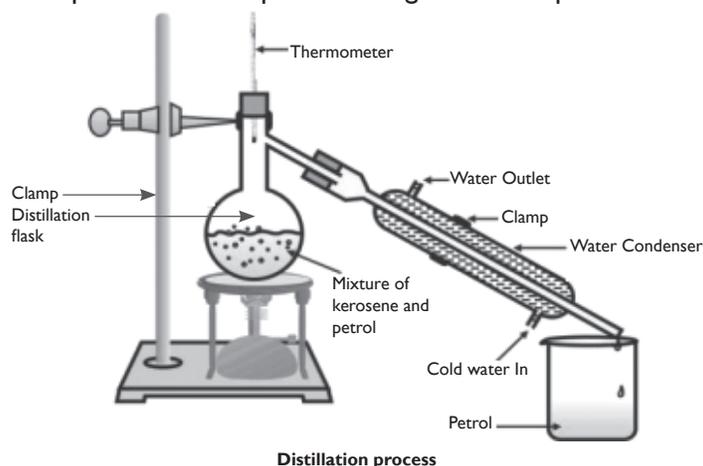
### Q.VI. Very Short Answer Questions:

- Heterogeneous mixtures.
- A colloidal solution in which gas is a dispersion medium and liquid is a dispersed phase is called aerosol. For e.g. - clouds, mist and sprays.
- Oxygen

4. A pure substance consists of particles of only one kind of matter which are similar to one another and which cannot be separated into other kind of matter by any physical process. Impure substances are normally called mixture. They have no definite composition. They have no fixed melting and boiling and contains different types of particles.
5. Yes, both physical and chemical changes can happen at the same time.  
For e.g. - burning a candle.
6. (a) Sunlight entering a dark room from a hole in window or door  
(b) Light falling on ground from the canopy of trees in a forest or garden.
7. When sulphuric acid is mixed with water, mixture is obtained.
8. (a) Sugar dissolved in water                      (b) NaCl dissolved in water
9. Simple distillation is used for the separation of components of a mixture containing two miscible liquids which boil without decomposition and have sufficient difference in their boiling points. Whereas fractional distillation is used to separate many different components from the mixture even if the difference in their boiling points is less.  
For e.g.- crude oil in petroleum industry is separated into various fractions such as gasoline, kerosene oil, diesel oil, lubricating oil, etc., by fractional distillation.
10. Iron and zinc are metals while carbon and oxygen are non-metals.
11. No, since alcohol and water are miscible liquids, they cannot be separated using separating funnel as they won't form two distinct layers. Instead, they can be separated using distillation.
12. It can also be obtained by the process of crystallisation.

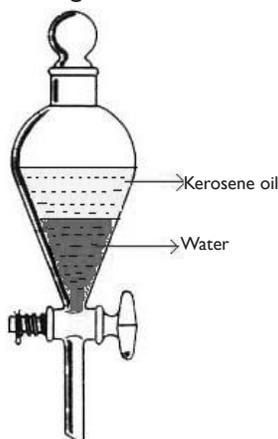
#### QVII.Short Answer Questions:

1. Mass of solute = 2.5 g  
Mass of solvent = 50 g  
Concentration (w/w) =  $\frac{\text{Mass of solute} \times 100}{\text{Total mass of solution}} = \frac{2.5 \times 100}{52.5} = 4.76\%$
2. Set up the apparatus as shown in the figure. Take the given mixture in a distillation flask. Heat the mixture slowly keeping a close watch at the thermometer. At a certain point, temperature becomes constant. Petrol vaporises first as it has the lower boiling point. It condenses in the condenser and is collected from the condenser outlet. Stop heating when the temperature further starts rising. Kerosene is left behind in the distillation flask. Hence, a mixture of kerosene and petrol can be separated using distillation process.



3. Distillation is the process of separating two miscible liquids with difference in their boiling points more than 25 K. On the other hand, fractional distillation is used to separate two miscible liquids with difference in their boiling points more than 25 K. It also contains a fractionating column which is absent in distillation process.
4. Chromatography is a separation technique used to separate different components from a mixture depending upon their solubility in a given solvent. It is widely used in the separation of amino acids and also in the the separation of different coloured dyes from a mixture.

5. (a) Metals are good conductors of heat and electricity.  
(b) Metals are hard, brittle and sonorous.  
(c) Metals are usually ductile and malleable.
6. When two liquids do not mix, they form two separate layers and are known as immiscible liquids. These two liquids can be separated by using a separating funnel.



### Separation of immiscible liquids using separating funnel

**Experiment:** A separating funnel is a special type of glass funnel, which has a stopcock in its stem to regulate the flow of liquid. It will separate the immiscible liquids into two distinct layers depending on their densities. The heavier liquid (water) forms the lower layer while the lighter one (kerosene) forms the upper layer. Remove the stopper and open the tap to run the lower layer into a beaker. You will be left behind with just the upper layer in the funnel. Collect this liquid into another beaker. For example, kerosene and water mixture is separated by using separating funnel method. This method is also used to extract iron from its ore.

7. (a) C is true solution as the entire mixture passes through the filter paper.  
(b) B is suspension as residue is left behind in the filter paper.  
(c) A is colloid as a translucent filtrate is obtained.

#### QVIII. Long Answer Questions:

1. (a) Magnetic Separation (b) Reverse osmosis (c) Evaporation (d) Sedimentation and decantation  
(e) Sublimation (f) Filtration (g) Chromatography
2. (a) Sugar (b) Iodine (c) Chalk

## WORKSHEET 1

## Q.I Multiple Choice Questions:

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

## Q.II Fill in the blanks using the suitable words given in the brackets:

1. masses      2. fixed      3. polyatomic      4. mole      5. molar

## Q.III Complete the given table:

Element	Symbol
Aluminum	Al
Copper	Cu
Nitrogen	N
Potassium	K
Iodine	I
Sliver	Ag
Calcium	Ca
Lead	Pb
Fluorine	F
Sodium	Na

## Q.IV State whether the following statements are true or false:

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

## Q.V Give the chemical formula of a following compounds:

Element	Symbol
Aluminum sulphate	$Al_2(SO_4)_3$
Potassium nitrate	$KNO_3$
Calcium carbonate	$CaCO_3$
Aluminum oxide	$Al_2O_3$
Lead bromide	$PbBr_2$
Magnesium chloride	$MgCl_2$
Ferrous sulphate	$FeSO_4$
Cupric carbonate	$CuCO_3$
Ammonium hydroxide	$NH_4OH$
Calcium phosphate	$Ca_3(PO_4)_2$

### QVI. Very Short Answer Questions:

1. It is the number of atoms present in a molecule.
2. It is the symbolic representation of the composition of an ionic compound. It gives the number and kinds of atoms which are chemically united in a compound.
3. Ion is a charged particle or a charged atom.
4. One mole is the amount of the substance which contains same number of particles as there are in 12 grams of C-12 isotope.
5. A group of atoms having a charge is called a polyatomic ion.
6.  $O_3$  (ozone)
7.  $X_2O_3$
8. 16 g
9.  $H_2O, HCl$
10. 1 mole =  $6.022 \times 10^{23}$  particles
11.  $12 \times 1.92 = 23.04$  u  
The element A is probably sodium.
12. Law of constant proportions.

### QVII. Short Answer Questions:

1. Molecular mass of  $CaCO_3$  ( $40+12+3 \times 16 = 100$ )  
100g of  $CaCO_3$  has molecules =  $6.022 \times 10^{23}$   
50g of  $CaCO_3$  have molecule =  $\frac{6.022 \times 10^{23} \times 50}{100} = 3.011 \times 10^{23}$  molecules
2. (a) Atomic mass of nitrogen = 14u  
Mass of 1 mole of nitrogen =  $14 \times 1 = 14$  g  
(b) Atomic mass of aluminium = 27u  
Mass of 4 moles of aluminium =  $27 \times 4 = 108$  g
3. **Law of conservation of mass** : According to the law of mass of conservation of mass, mass can neither be created nor be destroyed in a chemical reaction.  
Antoine Lavoisier proposed the law of conservation of mass.
4. (a) Every element is composed of extremely small particles called atoms.  
(b) Atoms of a given element are identical, both in mass and properties. Different chemical elements have different kinds of atoms; in particular, their atoms have the different masses.  
(c) Atoms cannot be created, destroyed or transformed into atoms of other elements.  
(d) Compounds are formed when atoms of different elements combine with each other in small whole number ratio.  
(e) The relative number and kinds of atoms in a given compound are constant.
5. (a) 32 g of  $O_2 = 1$  mole  
12 g of  $O_2 = 1/32 \times 12 = 0.37$  moles  
(b) 18 g of water = 1 mole  
20 g of water =  $1/18 \times 20 = 1.1$  moles

(c) 44 g of  $\text{CO}_2 = 1$  mole

22 g of  $\text{CO}_2 = 1/44 \times 22 = 0.5$  moles

6. (a) Glucose =  $\text{C}_6\text{H}_{12}\text{O}_6 = 6 \times 12 + 12 \times 1 + 6 \times 16 = 72 + 12 + 96 = 180$  g  
(b) Sulphuric acid =  $\text{H}_2\text{SO}_4 = 2 \times 1 + 32 + 4 \times 16 = 98$  g

7.

S.N	Name of element	Percentage	Atomic mass	Moles	Relative Ratio
1	C	75	12	6.25	$\frac{6.25}{6.25} = 1$
2	H	25	1	25	$\frac{25}{6.25} = 4$

Empirical formula =  $\text{CH}_4$

8. (a) Mole of 52 g of Helium =  $\frac{52}{4}$  atomic mass of He = 4  
(b)  $6.022 \times 10^{23}$  particles of He = 4 g  
 $12.044 \times 10^{23}$  particles of He =  $\frac{4 \times 12.044 \times 10^{23}}{6.022 \times 10^{23}} = 8$  g

### QVIII. Long Answer Questions:

1. (a) Moles =  $\frac{\text{Mass}}{\text{Atomic mass}}$   
Number of atoms = Moles  $\times$  Avogadro's number =  $\frac{0.08}{1} \times 6.022 \times 10^{23} = 0.48 \times 10^{23}$  atoms  
(b) Number of atoms = Moles  $\times$  Avogadro's number =  $\frac{0.8}{56} \times 6.022 \times 10^{23} = 0.086 \times 10^{23}$  atoms  
(c) Number of atoms = Moles  $\times$  Avogadro's number =  $\frac{0.008}{32} \times 6.022 \times 10^{23} = 0.0015 \times 10^{23}$  atoms  
(b) Number of atoms = Moles  $\times$  Avogadro's number =  $0.5 \times 6.022 \times 10^{23} = 3.011 \times 10^{23}$  atoms  
(e) Number of atoms = Moles  $\times$  Avogadro's number =  $2/23 \times 6.022 \times 10^{23} = 0.523 \times 10^{23}$  atoms
2. Sample I: Mass of chloride = mass of NaCl - Mass of Na =  $14.75 - 5.80 = 8.95$  g  
Sample II: Mass of Na = Mass of NaCl - Mass of Cl =  $11.32 - 6.87 = 4.45$   
Sample III: Mass of chloride = mass of NaCl - Mass of Na =  $7.45 - 2.93 = 4.52$  g  
Now, in sample I, ratio of Na:Cl is  $5.80 : 8.95 = 0.648$   
In sample II, ratio of Na:Cl is  
 $4.45 : 6.87 = 0.648$   
In sample III, ratio of Na:Cl is  
 $2.93 : 4.52 = 0.648$

Since the ratio of sodium and chloride ions in all samples is same, the law of constant proportions is verified.

## WORKSHEET 2

### Q.I Multiple Choice Questions:

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

### Q.II Fill in the blanks using the suitable words given in the brackets:

1. mono-atomic      2. Ionic      3. charge      4. mole      5. 44g

### Q.III State whether the following statements are true or false:

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

**Q.IV Complete the given table:**

Name of ion	Symbol
Ammonium	NH <sup>4+</sup>
Sulphide	S <sup>2-</sup>
Cupric	Cu <sub>2+</sub>
Carbonate	CO <sup>3-</sup>
Sulfite	SO <sub>3</sub> <sup>2-</sup>
Magnesium	Mg <sub>2+</sub>
Nitride	N <sup>3-</sup>
Sulfate	SO <sub>4</sub> <sup>2+</sup>
Phosphate	PO <sub>4</sub> <sup>3-</sup>
Ferrous	Fe <sup>2+</sup>
Hydroxide	OH <sup>-</sup>

**Q.V Complete the given table:**

Compound	Chemical Formula	Combining Elements	Ratio by mass
Water	H <sub>2</sub> O	H:O	1:8
Calcium oxide	CaO	Ca:O	5:2
Carbon dioxide	CO <sub>2</sub>	C:O	3:8
Magnesium sulphate	MgSO <sub>4</sub>	Mg: S: O	0.2: 0.26: 0.53
Ammonia	NH <sub>3</sub>	N:H	14:3
Sodium chloride	NaCl	Na:Cl	23: 35.5

**QVI. Very Short Answer Questions**

- Mole of sodium =  $\frac{\text{Mass of sodium}}{\text{Atomic Mass}} = \frac{0.5}{23} = 0.0217$
- A<sub>3</sub>B<sub>2</sub>
- Atoms can neither be created nor destroyed. Only rearrangement of atoms takes place during a chemical reaction.
- The atom which has excess or deficit of electrons is called an ion.
- 3
- Mole =  $\frac{\text{Mass}}{\text{Atomic Mass}}$   
Mass = mole x atomic mass = 0.2 x 16 = 3.2 g
- Ammonium ion or NH<sub>4</sub><sup>+</sup>
- Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>
- M(OH)<sub>2</sub>, M<sub>3</sub>N<sub>2</sub>
- CH<sub>3</sub>COOH
- On heating the compounds, sugar will turn brownish while salt will remain white. Also, the solution of salt in water conducts electricity while that of sugar does not.
- 23 u. It is sodium

### QVII. Short Answer Questions:

- Molar mass of  $\text{H}_2\text{O}$  ( $2 + 16$ ) = 18g  
Molecules in  $\text{H}_2\text{O}$  =  $\frac{\text{Mass of mass} \times \text{Avogadro's number}}{\text{Molecular mass}}$   
$$= \frac{0.9 \times 6.022 \times 10^{23}}{18} = 0.3 \times 10^{23}$$
- The atomic mass of an element is numerically equal to the mass of 1 mole of its atoms.  
1 mole of atoms =  $6.022 \times 10^{23}$  atoms.  
Now, 1 atom of element X has mass =  $2.65 \times 10^{-23}$ g.  
So,  $6.022 \times 10^{23}$  atoms of element X have mass =  $2.65 \times 10^{-23} \times 6.022 \times 10^{23} = 16$ u. This is oxygen.
- Sodium atom is defined as the smallest particle of an element which may or may not be capable of free existence. However, it is the smallest particle that takes part in a chemical reaction.  
Sodium ion carry positive charge after losing one electron from the outermost shell.
- Mass percentage of carbon =  $\frac{\text{Mass of Carbon} \times 100}{\text{Total mass of CO}_2} = \frac{12 \times 100}{44} = 27.27\%$   
Mass percentage of oxygen =  $\frac{\text{Mass of Oxygen}}{\text{Total mass of CO}_2} = \frac{16 \times 2 \times 100}{44} = 72.72\%$
- Number of moles of water molecules = 0.5 mol  
Number of moles of hydrogen atoms =  $0.5 \times 2 = 1$   
Number of hydrogen molecules =  $6.022 \times 10^{23}$  atoms.  
Number of moles of oxygen atom =  $0.5 \times 1 = 0.5$   
Number of molecules of oxygen atom =  $3.011 \times 10^{23}$  atoms.
- Element with atomic number 13 will form cation with charge +3.
- When this happens, the 5 g of magnesium will be produced consuming 2 g of oxygen. Rest 3 g of oxygen will remain unreacted. This is governed by the law of definite proportions.

### QVIII. Long Answer Questions

- This activity shows the law of conservation of mass. Here, solutions of barium chloride and sodium sulphate were weighed separately before reaction. After mixing the solutions, the total weight of the mixture is found to be equal to that of the individual solutions before reaction.
- Molar mass of glucose = 180 g  
Hence, 180 g of glucose requires 108 g of water  
18 of glucose requires =  $108/180 \times 18 = 10.8$  g water  
Also, density = mass/volume  
Volume of water =  $10.8/1 = 10.8$  cubic cm

## WORKSHEET 1

**Q.I Multiple Choice Questions:**

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

**Q.II Fill in the blanks using the suitable words given in the brackets:**

1. hydrogen      2. 2      3. same      4. nucleus      5. neutron

**Q.III State whether the following statements are true or false:**

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

**Q.IV. Identify the atomic models shown below and write any two characteristic features of each.**

1. Rutherford's model of atom
  - (a) Most of the space inside the atom is empty.
  - (b) The entire mass and positive charge of an atom is concentrated in the nucleus and electrons revolve around it.
2. Bohr's atomic model
  - (a) Electrons move around the nucleus in fixed orbits called shells.
  - (b) While revolving, electrons do not radiate energy, except when they move from one shell to another.
3. Thomson's model of atom
  - (a) Atom is a sphere of positive charge.
  - (b) Negative charges are embedded in the sphere of positive charge making atom electrically neutral.

**Q.V. Write the electronic configuration of the following ions:**

1. 2, 8
2. 2, 8, 8
3. 2, 8
4. 2, 8
5. 2, 8

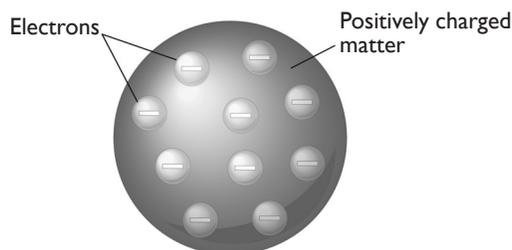
**Q.VI. Very Short Answer Questions**

1. The species containing the same number of electrons are called isoelectronic. For example,  $O^{2-}$ ,  $F^-$ ,  $Na^+$ ,  $Mg^{2+}$
2. Helium atom has only one shell (K-shell) which can have maximum 2 electrons. Thus, its shell is already completed. Hence, its valency is zero. It is called noble gas or inert gas.
3.  ${}_{19}K = 2, 8, 8, 1$
4. Atom will not carry any charge because electron carries one unit negative charge whereas proton carries one unit positive charge. The net charge on the atom will, therefore, be zero.
5. The outermost shell of the atom of an element is called valence electrons shell.
6. 10
7. Atomic number 8, Atomic mass number 16, so name of the element is oxygen.
8. The isotopes of an element have different mass numbers because they differ in the number of neutrons present in the nucleus.

9. If  $Z=3$ , the valency will be equal to 1.
10. Number of Neutron = Number of mass number - Number of proton  
 $= 4 - 2$   
 $= 2$
11. The statement is incorrect as the number of protons is never greater than the number of neutrons. Number of neutrons can be equal to or greater than the number of protons because mass number is equal to double the atomic number or greater than double the atomic number.
12. % of  $\alpha$  -particles deflected more than  $50^\circ = 1\%$  of  $\alpha$  -particles.  
 % of  $\alpha$  -particles deflected less than  $50^\circ = 100 - 1 = 99\%$   
 Number of  $\alpha$  -particles bombarded = 1 mole =  $6.022 \times 10^{23}$  particles  
 Number of particles that deflected at an angle less than  $50^\circ$   
 $= \frac{99}{100} \times 6.022 \times 10^{23}$   
 $= 596.178 \times 10^{23}$

### QVIII. Short Answer Questions

1. Atomic number of Al = 13, Numbers of electrons in  $Al^{3+}$  will be  $13 - 3 = 10$   
 Atomic number of Cl = 17, Number of electrons in Cl will be  $17 + 1 = 18$
2. Atomic mass number = 23  
 Number of neutron = 12  
 So, Number of electrons =  $23 - 12 = 11$   
 Symbol of the element =  ${}_{11}Na^{23}$
3. (a) Electrons  
 (b) Total number of electron in  $NO_3^-$  ion =  $7 + 3 \times 8 + 1 = 7 + 24 + 1 = 32$
4. According to J.J Thomson, an atom is a sphere of positive charge in which the negative charges are embedded just like the seeds are embedded in a watermelon. The negative and positive charges are equal and hence the atom is electrically neutral.



5. The atomic mass of two isotopic atoms are 35(75%) and 37(25%).  
 Thus, average mass =  $\frac{35 \times 75}{100} + \frac{37 \times 25}{100} = 26.25 + 9.25 = 35.5$  u
6. (a) 3 (b) 2 (c) 4 (d) 1
7. Let the percentage of  $\frac{16}{8}X$  be  $A\%$ . Then the percentage of  $\frac{18}{8}X$  be  $(100 - A)\%$   
 $\therefore 16 \times \frac{A}{100} + 18 \times \frac{100 - A}{100} = 16.2$   
 $\Rightarrow 1800 - 2A = 1620$   
 $\Rightarrow A = 90$   
 So the answer is  $90\%$   $\frac{16}{8}X$  and  $\frac{18}{8}X$

### QVIII. Long Answer Questions

1. Isotopes: Isotopes are atoms which have the same number of protons but the number of neutrons differ. This leads to the variation in mass number too.  
 Example: The simplest example is the carbon molecule which exists as  ${}_6C^{12}$  and  ${}_6C^{14}$  but their electronic

configuration is same, i.e., K-2, L-4

Isobars: Isobars are the pair of atoms which have the same mass numbers but differ in their atomic numbers.

Electronic configuration of an isobar pair is as follows,

$^{40}\text{Ca}_{20}$ : K-2 L-8 M-8 N-2

$^{40}\text{Ar}_{18}$ : K-2 L-8 M-8

Isotopes of hydrogen:

- |                                  |                                    |                                  |
|----------------------------------|------------------------------------|----------------------------------|
| a. H(Protium) ( $^1\text{H}_1$ ) | b. D(Deuterium) ( $^2\text{H}_1$ ) | c. T(Tritium) ( $^3\text{H}_1$ ) |
| Atomic number=1                  | Atomic number=1                    | Atomic number=1                  |
| Mass number = 1                  | Mass number = 2                    | Mass number = 3                  |
| Number of protons = 1            | Number of protons = 1              | Number of protons = 1            |
| Number of electrons = 1          | Number of electrons = 1            | Number of electrons = 1          |
| Number of neutrons = Nil         | Number of neutrons = 1             | Number of neutrons = 2           |

2. (a) Cathode rays.  
 (b) Cathode rays carry negative charge, are made up of material particles and travel in straight line.

## WORKSHEET 2

### Q.I Multiple Choice Questions:

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

### Q.II Complete the given table:

Element	Atomic number	Number of electrons	Number of neutrons	Number of protons	Valency
Carbon	6	6	6	6	4
Oxygen	8	8	8	8	2
Fluorine	9	9	10	9	1
Sodium	11	11	12	11	1
Silicon	14	14	14	14	4
Phosphorus	15	15	16	15	3
Chlorine	17	17	18	17	1

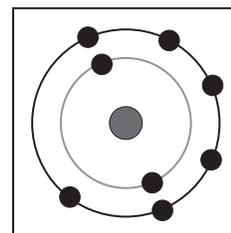
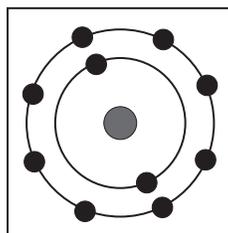
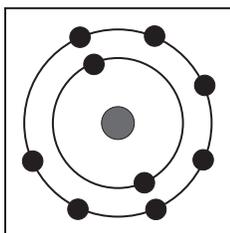
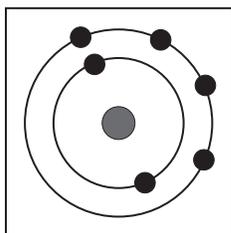
### Q.III Fill in the blanks using the suitable words given in the brackets:

1. helium      2. energy      3. valence shell      4. 16      5. nucleons

### Q.IV State whether the following statements are true or false:

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

### Q.V. From the given electronic configurations, identify and name the respective elements.

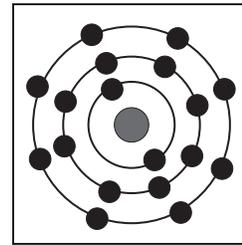
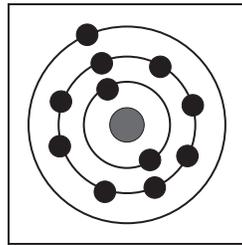
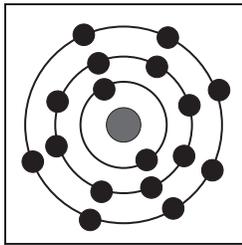
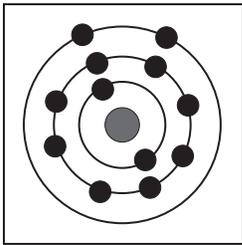


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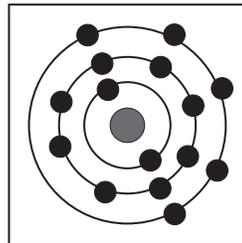
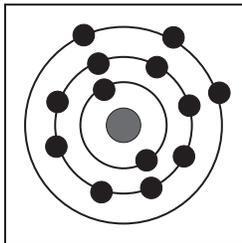
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Carbon      Fluorine  
 Neon        Oxygen  
 Magnesium Chlorine  
 Sodium     Argon  
 Aluminium Phosphorus

### QVI. Very Short Answer Questions

1. Proton
2. It is the combining capacity of an atom.
3. Due to different atomic mass numbers.
4. Absorbed
5. 18 electrons
6. Protons are located in the nucleus of atom, while electron revolve around the nucleus.
7. Electronic configuration of element having atomic number 12 is 2, 8, 2.
8. Hydrogen and Deuterium.
9.  $-1.6 \times 10^{-19}$  coulomb
10. The total number of protons and neutrons in an atom is called its mass number.
11. This is because the two oxygen atoms might be isotopes of each other.
12. Electrical discharge in gases.

### QVII. Short Answer Questions

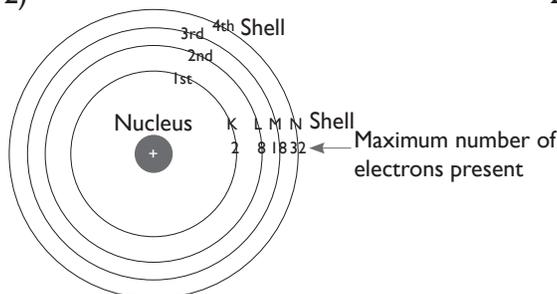
1.  $S^{2-}$   
 atomic configuration  
 $K=2$   $L=8$   $M=8$  since it has two extra electrons, the actual atomic number is  $18 - 2 = 16$ .
2. Number of protons = 5  
 Number of neutrons = 6  
 So, atomic mass number = Number of protons + Number of neutrons  
 $= 5 + 6 = 11$   
 Atomic number will be = 5  
 So, Number of electrons = 5  
 Electronic configuration = 2, 3  
 So, valence electron is 3

3. Electronic configuration of element having atomic number 16 is 2, 8, 6  
So, electron distribution in K, L, M are 2, 8, 6 respectively.  
Electro valency of atomic number of 16 will be 2.
4. Isotopes show similar chemical properties since isotopes of an element have same number of electrons, they have same electronic configuration and hence, the same number of valence electrons. Since chemical properties depend upon the number of valence electrons, therefore, they have same chemical properties.

Application of isotopes:

- (i) In the nuclear reactor, an isotopes of uranium (U-235) is used as a nuclear fuel.  
(ii) Some radioisotopes are widely used for the treatment as well as diagnosis of diseases like cancer, tumour, etc.  
(iii) Radioisotopes are used to detect the leakage in the underground oil pipes, gas pipes or water pipes.
5. (i) The maximum number of electrons that can be present in the  $n^{\text{th}}$  shell is equal to  $2n^2$ . Thus, we have

Shell	Maximum number of electrons present
1st shell or K-shell ( $n=1$ )	$2 \times 1^2 = 2$
2nd shell or L-shell ( $n=2$ )	$2 \times 2^2 = 8$



Maximum number of electrons present in different shells

3rd shell or M-shell ( $n=3$ )	$2 \times 3^2 = 18$
4th shell or N-shell ( $n=4$ )	$2 \times 4^2 = 32$

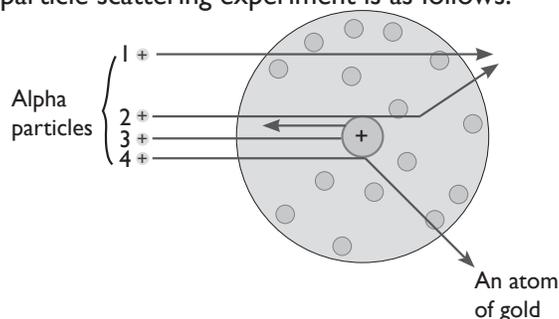
- (ii) The outermost shell cannot have more than 8 electrons even if the first rule is violated. For example 3<sup>rd</sup> shell (M-shell) can accommodate upto 18 electrons but as soon as it has acquired 8 electrons, the filler of the 4<sup>th</sup> shell (N-shell) starts. Thus, for the first 18 elements, rule(iii), as given below, can be applied.
- (iii) Electrons can not enter into a new shell unless the inner shells are completely filled. In other words, the shells are filled in a step-wise manner.
6. (a) Number of electrons in Rn= 86  
Number of protons in Rn=86  
Number of neutrons in Rn= 222 - 86 = 136
- (b) He, Ne and Ar are noble gas atoms, i.e., they have complete valence shell due to which they show zero valency.
7. The number of neutrons in an element M has atomic mass 24 and atomic number 12 is  $24-12=12$ .  
The electron distribution in K, L and M shells is 2, 8, 2 respectively.

### QVIII. Long Answer Questions

I.

Electrons	Protons	Neutrons
Negatively charged	Positively charged	No charge
Present outside the nucleus	Present inside the nucleus	Present inside the nucleus of an atom
Negligible mass	1 a.m.u	1 a.m.u
Get attracted towards positive charge	Get attracted towards negative charge	Do not get attracted to any charged particle

2. Ernest Rutherford discovered the nucleus within an atom in his alpha-ray scattering experiment. The arrangement of the alpha-particle scattering experiment is as follows:



Rutherford produced a narrow beam of particles from a radioactive source (e.g., radium or polonium), which was allowed to strike an extremely thin gold foil. Rutherford proposed that if the spherical model proposed earlier which made for a uniform distribution of positive and negative particles was correct then the alpha particle striking the gold atoms would be uniformly deflected. However, the observations were:

- Most of the alpha particles passed straight through the gold foil without suffering any deflection from their original path
- A few of them were deflected through small angles, while a very few deflected to a large extent.
- A very small percentage (1 in 100000) was deflected through  $180^\circ$  (turned back)

#### Conclusions

- The atom of an element consists of a small positively charged nucleus which is situated at the centre of the atom and which carries almost the entire mass of the atom.
- The electrons are distributed in the empty space of the atom and are revolving around the nucleus at high speed.
- The number of electrons in an orbit is equal to the number of positive charges (protons) in the nucleus. Hence, the atom is electrically neutral.
- The volume of the nucleus is negligibly small as compared to the volume of the atom.
- Most of the space in the atom is empty.
- The arrangement of electrons in an atom is just like a solar system.

#### Drawbacks of Rutherford's model of an atom:

The orbital revolution of the electron is not expected to be stable. Any particle in a circular orbit would undergo acceleration and the charged particles would radiate energy. Thus, the revolving electron would lose energy and finally fall into the nucleus. If this were so, atom should be highly unstable and hence, matter would not exist in the form that we know.

## WORKSHEET 1

### Q.I Multiple Choice Questions:

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

### Q.II Fill in the blanks using the suitable words given in the brackets:

1. cell theory
2. cristae
3. genes
4. nucleus
5. chromoplasts

### Q.III Differentiate between the following:

1. Plant cell is rectangular in shape, has a cell wall and chloroplasts. Animal cells are rounded in shape, lack cell wall and chloroplasts.
2. Prokaryotic cell does not have a well-defined nucleus and membrane-bound organelles while eukaryotic cell has well-defined nucleus and membrane bound organelles.
3. Chloroplasts are the plastids that contain chlorophyll whereas chromoplasts are the plastids that contain coloured pigments other than chlorophyll.
4. Organs are the structures made up of tissues while organelles are the structures present inside a cell.
5. SER are smooth and helps in formation of lipids while RER are rough and helps in protein synthesis.

### Q.IV Name the following:

1. Nucleus
2. Golgi apparatus
3. a. RER b. SER
4. Nucleus
5. Ribosome

### Q.V Give reasons for the following:

1. Both chloroplasts and mitochondria possess their own DNA, RNA, and 70S ribosomes which helps them synthesise some of their proteins and enzymes. Due to this functional independence, they are semi-autonomous.
2. Mitochondria are commonly known as power house of the cell because they contain enzymes necessary for the total oxidation of food and for release of high amount of energy in the form of ATP. The body uses energy stored in ATP for synthesis of new chemical compounds and for mechanical work.
3. Nucleus is called the brain of the cell because it controls all the metabolic activities of the cell.
4. The ribosomes help in the synthesis of proteins in the cell. Hence, they are known as the protein factories of the cell.
5. Nuclear membrane is a double-layered covering which has pores that allow the transfer of material from inside the nucleus to its outside. These pores have complex structures that selectively allow passage of substances. Therefore, nuclear membrane is selectively permeable.

### Q.VI Very Short Answer Questions:

1. No
2. Centrioles
3. The nucleolus is located in within the nucleus of the cell.
4. Ribosomes
5. Chloroplasts
6. Cellulose
7. Swollen raisin will shrink.
8. Synthesis of ATP in mitochondria occur on the inner mitochondrial membrane.
9. Iodine solution is used as a starch indicator in science experiment. When iodine solution is introduced to a substance that contains starch, it will turn to a dark blue or blue-black hue.
10. The functional segment of DNA is gene.
11. Due to consuming salt, the body cells undergo exosmosis and release water resulting in vomiting.
12. The onion peel cells will swell up while that of RBCs do not.

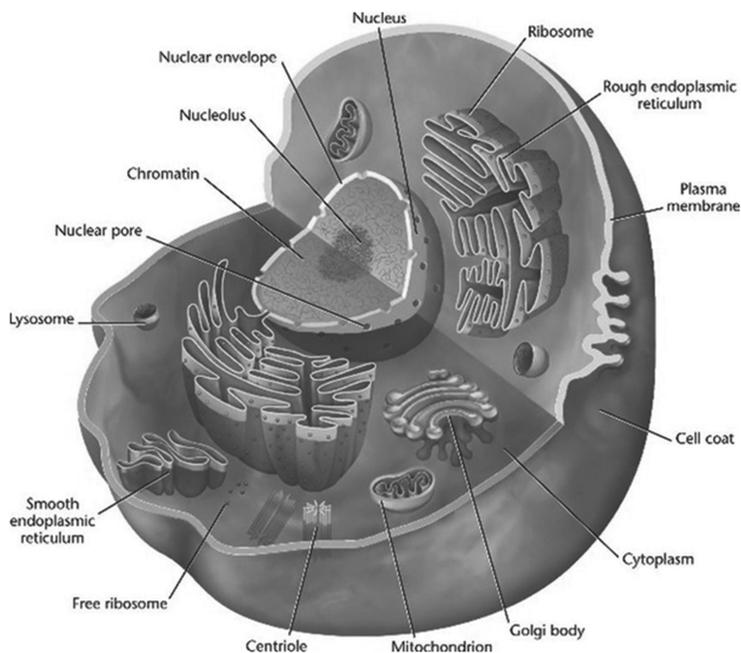
### Q.VII Short Answer Questions:

1. If animal cell is provided with cell wall, the animal would become stiff and rigid and would not able to do all the necessary things it needs to do like to survive, run, eat, etc.
2. The three similarities between mitochondria and plastids are:
  - (a) Both are cell organelles.
  - (b) Both are double membrane bound organelles.
  - (c) Both are capable of making their own copies.

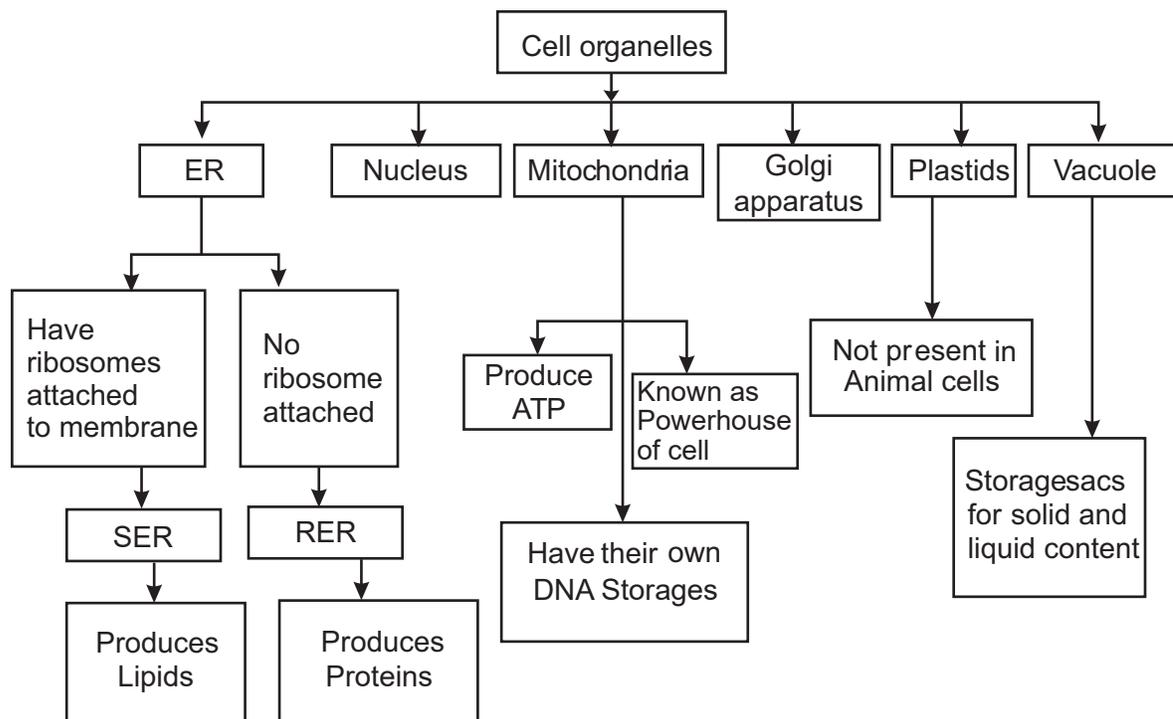
Difference is that mitochondria occur in the cells of aerobic organisms with the exception of RBCs whereas plastids occurs in the cells of green photosynthetic parts of the plants.

3. Amoeba obtains its food through a process called phagocytosis. The cell membrane of amoeba is projected into numerous finger-like outgrowths; called pseudopodia. Amoeba surrounds a food particle by pseudopodia and makes a food vacuole, after engulfing the food.

4.



5.



6. Chromatin is entangled mass of thread-like structure. Chromatin material gets organised into chromosome. The chromosome contains DNA and protein. Two arms of chromosome are called chromatids. Thus, chromosome is made of chromatid and chromatid is made of chromatin.
7. Digested food and water are absorbed into the blood and by the cells by the process of diffusion and osmosis.

### Q.VIII Long Answer Questions:

1.
  - (a) The cell wall is a protective layer around the plant cell. It mostly consists of cellulose, which provides rigidity and strength to the plant cell, helping it to stand upright.
  - (b) The cell walls of plant cells help maintain turgor pressure, which is the pressure pressing the cell wall. The cell wall efficiently holds water so that the cell does not burst.
  - (c) Plant cell
  - (d) If animal cell is provided with cell wall, the animal would become stiff and rigid and would not be able to do all the necessary things it needs to do like to survive, run, eat, etc.
2.
  - (a) A - Plant cell                      B - Animal cell
  - (b) It will gain water by the process of osmosis. The cell wall swells up because the concentration of water is high in the hypotonic solution.
  - (c) It will lose water by the process of osmosis. The cell wall shrinks and gets plasmolysed because the concentration of water is low in the hypertonic solution.

## WORKSHEET 2

### Q.I Multiple Choice Questions:

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

### Q.II Give one word for each of the following statements:

1. Multicellular
2. Cytoplasm
3. Nerve Cell
4. Prokaryotic Cell
5. Tonoplast

**Q.III 1.** Endosmosis and exosmosis

Endosmosis	Exosmosis
a. The cell swells up.	a. The cell shrinks.
b. It occurs when cell is placed in hypertonic solution.	b. It occurs when cell is placed in hypotonic solution.
c. Concentration of water is high outside the cell.	c. Concentration of water is high inside the cell.

2. Cell membrane and nuclear membrane

Cell membrane	Nuclear membrane
a. It encloses the cytoplasm.	a. It encloses the nucleus.
b. It is a lipid bilayer.	b. It is a double lipid bilayer.

3. Nucleus and nucleolus

Nucleus	Nucleolus
a. Controls the structure and working of cells	a. It synthesises information nutrients like RNA
b. Covered by a two membrane envelope	b. Does not have a covering membrane

**Q.IV Match the following**

**Column A**

1. Chromosome
2. Centriole
3. SER
4. Lysosomes
5. Food vacuole

**Column B**

- (b) Nucleus
- (a) Centrosome
- (d) Detoxification
- (e) Suicidal bags
- (c) Amoeba

**Q.V State whether the following statements are true or false:**

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

- Q.I**
- |                  |                |               |                                   |                |
|------------------|----------------|---------------|-----------------------------------|----------------|
| 1. Multicellular | 2. Prokaryotic | 3. Protoplasm | 4. Egg cell                       | 5. Prokaryotic |
| 6. DNA           | 7. Tonoplast   | 8. Cytology   | 9. Green parts like leaves, stems |                |
| 10. Cell wall    |                |               |                                   |                |

**Q.VI Very Short Answer Questions:**

1. Dead
2. Golgi apparatus
3. Membrane proteins
4. Cytoplasm
5. Deoxyribonucleic acid
6. Chlorophyll absorbs light in the red (long wavelength) and the blue (short wavelength) regions of the visible light spectrum. Greenlight is reflected by the plant. Chlorophyll absorbs all other colours of the electromagnetic spectrum, but it does not absorb green.
7. i) Microtubules                      ii) Microfilaments                      iii) Intermediate filaments
8. Prokaryotic cell.  
Evidence supports the idea that eukaryotic cells are actually the descendents of separate prokaryotic cells that joined together to form a symbiotic union.
9. i) The cell membrane - Its basic function is to separate the inside of cells from the outside.  
ii) The cytoplasm - It is the interior portion filled with cytomel (the aqueous fluid inside the cell).  
iii) The nucleus - It is the membrane bound internal region that contains genetic material.
10. The cytoskeleton acts as a support for the cell.  
It maintains the cell shape, holds and moves organelles.  
Microtubules are heavily involved in meiosis and form the mitotic spindle.
11. Bacteria contain cells that have chlorophyll or other photosynthetic pigments that perform photosynthesis.
12. Plasmolysis or exosmosis.

### Q.VII Short Answer Questions:

1. The folding of the inner membrane increases the surface area inside the organelle. Since, many of the chemical reactions happen on the inner membrane, the increased surface area creates more space for reactions to occur.
2. It is called selectively permeable membrane because it allows only certain/ selective materials to enter and exit the cell layer. Molecules like oxygen and water move in and out of cell by the process of diffusion and osmosis respectively.
3. Lysosomes - They are also known as suicidal bags of the cell. They are responsible for the digestion of the cell with the help of digestive enzymes when the cell has grown old or is dead.  
Peroxisomes - These are membrane bound organelles in eukaryotic cells. They are involved in lipid metabolism and conversion of reactive oxygen to safer molecules like water and oxygen.  
Centrosome - It is an organelle in eukaryotic cell. It helps in formation of the microtubules essential for cell division.
4. (a) The cell will shrink as the water inside the cell will move out from higher potential to lower potential.  
(b) The cell will swell up as the water from surrounding medium will move inside the cell from higher potential to lower potential.  
(c) The cell shall remain as it is without any net movement of water.
5. (a) Differences in the vacuoles found in plant cell and animal cell

Plant cell	Animal cell
a. Contains a single large vacuole.	a. Contains several small vacuoles.
b. Generally occur in the centre of the plant cell.	b. Can be distributed all over the animal cell.
c. Important in maintaining the turgor pressure.	c. Important in exocytosis and endocytosis.

- (b) i) It is involved in synthesis of cell wall, plasma membrane and lysosome.  
ii) It produces vacuoles or secretory vesicles which contain cellular nutrients.
6. Plasma membrane is defined as an outer membrane of the cell and it is composed of two layers of phospholipids and is embedded with proteins. Being a thin semi-permeable membrane layer, it surrounds cytoplasm and the other components of the cell. It is about 7nm thick. The membrane is 75% phospholipid. The membrane contains proteins, cholesterol and polysaccharides.  
Function - Plasma membrane permits the entry and exit of some molecules in the cells. Therefore, plasma membrane is called selectively permeable membrane. It performs certain physical activities such as diffusion and osmosis for intake of molecules.  
Certain biological and physiological activities such as active transport and endocytosis are performed by the plasma membrane.
7. Viruses can be considered to be alive as they depend upon hosts to replicate their DNA from RNA. They are much smaller than the cells.  
But cell theory states that "all living cells are made of cells that are fundamental unit of life". So, a virus is not made up of cells. But, it is considered to be living. Therefore, it is an exception to the theory.

### Q.VIII Long Answer Questions:

1. (a) Evidence supports the idea that eukaryotic cells are actually the descendents of separate prokaryotic cells that joined together to form a symbiotic union. The hypothesis of endosymbiosis theory supports that mitochondria have evolved in this way.  
(b) Mitochondria contain 70 S type of ribosomes, same as those found in prokaryotes.  
(c) Chloroplasts.
2. (a) The cell will shrink due to exosmosis.  
(b) Cell membrane, because it allows movement of only those substances that are required by the cell to maintain its vitality.  
(c) Exosmosis occurred here. The water surrounding the cell has lower water concentration than inside the cell. Hence, water from the cell moves out from the cell and the cell shrinks.

# Chapter 06 TISSUES

## WORKSHEET 1

### Q.I Multiple Choice Questions:

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

### Q.II Match the followings

#### Column A

1. Intercalary meristem
2. Thick walled cells
3. Sieve tube
4. Vessels
5. Blood

#### Column B

- (c) Base of Internode
- (e) Sclerenchyma
- (a) Phloem
- (d) Xylem
- (b) Fluid tissue

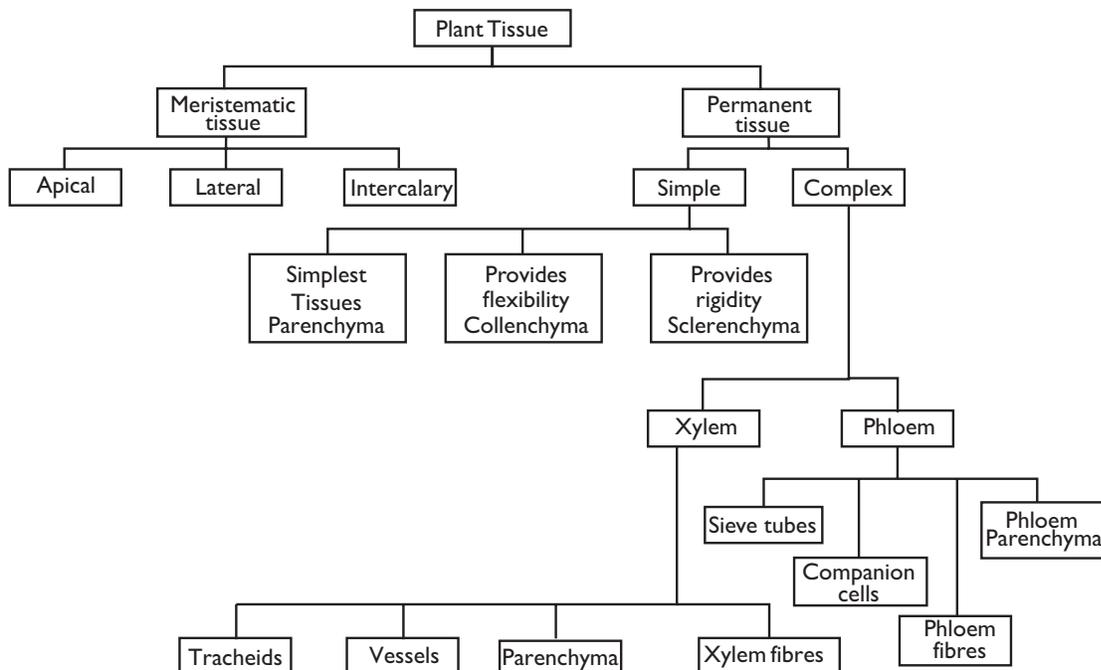
### Q.III Name the following:

1. Apical Meristem
2. Epithelial Tissue
3. Blood Plasma
4. Neurons
5. Ligament

### Q.IV Fill in the blanks using the suitable words given in the brackets:

1. epithelial
2. Sclerenchyma
3. heart
4. axon
5. Collenchyma

### Q.V Complete the flowchart given below:



### Q.VI Very Short Answer Questions:

1. Cork cambium and Vascular cambium.
2. Neuron is one of the unit cells that constitute nervous tissues that has the property of transmitting and receiving nervous impulses.
3. Meristematic tissue and epithelial tissue.
4. Calcium and phosphorus compounds are composition of bone matrix.
5. The dead elements present in the phloem is phloem fibre.
6. The different components of xylem tissue are tracheids, vessels, xylem parenchyma and xylem fibres.
7. The different cells present in blood are red blood cells, white blood cells and platelets.
8. Fluid or vascular connective tissues are motile connective tissues consisting of fluid matrix and free cells. Blood is the fluid connective tissue. It contains fluid matrix called plasma and blood cells such as Red Blood Cells, White Blood Cells and platelets are suspended in it.
9. Sclerechyma is the tissue found in the husk of coconut.
10. Suberin is the chemical substance which makes cork cell impervious to gases and water.
11. This is because subcutaneous fat acts as a layer to insulate the body from outside temperature of water and helps the animals to overcome the cold temperature of water.
12. This happens due to transpiration.

### Q.VII Short Answer Questions:

1. (a) Squamous epithelium - It is located in the skin.  
(b) Cuboidal epithelium - It is located in kidney tubules and in salivary glands.  
(c) Columnar epithelium - It is found in inner lining of stomach and intestine.  
(d) Stratified epithelium - It is located in outer skin.

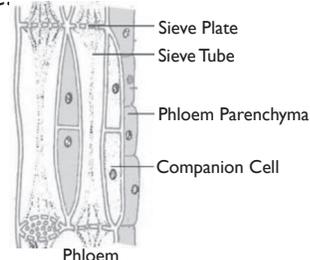
2. The elements of phloem tissues are:

Sieve tubes: These are tubular cells with perforated walls.

Companion cells: These are small elongated cells.

Phloem fibres: They provide mechanical strength to the tissue.

Phloem parenchyma: They help in storage and lateral conduction of food.



3. Sieve tubes are long tubular cells with perforated walls whereas companion cells are small elongated cells which are not perforated.
4. (a) Cells of cork are dead and compactly arranged without intercellular spaces. These cells have a chemical substance called suberin in their walls.  
(b) It is formed by secondary lateral meristem called cork cambium. Cork cambium gives rise to new cells on its both side, thus, forming cork on the outer side.  
(c) Cork is protective in function. Cork cells prevent infection and mechanical injury.
5. (a) Epidermis protects the plant body against invasion of parasites.  
(b) Epidermis is very important for plant. It is the outermost protecting layer of plant. It protects against loss of water, mechanical injury and invasion of parasitic fungi.
7. (a) Neuron  
(b) A-Dendrite, B-Cyton, C-Nucleus, D-Axon, E-Nerve ending  
(c) Neurons have the ability to receive stimuli from within or outside the body and conduct impulses to different part of the body. The impulses travel from one neuron to another neuron and finally to the brain or spinal cord.

### Q.VIII Long Answer Questions:

1. (a) A-Cardiac muscles, B-Smooth muscles, C-Skeletal muscles

(b)

Character	Striated	Unstriated	Cardiac
Structure	Cells are long, cylindrical, non tapering and are unbranched.	Cells are long with tapering ends and are unbranched.	Cells are non-tapering, cylindrical and are branched.
Location	In hands, leg and skeletal muscles	The wall of stomach intestine, ureter	In the heart

2. (a) Athlete feels tired because the muscles did not get enough oxygen and lactic acid starts accumulating in them.  
 (b) He was asked to take rest so that the muscles get enough oxygen, are relieved and the person can then feel rejuvenated.

## WORKSHEET 2

### Q.I Multiple Choice Questions:

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

### Q.II Give reasons for the following statements:

- Oxygen goes from the air to cells when we breathe in oxygen enters the small air sacs, called alveoli, in the lungs. These contain a red substance called hemoglobin, carries oxygen around the body in the blood, then lets it go when necessary.
- Bone matrix is mostly made up of composite material incorporating the inorganic mineral calcium phosphate in the chemical arrangement formed calcium hydroxyapatite and collagen, an elastic protein which improves fracture resistance.
- Contractile proteins of muscle are actin and myosin, the main components of the thin and thick filaments. The thin filaments extend from the z lines. They are formed by the actin molecules twisted in a helix.
- Nerve cells as are usually long and thin because of the need to transmit information between various parts of the body. It is the key unit of the nervous tissue and also helps in carrying stimulus from the body.
- Non-striated muscles are called so because these types of muscles do not show light and dark bands or striations when stained as shown by striated muscles. Non-striated muscles are also called involuntary muscles.

### Q.III Differentiate between the following:

1. Striated muscles and cardiac muscles

Striated muscles	Cardiac muscles
a. Cells are long cylindrical, non-tapering and unbranched.	a. Cells are non-tapering, cylindrical and branched.
b. Many nuclei which are situated towards the periphery of muscles fibres.	b. Each cell contains one or two nuclei situated in the center.
c. Hands, legs and other skeletal muscles.	c. Present in heart.

2. Unstriated muscles and skeletal muscle

Unstriated muscles	Skeletal muscle
a. Cells are long and uprisng ends (spindle shaped) and unbranched.	a. Skeletal muscle is involved in voluntary movement. They are attached to bones by tendon and to produce all the movements of body parts in relation to each other
b. Stomach wall, intestine, bronchi, etc.	b. For e.g. - Biceps

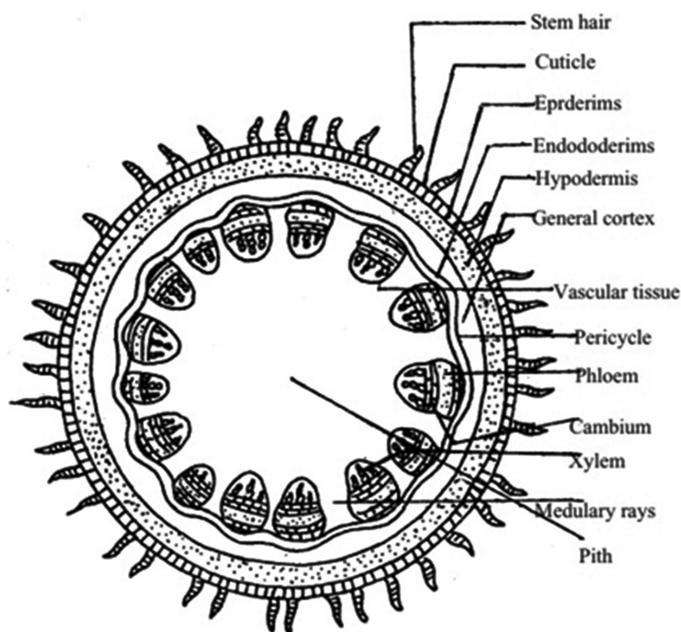
3. Plant tissues and animal tissues

Plant tissues	Animal tissues
a. Tissues organisation is targeted towards stationary habit of plants.	a. Tissues organisation is targeted towards mobility of animals.
b. Organisation is simple.	b. Organisation is complex.
c. Most of the tissues are dead. e.g. - Cork.	c. Most of the tissues are living.
d. Growth is confined to certain areas.	d. Growth is not limited to areas.
e. Less maintenance energy required.	e. More maintenance energy required.

4. Parenchyma and collenchyma

Parenchyma	Collenchyma
a. Parenchyma cells are found in every soft part of the cell.	a. Collenchyma cells are found in petiole leaves and young stems.
b. Unspecialised cells.	b. Specialised cells.
c. Consist of thin cell wall.	c. Consist of an unequally thin cell wall.
d. Photosynthesis, storage of food are major function.	d. Provide mechanical support to plants.

**Q.IV Label the diagram of the section of stem shown below:**



**Q.V Give one word for each of the following statements:**

1. Myology
2. Muscle fibre
3. Striated muscles
4. Neuron
5. Motor

**Q.VI Very Short Answer Questions:**

1. The term tissue was coined by Marie Francois Xavier Bichat in the year 1792.
2. Cutin is that chemical substance.
3. A complex organic polymer deposited in the cell walls of many plants, making them rigid and woody.
4. Sclerenchyma
5. Bone

6. Suberin
7. (a) Skeletal muscle                      (b) Smooth muscle
8. The specific function of the cardiac muscle is to control the contraction and relaxation of the heart.
9. It is found beneath the skin.
10. It connects bone to bone.
11. This is because increase in length occurs at nodes by intercalary meristem.
12. This is because it contains air sacs that provide buoyancy.

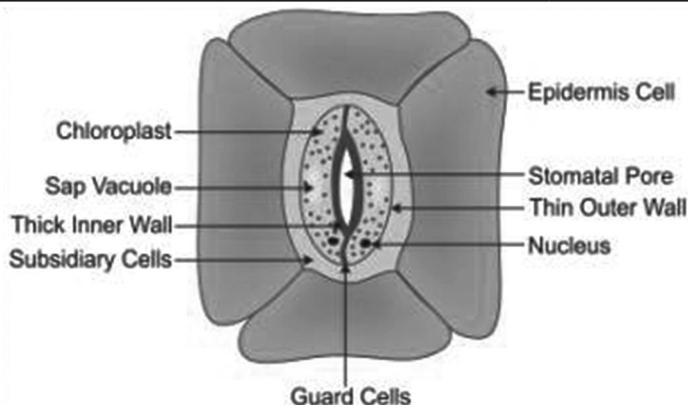
**Q.VII Short Answer Questions:**

1. The tracheid and vessels are the basic cells in the xylem, that is all plants have tracheids, but not the more highly evolved vessel elements. Tracheids are generally spindle shaped, very elongate, and have tapered ends.
2. In multicellular organisms, several cells are grouped to form tissues. These tissues perform particular function at a definite place in the body.  
for e.g. - nerve cells.

Simple tissues and Complex tissues

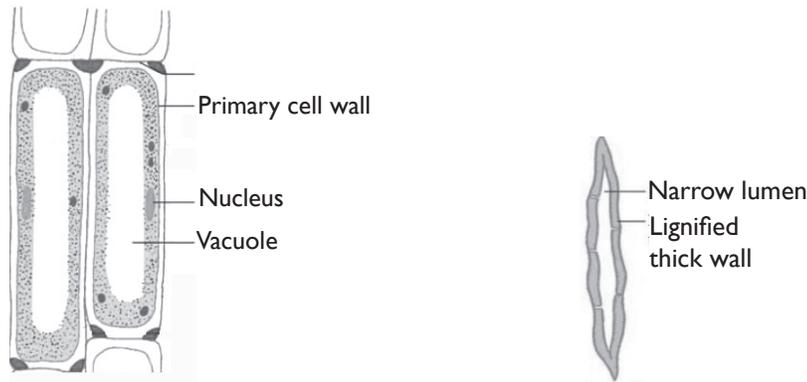
Simple tissue	Complex tissues
a. Simple tissue consists of one same type of cells.	a. Complex tissue has different type of cells.
b. Simple tissue consists of parenchyma, collenchyma and sclerenchyma.	b. Complex tissue consists of xylem and phloem.
c. Simple tissue occurs in all parts of plants.	c. Complex tissue only occurs in vascular region.

4. (a)



- (b) The gas exchange that occurs when stomata are open facilitates photosynthesis. Photosynthesis is the process by which plants convert sunlight into usable energy. During photosynthesis, carbon dioxide is taken in from the atmosphere through the stomata and oxygen is released as a waste product.
5. Tracheids and vessels are called tracheary elements. Tracheids are found in all vascular plants, but vessel elements are unique to angiosperms. Both kinds of cells die at maturity, but their lignified cell walls remain as the conduits through which water is carried in the xylem.
6. Collenchyma and Sclerenchyma

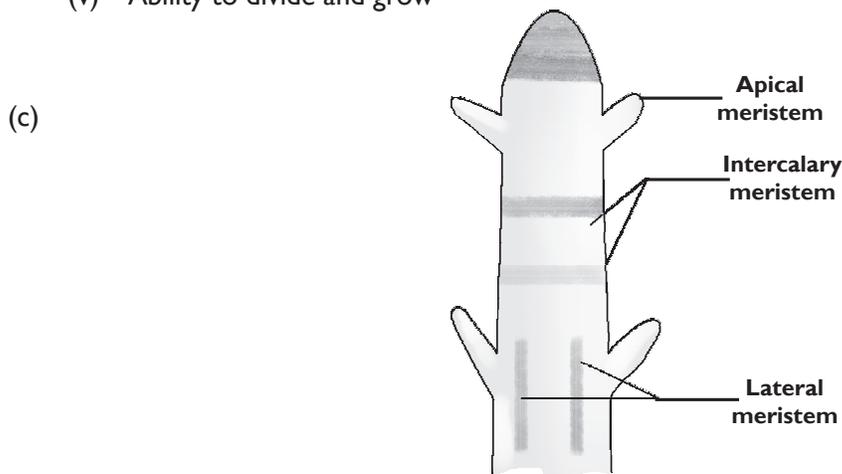
Collenchyma	Sclerenchyma
a. The cells of collenchyma are living and have the cytoplasm and the nucleus.	a. The cells are dead. They do not have the cytoplasm and the nucleus.
b. They provide mechanical support and elasticity to the plant organ.	b. They mainly provide mechanical support to plant and rigidity to the plant.
c. Collenchyma cells may contain chlorophyll and can also help in the manufacture of starch.	c. They do not contain chlorophyll in any condition as they are dead cells.



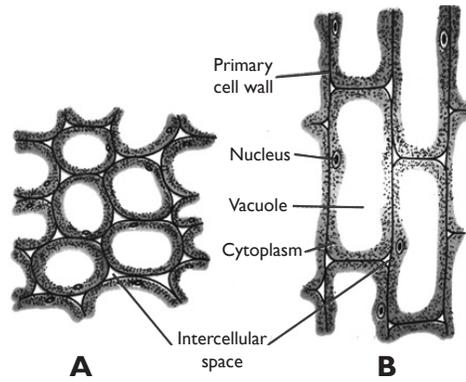
7. (a) Collenchyma  
 (b) It provided flexibility to plant tissues that helps in bending without breaking/  
 (c) Amyloplasts in collenchyma stores starch.

### QVIII Long Answer Questions:

1. (a) Meristematic tissues are simple tissues composed of a group of similar and immature cells that can divide and form new cells.  
 (b) The main characteristics of meristematic cells are:  
 (i) Isodiametric, rounded polygonal cells  
 (ii) Absence of intercellular spaces,  
 (iii) Dense cytoplasm and conspicuous nucleus  
 (iv) Absence of intercellular spaces  
 (v) Ability to divide and grow



- (d) The function of meristematic cells are mainly the increase in length and girth of plant. It is also responsible for secondary growth and thickness of plant. Due to presence of meristems the plant growth continues throughout the life of a plant.
2. (a) **Parenchyma:** The cells parenchyma have thin cell wall. They are loosely packed; with lot of intercellular spaces between them. Parenchyma makes the largest portion of a plant body. Parenchyma mainly works are packing material in plant parts. The main function of parenchyma is to provide support and store food. In some plant parts, parenchyma has chlorophyll as well. In that case, parenchyma carries out photosynthesis and is then termed as chlorenchyma. In aquatic plants, large air cavities are present in parenchyma. This provides buoyancy to the plant, and then the parenchyma is known as aerenchyma.



**Parenchyma: A transverse section; B longitudinal section**

- (b) (i) This is because it forms the base of different layers of cells o tissues.  
(ii) Because the produce lactic acid due to lack of oxygen during exercise.  
(iii) It helps them in floating.  
(iv) Because they help in movement and locomotion.  
(v) This is a place where chemical transmission of impulses occur from one neuron to another.
3. (a) On the basis of absence of nucleus.  
(b) B-Neutrophil, C-eosinophil  
(c) E is monocyte and helps to form more new cells while F are lymphocytes and provide immunity.  
(d) These pare platelets and help in blood clotting.They lack nucleus and are cellular fragments.

**WORKSHEET 1**

**Q.I Multiple Choice Questions:**

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

**Q.II Name the phylum to which the following animals belong:**

1. Arthropod
2. Phylum Chordate
3. Echinodermata
4. Cnidaria
5. Echinodermata

**Q.III Classify the following as cold-blooded or warm-blooded animals:**

**Cold blooded:** Rohu, dog fish, flying lizard, king cobra, crocodile, salamander

**Warm blooded:** ostrich, pigeon, bat, whale

**Q.IV (1)**

<b>Cryptogamae</b>	<b>Phanerogamae</b>
a. Reproductive organs are hidden.	a. Reproductive organs are visible.
b. Non-flowering and non-seed bearing e.g. fern, moss, etc.	b. Flowering and seed bearing. e.g. daisy, hibiscus, etc.

**(2)**

<b>Gymnosperms</b>	<b>Angiosperms</b>
a. Plants bear naked seeds.	a. Plants bear covered seeds.
b. Reproductive organs are present in cones. e.g. Pinus, cycas, etc.	b. Reproductive organs are flowers. e.g. beans, wheat, etc.

**(3)**

<b>Poriferans</b>	<b>Coelenterates</b>
a. Poriferans have small pores called ostia all over the body and a large opening at the top.	a. Coelenterates lack ostia and have only one opening.
b. They have canal system for circulating water throughout the body.	b. They don't have water canal system in the body.
c. External skeleton is present.	c. Skeleton is absent.
d. Tentacles are absent.	d. Tentacles are present.

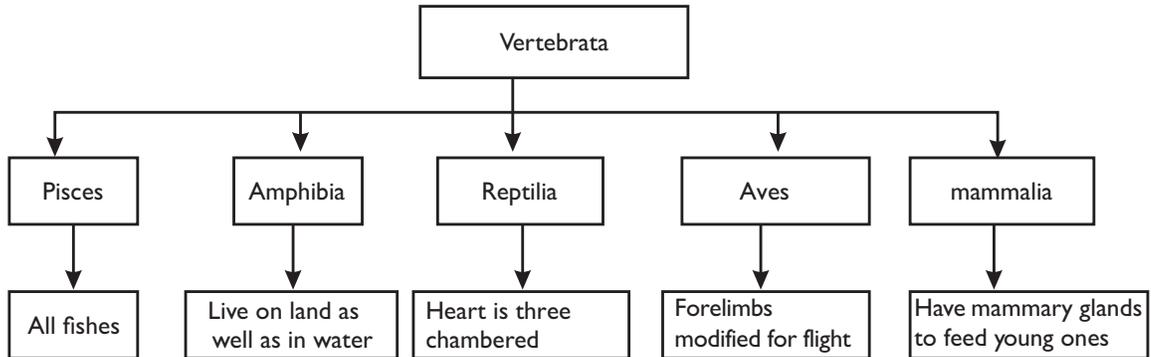
**(4)**

<b>Arthropods</b>	<b>Annelids</b>
a. Exoskeleton present.	a. No skeleton.
b. Body is segmented into head, thorax and abdomen.	b. Body is segmented into rings.
c. Sexes are usually separate.	c. Sexes may be united or separate.

(5)

Bony Fishes	Cartilaginous Fishes
a. Also known as Osteichthyes.	a. Also known as chondrichthyes.
b. Presence of bone tissue.	b. Presence of cartilage tissue.
c. Found in both marine and fresh water.	c. Found in marine, salt water.

Q.V



- Q.VI
- (a) Mushrooms (b) Green mold
  - Robert Whittaker 3. *Panthera tigris* 4. Carolus Linnaeus
  - Leech 6. Two chambers 7. Siliceous spicules
  - muscular foot
  - Whales are not grouped into fishes because whales are warm-blooded, which means they keep a high body temperature that does not change in the cold water. So whales are indeed mammals not fishes.
  - We keep both snakes and turtles in the same class because both are cold-blooded and lay eggs with tough coverings. So both snakes and turtles are kept in the same class (reptilia).
  - Balanoglossus
  - They have seen Pine trees.

Q.VII Short Answer Questions:

- Four characteristics of pisces are:
  - Fishes can live only in water.
  - The skin of fish is covered with scale/plates.
  - Body of fishes is streamlined.
  - Fishes are cold-blooded.
- The class of flying warm-blooded animals in which teeth are absent is 'Aves'.  
The some adaptations of Aves are:
  - The bodies of birds are adapted for flying.
  - They have a beak which serves some important functions - to build their home and feed and eat, etc.
  - The respiratory system is highly developed. They breathe through lungs.
  - Eyes are well developed having binocular vision because good sight is necessary for safe flight.
- Organisms with simple cellular structure and no division of labour are called Primitive. Advanced organisms like mammals have millions of cells and there are different organ system for different biological functions.
- Haemocoel: In some invertebrate groups of animals the body cavity is reduced and filled with blood, which is called haemocoel.  
The groups of animals having haemocoel are Arthropoda and Mollusca'.

5.

<b>Bilateral Symmetry</b>	<b>Radial Symmetry</b>
a. An animal with bilateral symmetry can be divided into mirror halves through a single plane.	a. An animal with radial symmetry could be divided into many equal portions from the center.
b. Bilateral symmetry is associated with having a head or leading end of a body	b. It has no right and left side or head and rear end.
e.g - Spiders, birds and mammals etc.	e.g. - Starfish, Sea anemones, etc.

6. Differences between Plant and Animalia.

<b>Plantae</b>	<b>Animalia</b>
a. Plants generally are rooted in one place and don't move on their own.	a. Most animals have the ability to move fairly freely.
b. Plants contain chlorophyll and are autotrophs.	b. Animals don't contain chlorophyll and are heterotrophs.
c. Plants give off (O <sub>2</sub> ) and take in (CO <sub>2</sub> ).	c. Animals give off CO <sub>2</sub> and take in O <sub>2</sub> .

7. (a) For easier and convenient study of variety of life forms we classify organisms.  
 (b) The major characteristics required for classification are:  
 i. nature of cell, whether it is prokaryotic or eukaryotic or unicellular or multicellular  
 ii. they occur singly or grouped together  
 iii. mode of nutrition either autotrophic, heterotrophic, saprotrophic  
 iv. level of body organisation  
 (c) 'Arthropoda' is the largest phylum which is probably the largest group of animals.
8. (a) A - Centipede  
 B - Hydra  
 C - Liver fluke  
 D - Earthworm  
 (b) (i) Platyhelminthes - Liver fluke  
 (ii) Arthropoda - Centipede  
 (iii) Annelida - Earthworm  
 (iv) Cnidaria - Hydra  
 (c) (i) Tissue level organisation- Hydra  
 (ii) Organ level organisation - Liver fluke  
 (iii) Organ system level of organisation - Centipede and earthworm

### Q.VIII Long Answer Questions:

1.

<b>Bryophytes</b>	<b>Pteridophytes</b>
1. Plant body is either leafy or thalloid.	1. Plant body is differentiated into roots, stem and leaves.
2. The cells in plant body are haploid.	2. The cells in body are diploid.
3. Vascular tissue like xylem and phloem absent.	3. Vascular tissue like xylem and phloem present.
4. In life cycle, the gametophyte phase is dominant.	4. In life cycle, the sporophytic phase is dominant.
5. Sporophytic phase completely depends upon gametophytic phase.	5. Sporophytic phase is independent and autotrophic.
e.g. - moss	e.g. - ferns

Two advancements of pteridophytes on bryophytes:

- (a) Pteridophytes have complex leaves (megaphyll) that contain more than one vein.  
 (b) These are seedless plants that possess a well developed vascular system.
2. (a) Cycas  
 (b) Cones

- (c) Cold regions like mountains
- (d) i. It bears naked flowers in the form of cones.  
ii. Its laves are reduced into needle-like structures.
- (e) Through xylem and phloem tissues.

**WORKSHEET 2**

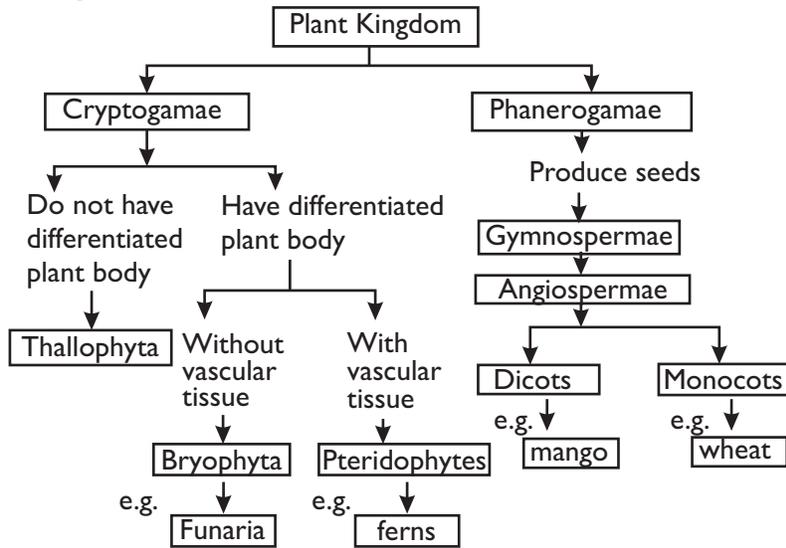
**Q.I Multiple Choice Questions:**

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

**Q.II**

- 1. Liver fluke - *Fasciola hepatica*
- 2. Cattle Leech - *Hirudo medicinalis*
- 3. Housefly - *Musca domestica*
- 4. Indian shark - *Scoliodon laticaudus*
- 5. Frog - *Rana tigrina*
- 6. Tapeworm - *Taenia solium*
- 7. Cockroach - *Periplanata americana*
- 8. Starfish - *Asteroidea*
- 9. Climbing Perch - *Anabas testudineus*
- 10. Flying Lizard - *Draco*

**Q.III. Complete the flowchart shown below:**



**Q.IV Fill in the blanks using the suitable words given in the brackets:**

- 1. locomotory
- 2. Lichens
- 3. sporangia
- 4. birds
- 5. nomenclature

**Q.V Name the following:**

- 1. Ostrich
- 2. Blue Whale
- 3. Octopus
- 4. Bryophytes
- 5. Ostia/Osculum

**Q.VI Very Short Answer Questions:**

- 1. Kingdom is the highest taxonomic category.

2. Lichens are dual organisms or entities comprising a permanent association of a fungus and an alga.
3. Sea squirts
4. Reptilia
5. Pseudopodia
6. No, different organisms have different type of body organisation, cells and tissues. Also the life span of different organisms is also quite varied. Diploblastic organisms are those whose body is made up of two germinal layers only, i.e., endoderm and ectoderm.
7. Pseudocoelom is the body cavity in animals that is derived from the blastocoel of the embryo. This is a false coelom.
8. (a) *Spongia officinalis*                      (b) *Leucosolenia*
9. Thallophyta
10. Protista. Because it cannot be classified as a plant, animal or fungus. They are aquatic
11. (a) Pisces    (b) Reptilia
12. Roundworms enter our body through contaminated food and water. Their infection can be prevented by keeping healthy and clean eating habits.

### Q.VII

1. Triploblastic organisms are animals having a body composed of three embryonic cell layers: the ectoderm, mesoderm and endoderm.
2. Because blue-green algae are prokaryotic unicellular organisms. Monera are prokaryotic and unicellular whereas plantae are autotrophic multicellular.
3. (a) Bryophytes: Plant body may be thalloid or leafy. True roots are absent instead rhizoids develop. Pteridophytes: The main plant body is the sporophyte, which is differentiated into true roots, stems and leaves.  
Gymnosperms : Reproductive organs are present in cones. The plants bear naked seeds.
- (b) Gametophyte is a haploid multicellular adult stage in a bryophyte's life cycle. In this phase multicellular haploid gametophyte develops from a spore and produces haploid gametes, hence is the dominant phase.
4. (a) Characteristics of vertebrate group of animals:
  - (i) As chordates, vertebrates have the same common features: a notochord, a dorsal hollow nerve cord, pharyngeal slits, and a post anal tail.
  - (ii) Vertebrates are further differentiated from chordates by their vertebral column, which forms when their notochord develops into the column of bony vertebrae separated by discs.
 Characteristics of invertebrate group of animals:
  - (i) The main characteristics that separates invertebrates from other organism is the absence of the spinal column and backbone.
  - (ii) They are multicellular organisms, they completely lack cell walls.
  - (iii) They are devoid of hard bony endoskeleton.
- (b) 97% of the total animals on earth are invertebrates. They are the cause of diseases in us but without them there would be no soil formation, nutrient cycling pollination in crops, ecological balance in nature. Therefore, the survey on invertebrates indicates the health and biodiversity of an ecosystem.
5. (a) Population growth and resource consumption, climate change and global warming, habitat conversion and urbanisation, invasive alien species, over exploitation of natural resources and environmental degradation are the threats to biodiversity.
- (b) To conserve biodiversity:
  - (i) Attract good insects by planting pollen and nectar plants.
  - (ii) Maintain wetlands by conserving water and reducing irrigation.
  - (iii) Avoid draining water bodies on your property.
6. Some adaptations of reptiles towards terrestrial mode of life are:
  - (a) Reptiles have dry skin covered with scales or bony plates to minimise water loss.
  - (b) Their eggs have shell for protection and to survive on terrestrial places.
  - (c) They have strong limbs and tail to catch their prey.
7. No, they will not be grouped into the same category.  
Leech and Nereis are classified into same group 'Annelid',
  - Both have bilaterally symmetrical and triploblastic.

- True body cavity present and extensive organ differentiation.
- Scolopendra is a species with very large centripedes of the family scolopendridae.
- Scorpion: They are predatory arachnids of the order scorpiones. They have eight legs.
- Prawns: These are classified into group or phylum Arthropoda showing common features as:
- Open circulatory system
  - Bilateral, triploblastic

### Q.VIII Long Answer Questions:

I. General characteristics of platyhelmenthis and Nemathelminthes:

Platyhelmenthis	Nemathelminthes
a. Their body is dorsoventrally flat and leaf like or ribbon like.	a. They are commonly called thread worm or round worm.
b. Body is bilaterally symmetrical that is left and right half have the same design.	b. It is a phylum of unsegmented triploblastic, pseudocoelomic, cylindrical or thread like worms which are covered by a body wall having cuticle and epidermis.
c. They are mostly hermaphrodite.	c. Organ system level of organisation.
d. Body cavity or true coelom is absent.	d. Respiratory and circulatory organs are absent.
e. They are either free living or parasitic.	
e.g. <i>Planaria, Fasciola</i>	e.g. <i>filariform and microfilariae</i>

- (a) A - fern (*Dryopteris*) B - *Rhizopus* C - Conifer D - *Euglena* E - *Spirogyra*
- (b) *Euglena*
- (c) (i) Bread Mould - *Rhizopus*  
(ii) Male shieldfern - *Dryopteris*
- (d) *Spirogyra*

# Chapter 08 Motion

## WORKSHEET 1

### Q.I Multiple Choice Questions:

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

### Q.II Fill in the blanks using the suitable words given in the brackets:

1. circular
2. slower
3. accelerated
4. accelerated
5. scaler

### Q.III Match the followings

#### Column A

1. The slope of speed-time graph
2. The arithmetic mean of initial and final velocity
3. The area under speed-time graph
4. The slope of the distance-time graph

#### Column B

- (c) Acceleration
- (a) Average velocity
- (b) Distance
- (d) Speed

### Q.IV A car moves in a straight line from rest at $t = 0$ and accelerates at $2\text{m/s}^2$ . On the basis of this information, solve the following table:

Time	Displacement	Velocity
2 s	4 m	2 m/s
4 s	40 m	10 m/s
2.5	25 m	10 m/s
10 min	2 m	1200 m/s

### Q.V Give one word for the following:

1. Linear Motion
2. Deceleration
3. Angular acceleration
4. Curvilinear Motion
5. Speed

### Q.VI Very Short Answer Questions:

1. Initial velocity,  $u = 80 \text{ km h}^{-1} = 80 \times \frac{5}{18} \text{ ms}^{-1} = 22.22 \text{ ms}^{-1}$   
Final velocity,  $v = 60 \text{ km h}^{-1} = 60 \times \frac{5}{18} \text{ ms}^{-1} = 16.67 \text{ ms}^{-1}$

Time,  $t = 5\text{ s}$

Acceleration,  $a = ?$

using, 
$$a = \frac{v - u}{t}$$
$$= \frac{(16.67 - 22.22)}{5\text{ s}} \text{ ms}^{-1}$$
$$= \frac{-5.55}{5\text{ s}} \text{ ms}^{-1}$$
$$= -1.1 \text{ ms}^{-2}$$

2. (a) Speedometer in a car measure its instantaneous speed  
(b) Odometer in a car measure its actual distance travelled by it.
3. When an object moves along a straight line on the same direction.
4. Initial velocity,  $u = 20 \text{ m/s}$

acceleration,  $a = 0.5 \text{ m/s}^2$

or,  $\frac{1}{2} \text{ m/s}^2$

time,  $t = 30\text{ s}$

distance,  $s = ?$

using, 
$$s = ut + \frac{1}{2} (at) t$$
$$= 20 \text{ m/s} \times 30 \text{ s} + \frac{1}{2} (0.5 \text{ m/s}^2 \times 30 \text{ s}) 30\text{ s}$$
$$= 600\text{ m} + \frac{1}{2} (450\text{ m})$$
$$= 600\text{ m} + 225\text{ m}$$
$$= 825\text{ m}$$

5. (a)  $\text{m/s}$  = velocity of an object  
(b)  $\text{m/s}^2$  = acceleration of an object
6. **Conclusion:**  $v$ - $t$  graph is not a straight line. This shows that the object is moving in accelerated motion with increasing speed.
7. It means the object is moving with uniform motion.
8. If the direction component of the object's velocity is constant.
9. The direction of velocity of an object moving along a circular path is along the tangent to the circle at every point.
10. Magnitude of average velocity = Average speed.  
So, numerical ratio of average velocity to average speed is 'One'.
11. Accelerated motion.
12.  $2 \times 5 \times 104 = 5 \times 104 + 104 \times t$   
 $10 = 5 + t$   
 $t = 5 \text{ s}$

### Q.VII Short Answer Questions:

1. Speeds in increasing order are:
  - (b) A bicycle moving with a speed of  $200 \text{ m/min}$ . i.e.  $\frac{200 \text{ m}}{60 \text{ s}} = 3.3 \text{ ms}^{-1}$
  - (c) A scooter moving with a speed of  $30 \text{ km/h}$ . i.e.  $\frac{30 \times 1000 \text{ m}}{60 \times 60 \text{ s}} = 8.3 \text{ ms}^{-1}$
  - (a) An athlete running with a speed of  $10 \text{ m/s}$ . i.e.  $10 \text{ ms}^{-1}$
2. Radius of orbit,  $r = 42,250 \text{ km}$   
Distance travelled by satellite to complete one orbit = circumference of orbit  
$$= 2\pi r$$
$$= 2 \times \frac{22}{7} \times 42,500 \text{ km} = 267142.84 \text{ km}$$

Time,  $t = 24$  hr

$$\begin{aligned}\text{Speed of satellite} &= \frac{\text{Distance}}{\text{Time}} \\ &= \frac{267142.84 \text{ km}}{24 \text{ h}} \\ &= 11130.95 \text{ km h}^{-1} \\ &= \frac{11130.95 \text{ km}}{3600 \text{ s}} \\ &= 3.09 \text{ kms}^{-1}\end{aligned}$$

3. (a) Constant (b) Zero

4. Initial velocity,  $u = 8$  m/s

acceleration,  $a = 1$  m/s<sup>2</sup>

Distance,  $s = 18$  m

Final velocity,

$$v = ?$$

using,

$$v^2 - u^2 = 2as$$

$$v^2 = \sqrt{2as + u^2}$$

$$v^2 = 2 \times 1 \text{ m/s}^2 \times 18 \text{ m} \times (8)^2 \text{ m/s}^2$$

$$v^2 = (36 + 64) \text{ m}^2/\text{s}^2$$

$$v = 100 \text{ m}^2/\text{s}^2$$

$$v = 10 \text{ m/s}$$

5. Initial velocity of motor cycle,  $u = 0$  m/s

Final velocity of motor cycle,  $v = 28$  m/s

Time,  $t = 4$  s

- (a) Its average acceleration,  $a = ?$

using,

$$v = u + at$$

$$28 \text{ m/s} = 0 + (4 \text{ s})a$$

$$(4 \text{ s}) a = 28 \text{ m/s}$$

$$a = 7 \text{ m/s}^2$$

- (b) Displacement,  $s$

using,  $v^2 = u^2 + 2as$

$$(28 \text{ m/s})^2 = (0 \text{ m/s})^2 + 2 \times (7 \text{ m/s}^2)(s)$$

$$784 = 14 \times s$$

$$s = \frac{784}{14}$$

$$s = 56 \text{ m}$$

6. Distance and Displacement

Distance	Displacement
1. Distance travelled by an object is the length of actual path.	1. Displacement travelled by an object is the shortest distance between the initial to final position.
2. It is scalar quantity	2. It is vector quantity
3. Its value can never be zero or negative.	3. Its value can be zero or negative.

7. In the first case:

Initial velocity,  $u = 0$  m/s

final velocity,  $v = 10$  m/s

time velocity,  $t = 25$  s

acceleration,  $a = \frac{v - u}{t}$

$$= \frac{(10 - 0) \text{ m/s}}{25 \text{ s}}$$

$$= 0.4 \text{ m/s}^2$$

In the second case:

Initial velocity,  $u = 10$  m/s

final velocity,  $v = 0\text{m/s}$

time velocity,  $t = 50\text{s}$

$$\begin{aligned}\text{acceleration, } a &= \frac{v-u}{t} \\ &= \frac{(0-10)\text{m/s}}{50\text{s}} \\ &= -0.2\text{m/s}^2\end{aligned}$$

Thus, the acceleration of the bicycle in the first case is  $0.4\text{ms}^{-2}$  and in the second case is  $-0.2\text{ms}^{-2}$

Distance travelled in 1st case:

$$2aS = v_2 - u_2$$

$$2(0.4) S = (10)_2$$

$$S = 125 \text{ m}$$

Distance travelled in 2nd case:

$$2aS = v_2 - u_2$$

$$2(0.2) S = (10)_2$$

$$S = 250 \text{ m}$$

$$\text{Total distance} = 125 \text{ m} + 250 \text{ m} = 375 \text{ m}$$

### Q.VIII Long Answer Questions:

1. (a) The initial speed of the car =  $10\text{km/h}$   
(b) The maximum speed attained by the car =  $35\text{km/h}$   
(c) Part of the graph shows zero acceleration  $\Rightarrow t = 3\text{h}$  to  $t = 8\text{h}$ .  
(d) The part of the graph shows varying retardation  $t = 8\text{h}$  to  $t = 10\text{h}$ .  
(e) Distance travelled in first 8 hours.

$$\begin{aligned}&= \text{area of trapezium} + \text{Area of rectangle} \\ &= \left[ \frac{1}{2} \times \text{Sum of perpendicular lines} \times h \right] + (l \times b) \\ &= \frac{1}{2} \times (10+35)\text{km/h} \times 3\text{h} + (5 \times 35)\text{h} \\ &= \frac{1}{2} (45) \times 3 + 175 \\ &= 242.5 \text{ km}\end{aligned}$$

2. (a) Initial velocity of an aeroplane,  $u = 0\text{m/s}$   
Final velocity of an aeroplane,  $v=?$   
Acceleration of an aeroplane,  $a = 3\text{m/s}^2$   
Time of an aeroplane,  $t = 35\text{s}$   
Displacement of an aeroplane,  $s=?$

For Displacement using,

$$s = ut + \frac{1}{2} at^2$$

$$s = \left[ 0 + \frac{1}{2} \times 3 \times (35)^2 \right] \text{m}$$

$$s = 1837.5\text{m}$$

For Velocity using,  $v = u + at$

$$= (0+3 \times 35)\text{m/s}$$

$$= 105\text{m/s}$$

- (b) The figure (graph) is possible.  
This distance-time graph shows 'when the body is at rest'. The position of the body does not change with time. Its distance from the origin continues to be same at the instants of time.

## WORKSHEET 2

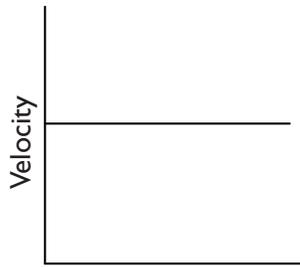
### Q.I Multiple Choice Questions:

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

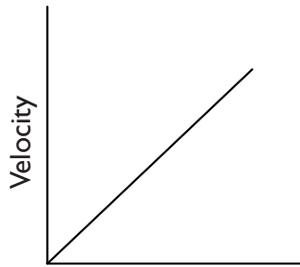
**Q.II** A particle is moving in a circle of diameter 20m. Complete the following table for the motion of this particle:

S. No.	Rounds	Displacement	Distance
1.	1	0	$22/7 \times 20$
2.	1.5	20M	$(1.5) 22/7 \times 20$
3.	2	0	$(2) 22/7 \times 20m$
4.	2.5	20M	$(2.5) 22/7 \times 20m$

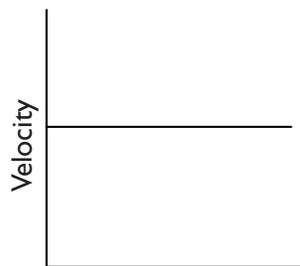
**Q.III.** Write the type of acceleration shown by the following graphs:



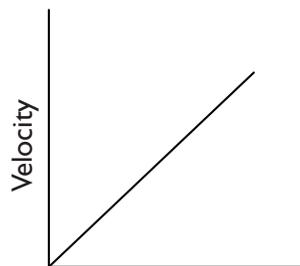
Time  
Zero



Time  
Uniformly increasing



Time  
Uniformly decreasing



Time  
Non-uniformly decreasing

**Q.IV** State whether the following statements are true or false:

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

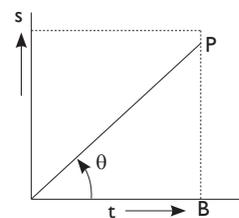
**Q.V** Fill in the blanks using the suitable words given in the brackets:

1. position
2. uniform
3. average speed
4. acceleration
5. speed

**Q.VI** Very Short Answer Questions:

1. The path may be a straight line or curved or zig-zag.
2. The object is stationary and is not moving.
3. (a) The total distance travelled =  $h+h=2h$   
(b) The displacement is zero, because the initial and final position coincide.

4. Yes, when another train in the track beside moves. This is the relative motion.
5. The distance is measured by the area occupied below the velocity-time graph.
6. The average velocity of that body will be  $(u + v) / 2$ .
7. The tangent of the graph gives us velocity of the object in motion.  
 $\tan \theta = P/B$   
 $\tan \theta = \text{Displacement}/\text{time}$ .
8. When the velocity of an object is constant.
9. Always acting towards center of the circular path.
10. It will move in a straight line tangential to the circular path.
11. Initial difference in height =  $(150 - 100)\text{m} = 50\text{m}$



We know that, by second equation of kinematics,  $s = ut + \frac{1}{2}at^2$  considering  $g = 10 \text{ m/s}$

$$\text{Distance travelled by first body in } 2s = h_1 = 0 + \left(\frac{1}{2}\right)g(2)^2 = 2g = 2 \times 10 = 20 \text{ m}$$

$$\text{Distance travelled by another body in } 2s = h_2 = 0 + \left(\frac{1}{2}\right)g(2)^2 = 2g = 2 \times 10 = 20\text{m}$$

After 2s, height at which the first body will be =  $h_1 = 150 - 20 = 130\text{m}$

After 2s, height at which the second body will be =  $h_2 = 100 - 20 = 80\text{m}$

Thus, after 2s, difference in height =  $(130 - 80)$

=  $50\text{m} = \text{initial difference in height}$

Thus, difference in height does not vary with time. So the answer is zero.

12. Zero.

### Q.VII Short Answer Questions:

1. (a) Yes, a particle can be accelerated when it is moving with constant speed.  
 (b) No.

2. Speed<sub>1</sub>,  $s_1 = 10\text{kmh}^{-1}$ , speed<sub>2</sub>,  $s_2 = 15\text{kmh}^{-1}$   
 time<sub>1</sub>,  $t_1 = 2\text{h}$ , time<sub>2</sub>,  $t_2 = 3\text{h}$   
 Distance<sub>1</sub>,  $d_1 = s_1 \times t_1$ , Distance<sub>2</sub>,  $d_2 = s_2 \times t_2$   
 $= (10 \times 2)\text{km}$   $= (15 \times 3)\text{km}$   
 $= 20\text{km}$   $= 45\text{km}$

$$\therefore \text{Total distance moved by her } D = D_1 + D_2$$

$$D = (20 + 45)\text{km} = 65\text{km}$$

$$\text{Hence, Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

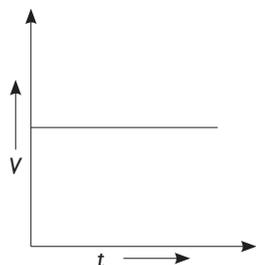
$$= \frac{65\text{km}}{(2+3)\text{h}}$$

$$= \frac{65\text{km}}{5\text{h}}$$

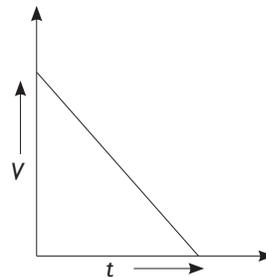
$$= 13\text{kmh}^{-1}$$

3. As average velocity depends on displacement and displacement can be zero if the object returns to initial position. Where as displacements is zero as source and destination is same. Hence a body can have zero average velocity but not average speed.  
 $v = \text{displacement}/\text{time}$   
 $s = \text{distance}/\text{time}$

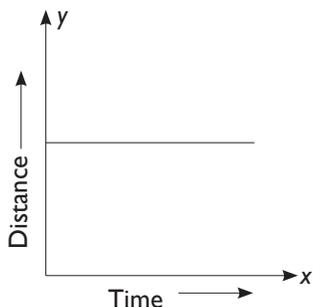
4. (a) When the object is in uniform motion.



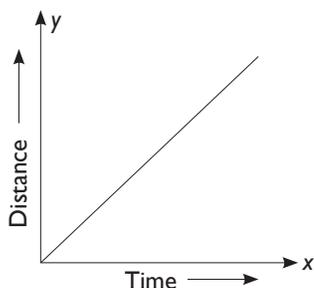
(b) When the object is thrown vertically upwards.



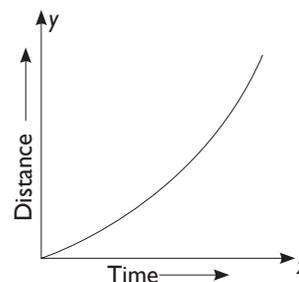
5. (a)



(b)



(c)



6. Initial velocity of shatabdi,  $u = 0$

final velocity of shatabdi,  $v = 108 \text{ km/h} = 108 \times \frac{5}{18} \text{ m/s} = 30 \text{ m/s}$

Time,  $t = 2 \text{ min} = 120 \text{ sec}$

(a) acceleration,  $a = ?$

using,  $v = u + at$

$$30 \text{ m/s} = 0 \text{ m/s} + a(120 \text{ s})$$

$$a = \frac{30 \text{ m/s}}{120 \text{ s}}$$

$$a = 0.25 \text{ m/s}^2$$

(b) Distance travelled by the train,  $s = ?$

using,  $s = ut + 0.5at^2$

$$s = 0 + (0.5)(120)^2$$

$$s = 7,200 \text{ m}$$

7. (a) Distance covered = total length of the path covered

It is a scalar quantity (scalar quantities are the ones which only have magnitude like time)

So, the distance covered by the person =  $3 \text{ km} + 2 \text{ km} + 3.5 \text{ km} = 8.5 \text{ km}$

(b) Displacement is the length of the shortest path between the initial and the final position object.

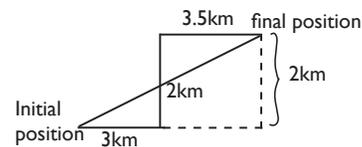
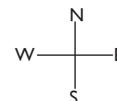
It is a vector quantity.

So, Displacement of this motion

$$(D)^2 = 2^2 + 6.5^2$$

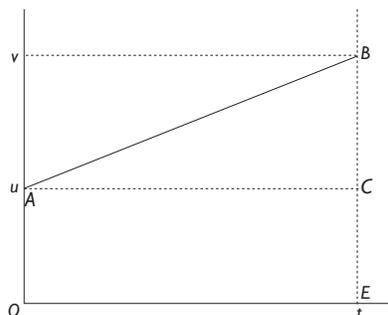
$$= \sqrt{4 + 42.25} = 46.25$$

Displacement =  $6.8 \text{ km}$  (approx)



### Q.VIII Long Answer Questions:

I. An object starts linear motion with a velocity ' $u$ ' and under acceleration ' $a$ '. It acquires a velocity ' $v$ ' in time ' $t$ '.



velocity-time graph

- (a) acceleration to this acceleration is in its uniform motion. As a result of the acceleration, its velocity from  $u$  to  $v$  (final velocity) in time  $t$ . Since the slope of the  $v$ - $t$  graph gives the acceleration of the moving object  $\text{acceleration} = \text{Slope of } AB = \frac{BC}{CA}$

$$a = \frac{v-u}{t}$$

$$v-u = at$$

$$v = u+at$$

it is velocity time equation.

- (b) Third equation of motion.

As we know that the distance travelled ' $s$ ' in time ' $t$ ' is given by the area enclosed by the velocity-time graph and the time axis.

Therefore, distance travelled  $s = \text{area of the trapezium } ABEO$

$$= \frac{u+v}{2} \times t \quad \text{_____ (i)}$$

we know,  $(v-u) = at$

$$t = \frac{v-u}{a}$$

Substituting the value of  $t$  in equation (i)

$$s = \frac{u+v}{2} \times \frac{v-u}{a}$$

$$2as = (v+u)(v-u)$$

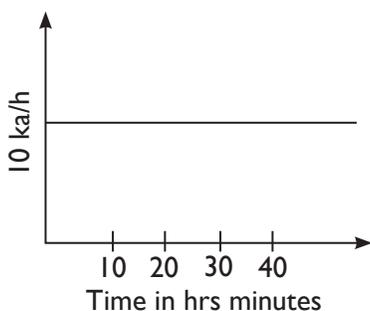
$$2as = v^2 - u^2$$

$$v^2 = u^2 + 2as$$

It is position-velocity relation.

2. (a)  $a = (58 - 56)/1 = 2 \text{ km/s}^2$

- (b)



The car is moving at a constant speed meaning the following formula applies :

Distance = speed  $\times$  time.

The time interval : 10 to 30

The time difference is :  $30 - 10 = 20$

Convert thus to hours, we have :

$$20 / 60 = 1 / 3 \text{ hrs}$$

Substituting in the formula we have :

$$10 \times 1/3 = 10/3 = 3.333 \text{ Km.}$$

3. (a) (i) The speed of car is constant but the direction of motion of the car is changing continuously.  
 (ii) The length of each side of a circular path tends to be zero. So, the athlete has to change his direction of motion at each point.  
 (iii) The wheels of the car are in uniform circular motion.
- (b) It actually moves in straight line but due to gravity its path is curved and it appears to be moving around the earth. So, because the satellite is falling freely under the influence of gravity, hence the motion is accelerated.

**WORKSHEET 1**

**QI. Multiple Choice Questions:**

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

**QII. Give reasons for the following statements:**

- In case sudden breaks are applied, the seatbelt will not allow the passenger to fall forward abruptly due to his/her inertia and hence prevent accidents.
- By doing this, he/she increases the rate change of momentum of the hand which increases the force abruptly as by the second law of motion, force is directly proportional to the applied unbalanced force.
- This helped in preventing slipping of the luggage at turns or during acceleration due to inertia.
- This decreases that rate change of momentum of the ball by increasing time so that the force exerted by the ball on the hand reduces.
- This happens because the inertia of rest of the passengers try to keep them at rest and resist their forward motion.

**QIII. Fill in the blanks using the suitable words given in the brackets:**

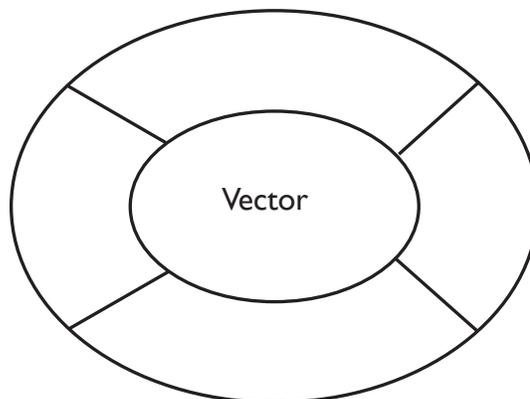
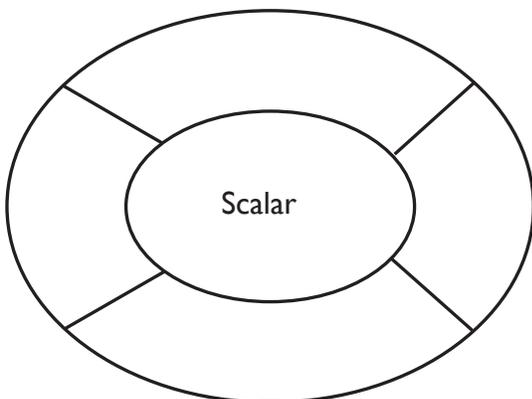
1. opposite      2. unbalanced      3. Galileo      4. opposes      5. inertia

**QIV. State whether the following statements are true or false:**

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

**QV. Classify the following as scalar or vector quantities:**

Mass, momentum, velocity, force, speed, acceleration, time, inertia



**Scalar:** Mass, speed, time, inertia

**Vector:** Momentum, velocity, force, acceleration

**QVI. Very Short Answer Questions:**

- Tendency of a body to resist changes in position of rest, motion or direction.
- Product of mass and velocity of an object. It's SI unit is  $\text{kg ms}^{-1}$
- Loaded one will require larger force to stop because it has more mass; ( $F \propto P$ ) more momentum.

4. For every action, there is an equal and opposite reaction. (3<sup>rd</sup> law of motion)
5. External unbalanced force.
6. For every action, there is an equal and opposite reaction and the action and reaction forces act on two different objects.
7. The crater is initially at rest so  $P_i=0$ . After bursting, according to law of conservation of momentum final momentum should be zero, so splinter fly off symmetrically in all directions such that overall momentum is zero.
8. He might injure his hand because of greater momentum imparted by the fast moving ball, because effect of force will be larger for short time.
9. Gun exerts force on bullet when fired then bullet exerts equal and opposite force on the gun according to 3<sup>rd</sup> law of motion.
10.  $F = ma$ ;  
 $1 \text{ N} = 1 \text{ kg} \times 1 \text{ ms}^{-2}$ . One newton is the force which when acts on an object of mass 1 kg produces acceleration of  $1 \text{ ms}^{-2}$  in the object.
11. Steel solid.
12. Lighter rifle as it will gain more backward velocity.

### QVII. Short Answer Questions:

1. A 3kg mass at  $4 \text{ m/s}^2$  as;  $F = ma$   
 So,  $F_1 = m_1 \times a_1 = 3 \times 4 = 12 \text{ N}$   
 where as  $F_2 = m_2 a_2 = 5 \times 20 = 10 \text{ N}$   
 so,  $F_1 > F_2$ .
2. Given,  $m_B = 20 \text{ g} = 0.02 \text{ kg}$ ;  $v_B = 150 \text{ m/s}$  and  $m_p = 2 \text{ kg}$ ;  $v_p = ?$   
 As  $m_B \times v_B = -m_p \times v_p \Rightarrow v_p = \frac{-m_B \times v_B}{m_p} = \frac{-0.02 \times 150}{2} = -1.5 \text{ m/s}$
3. (a) Unbalanced external retarding force (air resistance, force gravity).  
 (b) Unbalanced external accelerating force.  
 (c) Balanced force (object has same/uniform velocity at each external of time).
4. (a) Change of magnitude of speed of a moving object, e.g. cricket ball hit by batsman.  
 (b) It causes motion in a stationary body, e.g. - a book on table moves when pushed.  
 (c) It can stop a moving body. e.g. a moving ball stopped by force on our hand.
5. Sandy surface increases the time external for change of momentum i.e. rate of change of momentum is small and reducing the impact force and injury on a sandy surface than a hard concrete floor.
6. In the absence of an external force, the total momentum of all bodies of a system remains constant.  
 e.g. (a) Recoiling of gun  
 (b) Motion of rocket
7. a) kg m/s. Velocity needs to be varied if momentum of given mass to be changed.  
 b)  $m = 2 \text{ kg}$ ;  $t = 10 \text{ s}$ ;  $u = 5 \text{ m/s}$ ;  $v = 10 \text{ m/s}$   
 we know,  $\frac{v-u}{t} = a \Rightarrow a = \frac{(10-5)}{10} = \frac{1}{2} \text{ m/s}^2$   
 Now,  $F = ma = 2 \times \frac{1}{2} = 1$   
 Now,  $F = 1 \text{ N}$ ; if applied force 15s  
 then,  $F = \frac{mv}{t} \Rightarrow v = \frac{1 \text{ N} \times 15 \text{ s}}{2 \text{ kg}} \Rightarrow v = 7.5 \text{ m/s}$

### QVIII. Long Answer Questions:

1. a) Rate of change of momentum of an object is directly proportional to the applied force in the direction of force.  
 i.e. Consider an object of mass  $m$  having initial and final velocity applying force  $F$  for some time ' $t$ '. Initial momentum  $P_i = mu$  and  $P_f = mv$   
 change of momentum  $p_f - p_i = m(v - u)$

Now A/c 2nd law,  $F \propto$  rate of change of momentum,

$$\Rightarrow F \propto \frac{m(v-u)}{t} \Rightarrow F \propto ma \Rightarrow F = ma, \text{ If proportionality constant} = 1.$$

b)  $m = 500\text{g} = 0.5\text{kg}; v = 0 \text{ m/s}; u = 50 \text{ m/s}; t = 0.01;$

$$F = \frac{m(v-u)}{t}$$

$$\Rightarrow F = \frac{0.5(50-0)}{0.01} = 0.5 \times 50 \times 100 = 2500 \text{ N}$$

$$F = 2500 \text{ N}$$

2. (a) Coin falls down to the glass due to inertia of rest to resist the change of position.  
 (b) Inertia defined in 1<sup>st</sup> law of motion i.e. when no unbalanced external force acts on an object it continues to be in its state of rest or motion in a straight line path.  
 (c) It will be same even heavier coin will have more inertia hence tendency of being at rest will be more to stay at rest.

## WORKSHEET 2

### QI. Multiple Choice Questions:

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

### QII. Match the followings

#### Column A

1. Contact Force
2. Friction
3. Action and reaction forces
4. Pull or push
5. Balanced forces

#### Column B

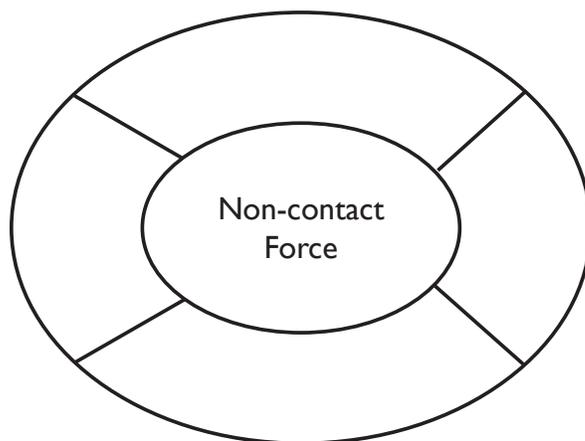
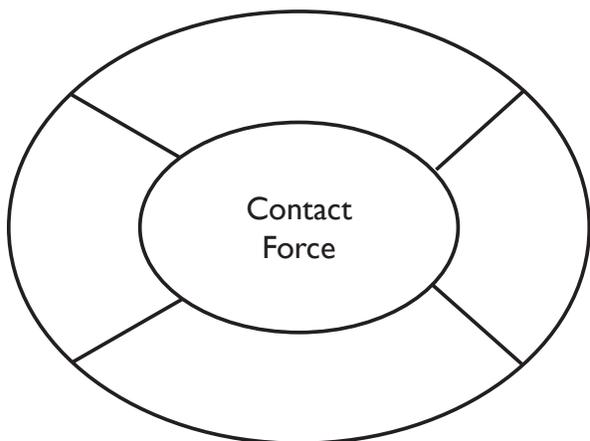
- (b) Air resistance
- (e) Opposes motion
- (a) Newton's 3rd law
- (c) Force
- (d) Zero resultant

### QIII. Fill in the blanks using the suitable words given in the brackets:

1. mass
2. vector
3. force
4. different
5. constant

### QIV. Classify the following a scontact an non-contact forces:

Gravitational force, frictional force, magnetic force, mechanical force, muscular force, electromagnetic force, normal reaction force, nuclear force



**Contact force:** Frictional force, mechanical force, muscular force, normal reaction

**Non-contact forces:** Gravitational force, magnetic force, electromagnetic force, nuclear force

**QV. Give one word for the following:**

1. Inertia
2. Momentum
3. Impulse
4. kg m/s
5. Force

**QVI. Very Short Answer Questions:**

1. Zero; all are balanced by each other.
2. Force of friction.
3. As soon as water comes out of the nozzle of the sprinkler, it exerts an equal force on the nozzle in opposite direction and the sprinkler starts rotating force on the nozzle in opposite direction.
4. Object thrown by shubham is an action that has an equal and opposite reaction (3<sup>rd</sup> Law of motion).
5. A car has more mass and hence  $P = mv \Rightarrow P \propto m$  ( $v$  is constant)
6.  $F = ma$
7. Zero; as at the highest point  $v = 0 \Rightarrow p = m \times v \Rightarrow p = m \times 0 \Rightarrow p = 0$
8. They act on different objects not the same.
9. Force
10. Due to conservation of momentum and to 3<sup>rd</sup> law of motion (action/reaction).
11. They will move in forward direction. The iron ball will move slower.
12. Inertia of rest.

**QVII. Short Answer Questions:**

1. a) Given:  $m_A = m_B = M$   $p_B = m_B \times v_B$   $p_B > p_A$   
 $v_A = v; v_B = 3v$   $= M3v$   $3mv > mv$   
 $p_A = m_A \times v_A = Mv$   $p_B = 3Mv$   
b) B has 3 times more momentum than A.
2.  $F = ma$ ; Given  $F = 50\text{N}$ ;  $m = 20\text{kg}$ ;  $u = 15\text{m/s}$   
so,  $a = F/m = 2.5 \text{ ms}^{-2}$   
Now,  $v = u + at$   
 $0 = 15 - 2.5 t$   
 $\Rightarrow t = 15/2.5$   
 $t = 6 \text{ s}$
3. Common velocity means both trolley and boy moves with same velocity.  
Initial momentum =  $(60 \times 3) + (170 \times 1.5\text{m/s}) = 180 + 210 = 390\text{kg m/s}$ .  
Final momentum =  $(60 + 170) v = 230v$   
so, on equating  $230v = 390$   
 $v = 390/230$   
 $v = 1.7 \text{ m/s}$
4. Rate of change of momentum of an object is directly proportional to the applied force in the direction of force. i.e. Consider an object of mass  $m$  having initial and final velocity applying force  $F$  for some time ' $t$ '. Initial momentum  $p_i = mu$  and  $p_f = mv$  change of momentum  $p_f - p_i = m(v - u)$   
Now according to 2<sup>nd</sup> law,  $F \propto$  rate of change of momentum,  
 $\Rightarrow F \propto \frac{m(v-u)}{t} \Rightarrow F \propto ma \Rightarrow F = Rma \Rightarrow F = ma$ , (If  $R = 1$ ). Hence,  $1 \text{ N}$  is the force that produces an acceleration of  $1 \text{ m/s}^2$  in a body of mass  $1 \text{ kg}$ .

5.	Balanced farce	Unbalanced farce
	1) forces equal in magnitude and opposite in direction.	1) Force unequal in magnitude, can be in same or opposite direction.
	2) If does not produce acceleration in an object it acts upon	2) If produces acceleration in the object it acts upon.

6. (a) Change of shape till the time the force is applied.  
 (b) Change of speed and direction of ball.  
 (c) Change of (shape and size) configuration of spring.
7. (a) Net force =  $F_1 - F_2 = 60 - 40 = 20 \text{ N}$   
 (b) Direction will be towards  $F_2$ .  
 (c) It will be 20 N of frictional force that will act towards  $F_1$  between the surface of block and force.

### QVIII.

1. a) **First law of motion:** The body continue in its state of rest or motion untill unless any external force is applied to it.  
 b) **Third Law:** To every action there is an equal and opposite reaction.  
 c) **Second Law:** Rate of change of momentum of an object is directly proportional to the applied force in the direction of force.  
 i.e. Consider an object of mass  $m$  having initial and final velocity applying four  $F$  for some time ' $t$ '. Initial momentum  $p_i = mu$  and  $p_f = mv$   
 change of momentum  $p_f - p_i = m(v - u)$   
 Now according to 2nd law,  $F \propto$  rate of change of momentum,  
 $\Rightarrow F \propto \frac{m(v - u)}{t} \Rightarrow F \propto ma \Rightarrow F = Rma \Rightarrow F = ma, \text{ (If } R = 1 \text{)}$
- d) Initial momentum =  $mv = 30 \times 48 = 1440 \text{ kg m/s}$   
 After exploding in 2 parts, 18kg has zero velocity (rest) and other part ( $30 + 8 = 12 \text{ kg}$ ) has velocity  $v$ .  
 Final momentum =  $18 \times 0 + 12v$   
 momentum before = momentum after  
 $\Rightarrow 1440 = 12v$   
 $\Rightarrow v = 120 \text{ m/s}$
2. (a) The cork is blown away.  
 (b) In backward direction, opposite to the motion of cork.  
 (c) Cork will move with greater velocity due to lesser mass.

## WORKSHEET 1

**QI. Multiple Choice Questions:**

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

**QII. Fill in the blanks using the suitable words given in the brackets:**

1. centripetal
2. less
3. inversely
4. Henry Cavendish
5. earth

**QIII. State the relation between buoyant force (FB) and weight of the block (W) for each of the cases shown below:**

1.  $FB = W$
2.  $FB > W$
3.  $FB = W$
4.  $FB < W$

**QIV. State whether the following statement are true or false:**

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

**QV. Match the followings:****Column A**

1. Buoyant force
2. Relative density
3. Gravitational forces
4. Pressure
5. Motion of the moon around the sun

**Column B**

- (c) Archimedes' principle
- (d) No unit
- (c) Attractive force
- (e) Force per unit area
- (a) Centripetal force

**QVI. Very Short Answer Questions:**

1. Every body in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.
2. The falling of a body from a height towards the earth under the gravitational force of earth alone is called free fall.

3. 
$$\text{Relative Density} = \frac{\text{Density of substance}}{\text{Density of water}}$$

$$7.8 = \frac{\text{Density of substance}}{1}$$

$$\text{Density of substance} = 7.8 \text{ g/cm}^3$$

4. When mass of object = 50 kg,  $g = 10\text{m/s}^2$   
 So, weight =  $m \times g = 50 \times 10 = 500\text{N}$   
 Weight of object on moon is  $1/6^{\text{th}}$  of that on earth  
 $\Rightarrow$  weight of moon =  $\frac{1}{6} \times$  weight of earth

$$= \frac{500}{6}$$

$$= 83.33$$

$$\frac{w_e}{w_m} = \frac{500}{83.33}$$

5. It is decreased and object appears lighter than actual.  
 6. To determine purity of milk.  
 7. Due to buoyant force acting on it.  
 8. No unit, it is dimensionless because it is given by same quantities division i.e

$$\text{Relative Density} = \frac{\text{Density of substance}}{\text{Density of water}} ; \quad \text{which cancels out each other.}$$

9. Mercury is less denser than water while steel block has more density than water.  
 10. It works on the application of Archimedes principle to determine density of liquids.  
 11. It measures weight of the body.  
 12. If they displace equal volumes of water, i.e., they have equal volumes.

### QVII. Short Answer Questions:

1. As,  $F = \frac{Gm_1m_2}{r^2}$  ;  $r$  is distance between objects

Since,  $F \propto \frac{1}{r^2}$

If  $r = \frac{r}{2} \Rightarrow F = \frac{1}{4r^2}$   $F$  becomes four times force increases by a factor of 4.

2. Density is defined as mass of substance per unit volume i.e.  $D = \frac{M}{V}$

Relative density is the ratio of density of a substance to that of water.

i.e. Relative Density of substance =  $\frac{\text{Density of substance}}{\text{Density of water}}$

Given

Density of water =  $1000\text{kg/m}^3$

Relative Density of substance = 1.9.3

Density of gold = Density of water  $\times$  Relative Density of gold  
 $= 1000 \times 19.3$   
 $= 19300\text{kg/m}^3$

3. Given,  $m=30\text{kg}$  on earth  $G =$  Universal gravitational constant  
 weight =  $m \times g = m \times \frac{GM}{R^2}$   $M =$  Mass of earth  
 $R =$  radius of earth

Mass of the body remains same on surface of other planets.

Gravity on a planet  $g' = \frac{GM'}{R'^2}$

and given  $M' = \frac{M}{9}$  and  $R' = \frac{R}{2}$

$\Rightarrow g' = \frac{GM}{R \times 9} \times 4$

$g' = \frac{4}{9} \frac{GM}{R}$   
 $= \frac{4}{9} \times g$

weight on planet =  $m \times g' = \frac{4}{9} \times 30 = \frac{40}{3} = 13.33\text{N}$

Mass	Weight
1. Mass of an object is the quantity of matter contained unit	1. Weight is the force with which it is attracted towards the centre of earth.
2. SI unit is kg	2. SI unit is Newton (N).
3. The mass can never be zero and remains constant	3. It can be zero and is variable (with change of acceleration due to gravity.)

5. (a) Buoyancy is a tendency of water to exert an upward force on an object immersed in it. Buoyancy depends upon density of fluid i.e. higher the density of fluid in which object is immersed, higher the object floats over it. As buoyant force is upward force, so greater the upward force, so greater the upward force higher the object float.
- (b) According to Archimedes' principle, the upthrust exerted by a fluid on an object immersed in it is equal to the weight of the fluid displaced by that object.

6. (a) 1 pascal is the pressure exerted or experienced by a body or object when a thrust of 1N acts on an area of 1metre square.

$$\begin{aligned} \text{mass of boy} &= 40\text{kg} \\ \text{weight of boy} &= 40 \times g = 40 \times 10 = 400\text{N} \\ \text{Area} &= 0.04 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Pressure} &= \frac{\text{Force}}{\text{Area}} \\ &= \frac{400}{0.04} \\ P &= 10000 \text{ Pa} \end{aligned}$$

- (b) This is because the area of a sharp pin is less and hence it exerts a greater pressure and pierces easily as compared to that of a blunt pin.

7. Given,  $v=0$  (at highest point)

$$\text{time of reach highest point} = \frac{6}{2} = 3\text{s}$$

$$a = -9.8\text{ms}^{-2}$$

$$(a) \quad v = u + at$$

$$0 = u - 9.8 \times 3$$

$$u = 29.4\text{ms}^{-1}$$

$$(b) \quad 2as = v^2 - u^2$$

$$s = \frac{v^2 - u^2}{2a}$$

$$= \frac{0 - 29.4 \times 29.4}{2 \times 9.8}$$

$$= 44.1$$

- (c)  $t=4\text{s}$ . In 3s ball reaches top 2 in 1s if fall down so,  $u=0$

Distance covered in 1s from top

$$s = ut + \frac{1}{2}at^2$$

$$\Rightarrow s = 0 + \frac{1}{2} \times 9.8 \times 1$$

$$s = 4.9\text{m}$$

$\therefore$  The ball will be 4.9m below the top of tower after 4s.

8. Given, height of tower = 100m ;  $g = 10\text{m/s}^2$   
velocity of stone projected from ground = 25m/s  
velocity of stone projected from tower = 0

Let the particles meet at time 't' and at height 'h'

$$\text{(from ground) So, } h = 25t - \frac{1}{2}gt^2 \Rightarrow h = 25t - \frac{1}{2} \times 10 \times t^2$$

$$\Rightarrow h = 25t - 5t^2$$

————— (i)

Distance covered by projectile thrown down in time t will start from rest  $u=0$

$$100 - h = \frac{1}{2}gt^2$$

$$\Rightarrow 100 - (25t - 5t^2) = 5t^2$$

————— from (i)

$$\Rightarrow 25t = 100$$

$$t = 4\text{s}$$

Thus, (particles) stone meets at 4s  
 Height at which the stone meets is 'h'

$$h = 25t - 5t^2$$

$$\rightarrow h = 25(4) - 5(4)^2$$

$$h = 100 - 80$$

$$h = 20\text{m}$$

### QVIII. Long Answer Questions:

1. (a) The object will float in a liquid if the weight of object is equal to the weight of liquid displaced by it.  
 (b) Life jackets do not absorb water neither add to weight and are far less denser than water so it floats easily and when we wear, it reduces our relative density to water. The buoyancy life jacket provides, from being less denser than us and keeps us floating in any circumstance.  
 (c) The volume of a 500 g sealed packet is  $350 \text{ cm}^3$ .  
 The volume of sealed packet is greater than density of water so it will sink.  
 Now, density of water is  $1 \text{ g/cm}^3$ .

Using Archimedes Principle.

$$\text{The volume of water} = \frac{\text{Mass of water}}{\text{Density of water}}$$

$$= \frac{350}{1}$$

$$= 350 \text{ cm}^3$$

$\therefore$  Weight of water displaced is  $350 \text{ cm}^3$

2. (a) Universal law: If we drop a stone of mass  $m$  from a distance  $R$  from centre of earth of Mass  $M$ , then force entered by earth on stone is

$$F = \frac{GmM}{R^2} \text{ (i)}$$

Second law: Now, gravitational force acting on stone

$$F = m \times g \text{ (ii)}$$

from (i) and (ii)

$$\frac{GmM}{R^2} = m \times g$$

$$g = \frac{GM}{R^2}$$

- (b)  $u = 10 \text{ m/s}$   
 $v = 0$  (top)  
 $s = 120 \text{ m}$   
 $g = 10 \text{ m/s}^2$

$$s = ut + \frac{1}{2}gt^2$$

$$120 = 10 \times t + \frac{1}{2} 10 t^2$$

$$\Rightarrow 5t^2 + 10t - 120 = 0$$

$$\Rightarrow t^2 + 2t - 24 = 0$$

solve using quadratic equation

we get,  $t = 4 \text{ sec}$

Time taken to reach the ground

$$= 2 \times \text{time taken to reach top}$$

$$= 2 \times 4 = 8 \text{ s}$$

$\therefore$  time taken to reach ground is 8s.

## WORKSHEET 2

### QI. Multiple Choice Questions:

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

**QII. Give reason for the following statements:**

1. It is equal to the weight of the fluid displaced by the object.
2. Ice has lesser density than water due to cage-like structure.
3. Weight varies with the value of 'g' from place to place.
4. Because the value of 'g' near the earth's surface is nearly constant.
5. The radius of earth at equator is slightly greater than that at its poles.

**QIII. Fill in the blanks using the suitable words given in the brackets:**

1. constant
2. weight
3. N
4. decrease
5. more

**QIV. State whether the following statements are true or false:**

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

**QV. Complete the table given below:**

Quantity	SI Unit	Symbol of unit
Pressure	Pascal	Pa
Thrust	newton	N
Universal Gravitational Constant	$\text{Nm}^2\text{kg}^{-2}$	$\text{Nm}^2\text{kg}^{-2}$
Acceleration due to Gravity	metre per second square	$\text{m s}^{-2}$
Weight	newton	N
Mass	kilogram	kg

**QVI. Very Short Answer Questions:**

1.  $F = \frac{Gm_1m_2}{r^2}$  ;  $m_1$  = mass of object  
 $m_2$  = mass of earth  
 $r$  = distance between object and earth.
2. The uniform acceleration produced in a freely falling body due to gravitational force of earth is called acceleration due to gravity.
3. Thrust is the force acting on an object perpendicular to its surface.  
SI unit is Newton (N).
4. weight on earth = 100N  
weight on moon =  $\frac{1}{6}$  weight on earth  
 $= \frac{1}{6} \times 100 = 16.66 \text{ N}$
5. It is dependent upon mass of both objects and inversely dependent upon distance between both the objects.
6. The weight of a body at centre of earth is zero.

<b>G</b>	<b>g</b>
1. It is universal gravitational constant.	1. Weight is the force with which it is attracted towards the centre of earth.
2. SI unit is $\text{Nm}^2\text{kg}^{-2}$	2. SI unit is $\text{m s}^{-2}$

8.  $m_1 = m_2 = 50\text{kg}$ ,  $e = 0.5\text{m}$

$$F = \frac{Gm_1m_2}{r^2}$$

$$= \frac{6.67 \times 10^{-11} \times 50 \times 50}{0.5 \times 0.5}$$

$$F = 6.67 \times 10^{-7} \text{N}$$

9. Applications:

- 1) In determining relative density of a substance.
- 2) The lactometers used to determine purity of milk.

10. SI unit of  $g = \text{ms}^{-2}$   
SI unit of  $G = \text{Nm}^2\text{kg}^{-2}$

11. Both will reach the ground at the same time.

12. Liquid A.

### QVII. Short Answer Questions:

1. (a)  $w = 600\text{N}$ ,  $g = 10\text{m/s}^2$

$$w = mg \Rightarrow m = \frac{600}{10} = 60 \text{ kg}$$

(b)  $w_{\text{moon}} = 100\text{N}$

we know that,  $w_{\text{earth}} = 6 \times w_{\text{moon}}$

So,  $m \times g_e = 6 \times m \times g_m$

$$\frac{g_e}{6} = g_m$$

$$g_m = \frac{9.8}{6}$$

$$g_m = 1.63\text{m/s}^2$$

2. Length of tank,  $l = 4\text{m}$

Width of tank,  $b = 2\text{m}$

Depth of tank,  $h = 2\text{m}$

So, volume of tank,  $V = \text{volume of cuboid} = l \times b \times h$

$$= 4 \times 2 \times 2 = 16 \text{ m}^3$$

Density of water,  $= 10^3 \text{ kg/m}^3$

and acceleration due to gravity,  $g = 10 \text{ g/m}^2$

total thrust on the bottom surface of the tank  $= 16 \times 10^3 \times 10$

$$= 160000 \text{ N}$$

3. (a) Given  $m' = \frac{m_e}{2}$

and  $r' = \frac{r_e}{2}$ ,

for earth,  $g = \frac{Gm_e}{r_e^2}$

for new planet,

$$g' = \frac{Gm'}{r'^2}$$

$$g' = G \frac{m_e \times (2)^2}{2 \times r_e^2}$$

$$= \frac{4 G m_e}{2 \times r_e^2}$$

$$g' = \frac{4}{2} g$$

$$g' = 2g$$

$$= 2 \times 9.8$$

$$g' = 19.6\text{m/s}^2$$

(b) When an object is dropped freely under gravitational force of earth is called free fall. And its velocity changes at a constant rate causing a uniform acceleration of  $9.8 \text{ m/s}^2$

4. (a) A thin strap will have less or small area of contact which will exert more pressure on the shoulder of a person carrying it. Hence, it will be difficult to hold a bag with thin and strong string.

(b) Mass of substance  $m = 50\text{g}$

Volume of substance  $v = 20\text{cm}^3$

Density of substance  $= \frac{m}{v}$

$$= \frac{50}{20}$$

$$= 2.5\text{gcm}^{-3}$$

As density of water is  $1\text{g/cm}^3$  and Density of substance is more than it.

Hence it will sink.

5. As we know,  $F \propto \frac{m_1 m_2}{r^2}$

(a) If  $m_1 = 2m_1$

then  $F \propto 2m_1 m_2$

force will be twice.

(b)  $F \propto \frac{1}{r^2}$

if  $r = 3r$

$$F \propto \frac{1}{(3r)^2}$$

$$F \propto \frac{1}{9r^2}$$

$F$  will decrease by a factor of 9.

(c) both masses are doubled

i.e.  $m_1 = 2m_1$  and  $m_2 = 2m_2$

$$F \propto m_1 m_2$$

$$F \propto 2m_1 2m_2$$

$$F \propto 4m_1 m_2$$

Force will be 4 times.

6. (a)  $u = 49\text{m/s}$

$v = 0$  (at highest point)

$$g = -9.8\text{m/s}^2$$

Using,  $v^2 - u^2 = 2as$

$$s = \frac{v^2 - u^2}{2g}$$

$$= \frac{0 - 49 \times 49}{2 \times 9.8}$$

$$s = \frac{-2401}{19.6}$$

$$= 122.5\text{m}$$

(b) time taken to reach at top 't'

$$v = u + gt$$

$$-gt = v - u$$

$$t = \frac{v - u}{-g}$$

$$= \frac{0 - 49}{9.8}$$

$$t = 5\text{s}$$

$\therefore$  Total time taken to return =  $2 \times$  time taken to reach top

$$= 25$$

$$= 10\text{s}$$

7. (a) The gravitational attraction between the planet and sun is the source of centripetal force.

(b) This force depends upon mass of two objects between which it acts and the distance between them i.e.

$$F \propto \frac{m_1 m_2}{r^2}; \quad m_1 = \text{mass of one object}$$

$$m_2 = \text{mass of second object}$$

$$r = \text{distance between them}$$

- (c) If this force will be zero then the planet will be moving into tangential path from the point on its rotational orbit.

### QVIII. Long Answer Questions

1. (a) The weight depends upon acceleration due to gravity for any certain place.  
i.e.  $w = mg$   
 $g$  is found to be maximum at poles and minimum at equator.  
Weight on equator will also be less than that at poles.  
Mass is constant everywhere in the universe.
- (b) The weight will be more at poles than at equator.
- (c) At the centre.
- (d) If there is no acceleration due to gravity then object may be falling but not under free fall and would not be attracted to the earth and everything will be floating in the air.
2. (a) (i) Life jackets do not absorb water neither add to weight and are far less denser than water so it floats easily and when we wear, it reduces our relative density to water. The buoyancy life jacket provides, from being less denser than us and keeps us floating in any circumstance.
- (ii) Sea water is more denser than river water, hence he tend to float higher because of much higher buoyant force acting on an body making it easier to swim.
- (iii) The young babies when uses four area of contact i.e. two palms and two knees. The area of contact is increased and hence their weight is distributed on ground which exert less pressure on them and making it-easier to crawl on floor.
- (b) A steel needle has more density than water and hence it sinks. While a ship made up of steel has a definite structure in which inner part is hollow and contain air in it which makes it less denser than density of water and hence it floats over.

**OR**

Ship displaces more water than needle as volume of ship is more than that of needle. Since upthrust depends upon volume of object. So, more the volume, more upthrust acts on it and object floats.

3. (a) Let the height of tower be "H"  
Time taken to reach the ground = T  
Use equation of motion  
 $S = ut + 0.5at^2$   
For entire time "T"  
 $H = 0.5gT^2$  .....(1)  
Distance travelled in last second =  $16H/25$   
Distance travelled in (T - 1) =  $H - 16H/25 = 9H/25$   
For the time (T - 1) seconds  
 $9H/25 = 0.5g(T - 1)^2$  .....(2)  
Divide (1) and (2)  
 $H / (9H/25) = 0.5gT^2 / [0.5g(T - 1)^2]$   
 $25/9 = [T / (T - 1)]^2$   
 $5/3 = T / (T - 1)$   
 $5T - 5 = 3T$   
 $2T = 5$   
 $T = 5/2$  seconds  
 $T = 2.5$  seconds  
From equation (1)  
 $H = 0.5gT^2$   
 $= 0.5 \times 9.8 \text{ m/s}^2 \times (2.5 \text{ s})^2$   
 $= 30.625 \text{ m}$
- (b) According to the problem the object is dropped to hit the target from the height of 1000 m  
The velocity of the aircraft will be  $500 \text{ km/h} = 138.89 \text{ m/s}$

Now as it can be seen that the object cannot hit the target as the aircraft has the horizontal velocity initially.

As the object has no vertical velocity.

let the vertical velocity will be,  $v(\text{vertical}) = 0$

let  $t$  be the time when the object touch the ground.

$s = v(\text{vertical}) - \frac{1}{2}gt^2$  [here  $s$  is the height from which the object is dropped]

$$1000 = 0 - \frac{1}{2} \times 9.81 \times t^2$$

$$\Rightarrow t = 14.27 \text{ sec}$$

Therefore the horizontal displacement of the object will be,

$$\text{velocity} \times \text{time} = 138.89 \times 14.27 = 1982 \text{ m}$$

## WORKSHEET 1

**Q.I Multiple Choice Questions:**

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

**Q.II. Match the followings:****Column A**

1. Chemical energy into mechanical energy
2. Heat energy into mechanical energy
3. Mechanical energy into electrical energy
4. Electrical energy to mechanical energy
5. Light energy into electrical energy
6. Electrical energy into Light energy

**Column B**

- (a) Car engine
- (b) Steam engine
- (a) Electric generator
- (b) Electric motor
- (f) Solar cell
- (e) Electric bulb

**Q.III. A body of mass 10 kg falls from the height of 10 m towards the earth. Complete the following table, given  $g = 10 \text{ m/s}^2$ .**

Height from the earth(m)	10 m	0 m	5 m	2 m
Potential energy(J)	1000 J	0J	500 J	200 J
Kinetic energy(J)	0 J	1000 J	500 J	800 J
Mechanical energy (J)	1000 J	1000 J	1000 J	1000 J

**Q.IV. Fill in the blanks using the suitable words given in the brackets:**

1.  $3.6 \times 10^6 \text{ J}$
2. work
3. work done
4. potential
5. constant

**Q.V. Give one word for the following:**

1. Kilowatt hour
2. Kinetic Energy
3. Free fall
4. Energy
5. Potential energy

### QVI. Very Short Answer Questions:

1. When the force is acting on the object is opposite the force of gravity.
2. Power of electric over,  $P = 2500\text{W}$ , time  $t = 4$  hours  
Total energy consumed  $= p \times t$   
 $= 2500 \times 4$   
 $= 1\text{KWL}$   
 $= 1$  unit
3. Potential energy of body A  $= mgh_1 = mgh_2$   
Potential energy of body A  $= mgh_2 = 2mgh_2$   
Ratio  $= \frac{mgh_1}{2mgh_2} = \frac{1}{2} = 1:2$
4. Force,  $F = 10\text{N}$   
Distance,  $s = 5\text{m}$   
Work done  $= \text{Force} \times \text{Distance}$   
 $= 10 \times 5$   
 $= 50\text{Nm} = 50\text{J}$
5. Work is said to be done whenever a force acts on a body and the body moves in the direction of the force. SI unit of work is joule (J)
6. K. E.  $= \frac{1}{2} mu^2$   
Where  $v$  is the velocity of object  
 $\Rightarrow \text{K. E.} \propto v^2$
7. SI unit of power is watt (W)
8. Electrical energy converts in to mechanical energy.
9. Gravitational potential energy,  $\text{PE} = mgh$
10. Mass of horse,  $m_1 = 250\text{kg}$   
Mass of dog,  $m_2 = 25\text{kg}$   
 $v_1 = v_2 = v$   
Kinetic energy of horse  $= \frac{1}{2} m_1 v_1^2 = \frac{1}{2} \times 250 \times v^2$   
Kinetic energy of dog  $= \frac{1}{2} m_2 v_2^2 = \frac{1}{2} \times 25 \times v^2$   
 $\therefore$  Horse possesses more kinetic energy.
11.  $V_1^2 / V_2^2 = 1/9$ . Therefore ratio is 1:9.
12. If all the forces are balanced.

### QVII. Short Answer Questions:

1. Mass of object,  $m = 1\text{kg}$   
Kinetic energy, K. E  $= 4\text{J}$   
 $\frac{1}{2} m v^2 = 4$   
 $\frac{1}{2} \times 1 \times v^2 = 4$   
 $v^2 = 8$   
 $v = 2\sqrt{2}$  m/s  
If velocity is increased by 50% new velocity,  $v' = 3\sqrt{2}$   
New kinetic energy  
 $= \frac{1}{2} m \times v'^2$   
 $= \frac{1}{2} \times 1 \times (3\sqrt{2})^2$   
 $= \frac{1}{2} \times 9 \times 2 = 9\text{J}$
2. (a) The rate doing work is called power. SI unit of power is watt (W).  
(b) Mass of boy,  $m_1 = 40\text{kg}$   
Mass of box,  $m_2 = 20\text{kg}$

Height of building,  $h = 15\text{m}$

Time,  $t = 25\text{s}$

work done =  $mgh$

$$= (m_1 + m_2) \times 10 \times 15$$

$$= 60 \times 10 \times 25$$

$$= 15000 \text{ J}$$

$$\text{Power} = \frac{w}{t} = \frac{15000 \text{ J}}{25\text{s}} = 600 \text{ watt (W)}$$

3. An object possesses gravitational potential energy if it is positioned of a height above the zero height. An object possesses elastic potential energy if it is of a position on energy medium other than the equilibrium position.

4. Kilowatt - hour (kwh) is the commercial unit of energy

SI unit of energy is joule

If 1000 joule of energy is used to do some work for 1 hour, then the power generated is

$$= 1000 \text{ J } 1 \text{ hour}$$

$$= 1 \text{ kJ } 1 \text{ hour}$$

$$= 1 \text{ kWh}$$

$$\text{Power, } P = 500 \text{ W} = \frac{1}{2} \text{ kW}$$

Time,  $t = 10 \text{ hours}$

Energy consumed in one day

$$= p \times t$$

$$= \frac{1}{2} \times 10$$

$$= 5 \text{ kW h}$$

Energy consumed in month of April

$$= 5 \text{ kWh} \times 30$$

$$= 150 \text{ kWh}$$

$$= 150 \text{ units}$$

5. (a) Here,  $\theta = 90^\circ$   
Work done =  $F \cdot S \cos \theta = F \cdot S \times \cos 90^\circ = 0$   
Hence, the work done is zero

- (b) Force,  $F = 50 \text{ N}$

Distance, and =  $4\text{m}$

$$\theta = 60^\circ$$

Work done =  $F \cdot S \cos \theta$

$$= 50 \times 4 \times \cos 60^\circ$$

$$= 100 \text{ J}$$

6. Mass of body,  $m = 10\text{kg}$   
Initial velocity,  $v = 0 \text{ m/s}$   
Final velocity,  $v = 25 \text{ m/s}$   
Distance covered,  $s = 20\text{m}$

$g = 10\text{m/s}^2$

$$s = ut + \frac{1}{2} g t^2$$

$$20 = 0 \times t + \frac{1}{2} \times 20 \times t^2$$

$$2 = t^2$$

$$t = \sqrt{2}$$

7. Mass of lady,  $m = 60\text{kg}$

Time,  $t = 50\text{s}$

Total steps = 70

Height of each step =  $15\text{cm}$

Total height of 4 steps =  $70 \times 15 \text{ cm} = 1050 \text{ cm}$

$$= 10.5 \text{ m}$$

$$\text{Work done} = mgh = 60 \times 10.5 = 63 \text{ J}$$

$$\text{Power} = \frac{W}{t} = \frac{63}{30} = 2.15$$

8. Mass  $m$  kg

Let, weight of the man on earth  $W_1$

Weight of the man on planet A  $W_2$

$$\text{Given: } W_2 = \frac{W_1}{2}$$

$$\text{or } mg' = \frac{mg}{2}$$

$$\text{or } g' = \frac{g}{2}$$

potential energy used by him to jump height of 0.4 m on earth is  $0.4 mg$ .

if he apply same potential energy on planet A with acceleration due to gravity  $g'$  he would move a height  $h'$

$$\text{so, } mgh = mg'h'$$

$$\text{since, } \frac{g}{2} = g'$$

$$g \times 0.4 = \frac{g}{2} h'$$

$$\text{So, } h' = 0.8 \text{ m}$$

Hence, he can jump on the planet A up to height of 0.8 m.

### QVIII. Long Answer Questions:

1. Let an object of mass  $m$ , starts from rest and attains a uniform velocity  $v$ , after a force  $F$  is applied on it.

Let during this period the object be displaced by distance  $s$ .

thus, work done on object,  $W = F \times S$

Let the acceleration produced after applying force on object be  $a$ .

So, using third equation of motion, we have:

$$v^2 - u^2 = 2as$$

$$s = \frac{v^2 - u^2}{2a}$$

Also, force,  $F = ma$

$$\rightarrow W = ma \times \frac{v^2 - u^2}{2a}$$

$$\rightarrow W = \frac{1}{2} m (v^2 - u^2)$$

$$\rightarrow W = \frac{1}{2} mu^2 \quad (\text{As, } u = 0)$$

$$\rightarrow (E_k = \frac{1}{2} mv^2)$$

Mass,  $m = 70\text{kg}$

Height,  $h = 10\text{m}$

$$\text{PE} = mgh = 70 \times 10 \times 10 = 7000 \text{ J}$$

$$= 7 \text{ KJ}$$

At half way down, the potential energy of the object will be  $\frac{1960}{2} = 980 \text{ J}$ .

At this point, the object has on equal amount of potential energy and elastic energy.

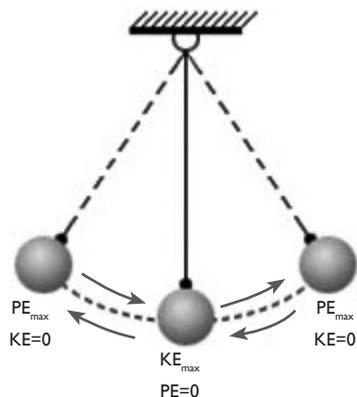
Hence, elastic energy = 580 J.

2. (a) Law of conservation of energy states that energy can neither be created nor destroyed, but it can be transformed from one form to another. The total energy before and after the transformation remains the constant.
- (b) In case of swinging pendulum, the bob moves in to and from motion and at mean position it has maximum KE. This KE transforms into PE while going from mean to extreme position and this process repeats.

3. Because, frictional force is non-conservative force so the total travelling distance =  $1500 \text{ m} + 2000 \text{ m} + (1.5 \times 2 \times 3.14 \times 100) = 4442 \text{ m}$

Frictional force = 5N

So, the work done =  $F \cdot S = 5 \times 4442 = 22210 \text{ J}$ .



**QI. Multiple Choice Questions:**

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

**QII. Match the followings**

**Column A**

1. Rate of doing work
2. Work and energy
3. Energy is flowing water
4. Commercial unit of energy
5. Energy in a stretched slinky

**Column B**

- (c) Power
- (d) Scalar quantities
- (a) Kinetic energy
- (e) Kilowatt hour
- (b) Potential energy

**QIII. The gravitational potential energy of an object is due to**

1. Zero
2. Positive
3. Negative

**QIV. State whether the following statements are true or false:**

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

**QV. Fill in the blanks using the suitable words given in the brackets:**

1. decreases
2. conserved
3. velocity
4. kilowatt
5. scalar

**QVI. Very Short Answer Questions:**

1. As, work done is  $FS \cos \theta$ , so where the box is not displaced, from its position, karan has not done any work.
2. When the direction of force acting on an object is opposite to the direction of displacement, the work done by force is negative.
3. Object A loses energy.
4. Object B gaining energy
5. kinetic energy,  $K. E = \frac{1}{2} mv^2$ , Where  $v$  is the velocity.  
→  $K. E. \propto v^2$
6. Law of conservation of energy states that the energy can never be created nor be destroyed but can be transformed from one form to another.
7.  $Power = \frac{Work\ done}{Time}$  so, the worker who completes the work in less time has more power.
8. So that can store the potential energy and the flow converts that energy in to kinetic energy. more the height greater the potential energy.
9. When the object is displaced per perpendicular to the force spliced, the work done is zero.
10. During photosynthesis, light energy converts into chemical energy.

11. Iron object
12. A has more potential energy.

**QVII. Short Answer Questions:**

1. Power,  $P = 40 \text{ w}$   
Time,  $t = 6 \text{ h}$   
Energy consumed by the tube in one day. = Power x time  

$$= 40 \text{ W} \times 6 \text{ h}$$

$$= 240 \text{ Wh}$$

$$= 0.24 \text{ kWh} = 0.24 \text{ units}$$
2. Work done is zero because in one complete revolution, earth returns to its initial position and displacement is zero.
3. (a) (i) Steam engine (ii) Generator.  
(b) Since the displacement of the pitcher is zero from the last 20 minutes, hence the work done by person is zero.
4. (a) Kinetic energy is the energy possessed by its motion while potential energy is the energy possessed by its position  
(b) Mass of ball,  $m = 0.5 \text{ kg}$   
Initial speed,  $u = 5 \text{ m/s}$   
Final speed,  $v = 3 \text{ m/s}$   
Change in K. E. = Final K. E. - Initial K. E.  

$$= \frac{1}{2} mv^2 - \frac{1}{2} mu^2$$

$$= \frac{1}{2} m(v^2 - u^2)$$

$$= \frac{1}{2} \times 0.5 (9 - 25)$$

$$= 4 \text{ J.}$$
5. Initial velocity of car,  $u = 30 \text{ km/h}$   
Final velocity of car,  $v = 60 \text{ km/h}$   
mass of car = 1500 kg  
Work done = change in kinetic energy  

$$= \frac{1}{2} m(v^2 - u^2)$$

$$= \frac{1}{2} \times 1500 (60^2 - 30^2)$$

$$= \frac{1}{2} \times 1500 \times 2700$$

$$= 150 \times 2200$$

$$= 2025000 \text{ J} = 2025 \text{ k J.}$$
6. Consider a body with mass  $m$ , raised through a height  $h$ , from the ground.  
Force required to raised the object = Weight of object  $mg$   
Object gains energy equal to the work done on it.  
Work done on the object against gravity is  $W$ .  

$$W = \text{Force} \times \text{displacement}$$

$$= mg \times h$$

$$W = mg h$$

$$\text{PE} = mg h$$
7. Kinetic energy of the object, K. E. = 25 J  
Velocity,  $v = 5 \text{ m/s}$   
As we know that,  

$$\text{K. E.} = \frac{1}{2} mv^2$$

$$25 = \frac{1}{2} \times m \times 5^2$$

$$m = 2 \text{ kg.}$$

- (a) When velocity is made two times, k. E. becomes four times

As,  $v' = 2v$

$$\begin{aligned} (\text{K. E.})' &= \frac{1}{2} m v'^2 \\ &= 4 \left( \frac{1}{2} m v^2 \right) = 4 \text{ K. E.} \end{aligned}$$

- (b) When velocity is made three times, K. E. becomes 9 times.

$v' = 3v$

$$\begin{aligned} (\text{K. E.})' &= \frac{1}{2} m v'^2 \\ &= \frac{1}{2} m (3v)^2 \\ &= 9 \left( \frac{1}{2} m v^2 \right) \\ &= 9 \text{ K. E.} \end{aligned}$$

8. When the ball is dropped from a certain height, it will have some stored gravitational energy. This energy can be shown by

$$\text{GPE} = m \times g \times h$$

The potential energy of gravity is directly affected by the height. When the ball is dropped from a 10m height, it loses 40% energy thus affecting the same percentage of height when it bounces back.

Now 40% of the energy lost means 40% of the height also lost on bouncing back. Given height is 10m and when you lose 40% of 10m, left will be 60% of 10m.

The height of the bounce back is hence 60% of 10m which is 6m.

### QVIII. Long Answer Questions:

- I. Let us consider a body of mass placed at A

Let,

$h = AB =$  height of body diagram above the ground.

$s =$  distance of any point C from A.

$g =$  acceleration due to gravity at the place.

$v_1 =$  velocity of the body at C.

$v =$  velocity of the body at B, a point just above the ground.

The velocity at the point A is zero, i.e.,  $u = 0$ .

- (i) At the point A,

$$\text{P. E.} = mgh$$

$$\text{K. E.} = 0$$

Total mechanical energy at A,

$$= \text{P. E.} + \text{K. E.}$$

$$= mgh + 0 = mgh$$

- (ii) At the point C:

When the body moves from A to C, it covers a distance  $s$ . If  $v_1$  is the velocity at C.

Then from,  $v^2 - u^2 = 2as$  we get

$$v_1^2 - 0 = 2gs$$

$$v_1^2 = 2gs$$

$$\text{K. E. at C} = \frac{1}{2} m v_1^2 = \frac{1}{2} m (2gs)$$

$$= mgs$$

$$\text{P. E. at C} = mg(h-s)$$

Total mechanical energy at C = K. E. + P. E.

$$= mgs + mg(h-s)$$

$$= mgh$$

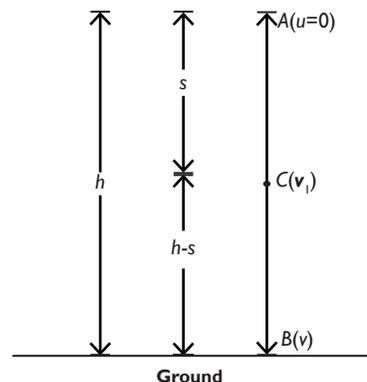
- (iii) At the point B :

From,  $v^2 - u^2 = 2as$

$$v^2 - 0 = 2gh$$

$$v^2 = 2gh$$

$$\text{K. E. at B} = 0$$



Total mechanical energy at B = K. E. + P. E.

$$= mgh + 0 = mgh$$

Clearly, the total mechanical energy of the body at A, B and C is the same. Hence, the total mechanical energy of the body throughout the free fall is conserved and is equal to the sum of kinetic energy and potential energy.

2. Given A bullet of 10 g strike the sand bag at a speed of 1000 m/s and gets embedded after travelling 5 cm. calculate

(a) Resistive force exerted by sand on bullet.

(b) Time taken by bullet to come to rest.

Given mass of bullet  $m = 10 \text{ g} = 0.01 \text{ kg}$

Speed  $v = 1000 \text{ m/s}$

Distance  $s = 5 \text{ cm} = 0.05 \text{ m}$

We know that  $F = ma$

and  $v^2 = u^2 - 2as$

or  $a = \frac{v^2 - u^2}{2s}$

Now  $F = m \left( \frac{v^2 - u^2}{2s} \right)$

$$= 0.01 \times \frac{(1000^2 - 0)}{2 \times 0.05}$$

Resistive force will be  $F = 10^5 \text{ N}$

Now time taken to come to rest will be

$$s = \left( \frac{u + v}{2} \right) t$$

$$\text{So } t = \frac{2s}{u + v}$$

$$= \frac{2 \times 0.05}{1000}$$

$$t = 10^{-4} \text{ secs}$$

3. (a) Let  $v$  be the velocity of dog and horse.

Mass of dog  $m_1 = m$

Mass of horse,  $m_2 = 10m$

$$\text{K. E of horse} = \frac{1}{2} \times m_2 \times v^2$$

$$= \frac{1}{2} \times 10m \times v^2$$

$$= \frac{mv^2}{2}$$

$$\text{Ratio of K. E} = \frac{\frac{1}{2} m_1 v^2}{\frac{1}{2} m_2 v^2}$$

$$\text{KE}_1 : \text{KE}_2 = \frac{m_1}{10m_1} = 1 : 10$$

(b) mass of object,  $m = 40 \text{ kg}$

Height,  $h = 5 \text{ m}$

Potential energy,  $\text{PE} = mgh$

$$= 40 \times 10 \times 5$$

$$= 2000 \text{ J}$$

$$= 2 \text{ KJ}$$

When half-way down, potential energy of object is  $\frac{2}{1} = 1 \text{ KJ}$ .

At that point kinetic energy will be equal to that of potential energy.

$\therefore$  Kinetic energy of the object at half-way down = 1 KJ.

# Chapter 12 SOUND

## WORKSHEET 1

### QI. Multiple Choice Questions:

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

### QII. Give reasons for the following statements:

- This is because the speed of light is greater than the speed of sound.
- The ceilings of the concert halls are curved so that it can reject the sound waves and give minimum amplitude.
- Those animals have audible range of ultrasonic sound so they can sense earthquakes before its effect.
- As they need a material medium to travel.
- Because there is vacuum in space so sound waves cannot travel.

### QIII. Identify the following musical instrument and name the part which vibrates and produces sound in them:

Guitar

Flute

Veena

Harmonium

Sitar

Mouth organ

tabla

Shehnai

Piano

Drum

### QIV. Fill in the blanks using the suitable words given in the brackets:

- cannot
- pressure
- absorbers
- more
- infrasonic

### QV. Complete the following table:

Sound Velocity	330 m/s	34000 m/s	343.4 m/s
Frequency	550 Hz	500 Hz	20200 Hz
Wavelength	0.6 m	68 m	1.7 cm
Time Period			
Audible / Ultrasonic / Infrasonic	Audible	Audible	Ultrasonic

### QVI. Very Short Answer Questions:

1. Amplitude determines loudness  $\vartheta$
2. Frequency  $\nu = 220$  Hz  
speed,  $v = 440$  m/s  
wavelength,  $\lambda = \frac{\text{speed}}{\text{frequency}} = \frac{v}{\nu} = \frac{440\text{m/s}}{220\text{Hz}} = 2\text{m}$
3. Iron
4. 20Hz - 20000 Hz
5. Wavelength,  $\lambda = \frac{\text{speed}}{\text{frequency}}$
6. Ultrasound waves have frequencies above 20,000 Hz.
7. Frequency,  $\nu = 100$  Hz  
Vibrations per minute =  $100 \times 60 = 6000$
8. Speed of sound in air increases with increase in temperature.
9. Speed,  $v = 330$  m/s  
Frequency,  $\nu = 550$  Hz  
wavelength,  $\lambda = \frac{\text{speed}}{\text{frequency}} = \frac{v}{\nu} = \frac{330\text{m/s}}{550\text{Hz}} = \frac{3}{5} = 0.6\text{m}$
10. Time-period,  $T = 0.02$  seconds  
frequency,  $\nu = \frac{1}{T} = \frac{1}{0.02} = 50$  Hz
11. This is because the particles in vulcanized rubber do not vibrate or oscillate as fast as in other solids or in air.
12. Higher pitch

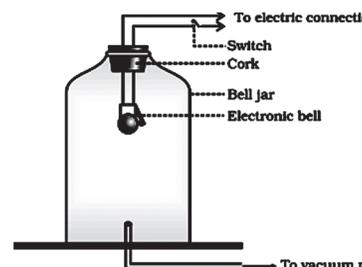
### QVII. Short Answer Questions:

1. (a) Parallel to the direction of waves propagation.  
(b) perpendicular to the direction of wave motion.
2. Time,  $t = 1.02$  s  
Speed of sound in water,  $\nu = 1531$  m/s  
Distance = Speed  $\times$  Time  
 $= 1531 \times 1.02$   
 $= 1561.62$  m  
So, the distance of the cliff from the substance =  $\frac{1561.62 \text{ m}}{2} = 780.81$  m
3. Number of vibrations = 32  
Frequency tuning fork = 256 Hz  
Time to complete one vibration =  $\frac{1}{256}$  s  
Time to complete 32 vibrations =  $\frac{32}{256}$  s =  $\frac{1}{8}$  s = 0.125 s
4. The sensation of sound, which an observer hears, persists in the brain for about 0.1 s. Thus, for distinct echo formation, the time difference between the original sound and reflected sound must be at least 0.1 s or more.  
Now, the time of echo is  $t = 2d/v$ , where  $d$  is the distance between observer and the reflecting surface and  $v$  is the velocity of sound.  
Hence,  $d = vt/2$   
Therefore, minimum distance ( $d$ ) =  $v \times 0.1/2 = v/20$   
Thus, reflector surface must be situated at a minimum distance of  $v/20$  in order to form a distinct echo.  
At room temperature of about 22°C speed of sound in air has a value of 344 m s<sup>-1</sup>, hence value of minimum distance ( $d$ ) =  $344/20 = 17.2$  m  
It means that in a room of length less than 17.2 there will be no echo.
5. Ultrasonography uses high-frequency sound pulses that are emitted from a hand-held ultrasound transducer.  
This technique is used in x-ray, medical treatment etc.

6. Longitudinal waves are the waves in which the particles of the medium vibrate along the direction of propagation of the wave. e.g.- Sound wave.  
In transverse waves, particles of the medium vibrate in a direction perpendicular to the direction of propagation of the wave.  
e.g. - Waves produced in a stretched string.
7. The echo will be heard later as sound is directly proportional to temperature and as temperature increases the sound will be faster. so as 4degrees is less than 22 degrees it will be heard later.

### QVIII. Long Answer Questions:

1. (a) Take an electrical bell and an air tight glass bell jar connected to a vacuum pump. Suspend the bell inside the jar, and press the switch of the bell.  
You will be able to hear the bell ring. Now pump out the air from the glass jar. The sound of the bell will become jointer and after some time, the sound will not be heard. This so because almost all air has been pumped out. This shows that sound needs a material medium to travel.
- (b) It travels fastest in iron.
- (c) 331.7 m/s.
- (d) Nature od medium and pressure.



2. Sound travels fastest in solids and slowest in air. Water is in between. This is because the particles in solids are closer together than the particles in liquids or gases, and the particles in liquids are closer together than the particles in gases. The tighter particles are packed in a space, they collide more frequently. This allows sound, which is simply the combined collisions of particles, to travel fastest in solids. So, to reiterate, sound travels fastest in solids, then water, and slowest in air.

In this case, the sound of an explosion on the surface of a lake is heard by a boat man 100 m away and by a diver 100 m below the point of explosion and the sound takes time  $t$  to reach the boat man. Here, the boat man is on the surface of the lake, that is, air and the diver is inside the lake of water. The diver hears the explosion first as the sound travels four times faster in water than in air. Hence, the time taken for the sound to reach the diver is  $t \times 1/4$   
= 0.25t.

## WORKSHEET 2

### QI. Multiple Choice Questions:

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

### QII. Match the following:

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

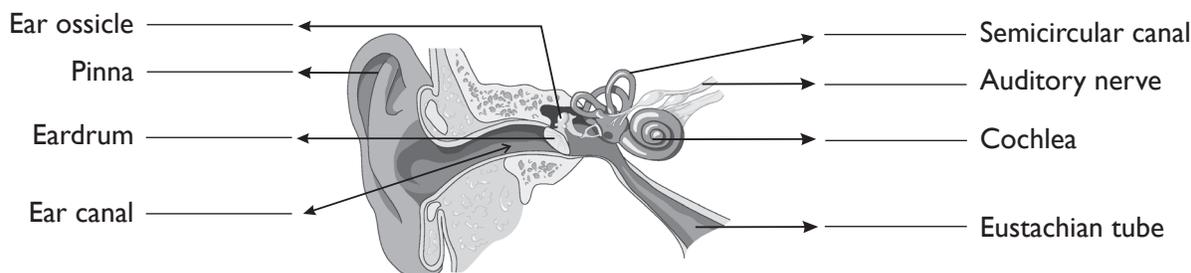
### QIII. Write the range of frequencies for the following sound:

1. 20Hz 20000Hz  
2. Above 20,000Hz  
3. Above 20 kHz

### QIV. From the diagrams shown below, identify the high pitched and low pitched sounds:

1. Low pitched  
2. High pitched

**QV. Label the given diagram of human ear:**



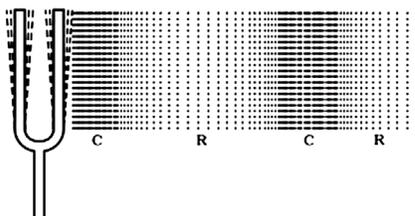
**QVI. Very Short Answer Questions:**

1. Hertz.
2. Frequency.
3. Range < 20Hz.
4. Infrasound waves.
5. In this type of wave the particles of the medium vibrate in a direction perpendicular to the direction of propagation of the wave.
6. A loud sound.
7. Extracorporeal shock wave lithotripsy (ESWL)
8. Electrocardiography (ECG) is the process of recording the electrical activity of the heart over period of time.
9. Stethoscope works on the principle of multiple reflection of sound waves.
10. Sound Navigation And Ranging
11. Mechanical waves, e.g., sound waves.
12. (a) Energy (b) particles of medium

**QVII. Short Answer Questions:**

1. Speed of sound wave,  $v = 339 \text{ m/s}$   
Wavelength,  $\lambda = 1.5 \text{ cm} = 0.015 \text{ m/s}$   
Frequency,  $\nu = \frac{v}{\lambda} = \frac{33900}{0.015} = 2260 \text{ Hz}$   
Yes, it will be audible.
2. Height of tower,  $h = 500\text{m}$   
 $g = 10 \text{ m/s}^2$   
Speed of sound,  $v = 340 \text{ m/s}$   
Initial velocity of the stone,  $u = 0$   
According to the second equation of motion:  
$$h = ut + \frac{1}{2} gt^2$$
$$500 = 0 \times t + \frac{1}{2} \times 10 \times t^2$$
$$\Rightarrow 100 = t^2$$
$$\Rightarrow t = 10 \text{ s}$$
  
Now time taken by the sound to reach the top from the base of the tower =  $500/340 = 1.475$ .  
Therefore, the splash is heard at the top after time =  $10 + 1.475 = 11.475$
3. (a) The persistence of sound in an auditorium is the result of repeated reflections of sound and it is called reverberation.  
(b) The reverberation can be reduced by covering the ceiling and walls of the enclosed space with sound absorbing materials, such as fiber board, loose woolens, etc.
4. The quality or timbre of sound.
5. The sound is produced through the vibration of parties of medium and it is transmitted through vibrations and passes through the ear canal to a thin membrane called eardrum. The eardrum vibrates.

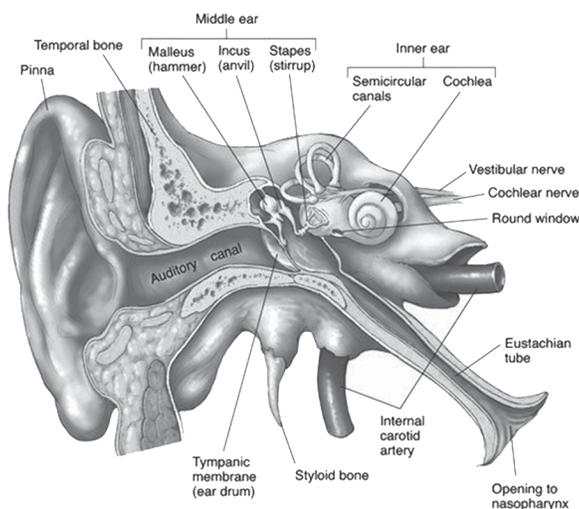
6. When a vibrating body moves forward it creates a region of high pressure in its vicinity region of high pressure is known as compressions. When it moves backwards, it creates a region of low pressure in its vicinity. This region is known as rarefaction. As the body continues to move forward and backwards, it produces a series of compressions and rarefactions. This is shown in figure below.



7. Time,  $t = 70\text{s}$   
 Speed of sound in water =  $1550\text{ m/s}$   
 Distance of enemy submarine =  $\frac{1}{2} \times \text{Speed} \times \text{Time} = \frac{1}{2} \times 1550 \times 70 = 54250\text{ m}$
8. Sound is called a longitudinal wave because it is produced by compression and rarefactions in the air. The air particle vibrates parallel to the direction of propagation.

### QVIII. Long Answer Questions:

1. The sound waves pass through the ear canal to a thin membrane called eardrum. The eardrum vibrates. The vibrations are amplified by the three bones of the middle ear called hammer, anvil and stirrup. Middle ear transmits the sound waves to the inner ear. The brain then interprets the signals as sound.



2. (a) X  
 (b) Y  
 (c) Frequency = No. of oscillations/ time  
 $= 360 / (2 \times 60)$   
 $= 3\text{ Hz}$

## WORKSHEET 1

**QI. Multiple Choice Questions:**

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

**QII. Differentiate between the following:**

1. The disease spread from person to another, they are 'catching' disease and can be spread through the air, water, etc. are called communicable disease.

The disease which does not spread from one person to another through any mode is called non-communicable disease.

2. Such disease which occurs suddenly and last for a short period is called as acute disease.  
Such disease which shows it's prolonged effects on human health. The condition is said to be chronic when the disease lasts for more than three months. Such disease can be life-threatening and majorly affect the immune system of the body and thus declines the health.
3. Though signs and symptoms describe the same conditions, these two are different in many characteristics. While signs are what a doctor sees, symptoms are what a patient experiences.  
A symptom can be defined as one of the characters of a disease. Meanwhile, sign is the definite indication of a specific disease.
4. The diseases present by birth are called congenital, for example, Haemophilia. The diseases that one acquires during lifetime are called acquired diseases, example, cancer.

**QIII. Give reasons for the following statements:**

1. A balanced diet is important because your organs and tissues need proper nutrition to work effectively. Without good nutrition, your body is more prone to disease, infection, fatigue, and poor performance. Children with a poor diet run the risk of growth and developmental problems and poor academic performance, and bad eating habits can persist for the rest of their lives
2. Health is a state of being well enough to function physically, mentally and socially well and these conditions in turn depend upon the surrounding environmental conditions. e.g., if there are unhygienic conditions in surrounding area, it is likely that we might get infected or diseased.
3. Stagnant water is a breeding place of mosquitoes. If there will be stagnant water then the mosquito will take birth which can cause several diseases. So the area must be free from stagnant water.
4. Health is a state of social, mental and physical well being. If all the people will help each other, will share their sorrow then a social harmony will be made and a person will be mentally healthy. Good economic condition is necessary for getting good opportunities of employment. Health also depends on economy. If one will get proper earning then one will be able to get balanced food which will make one's family healthy. So good economy is important.

**QIV. Match the followings:**

- | Column A                 | Column B                         |
|--------------------------|----------------------------------|
| 1. Antibodies            | (c) Immunity                     |
| 2. AIDS                  | (e) Sexually transmitted disease |
| 3. BCG                   | (a) Tuberculosis                 |
| 4. Communicable disease  | (b) Measles                      |
| 5. Japanese encephalitis | (d) Brain fever                  |

**QV. Expand the following:**

1. WHO - WORLD HEALTH ORGANIZATION
2. BCG- Bacillus Calmette-Guerin
3. AIDS - Acquired Immune Deficiency Syndrome
4. DPT -Diphtheria, Pertussis, Tetanus

**QVI. Very Short Answer Questions:**

1. Use of contaminated needles and syringes and organ transplant.
2. (a) Number of microbes attached to the body  
(b) Immune system of the individual
3. Infection occurs when viruses, bacteria or other microbes enter your body and begin to multiply. Disease occurs when the cells in your body are damaged as a result of infection and symptoms appear.
4. Rabies is transmitted by bite of dog or cat.
5. Staphylococcus
6. Liver
7. Diarrhoea
8. Polio and Hepatitis
9. Helicobacter pylori. It was identified in 1982 by Australian scientist Barry Marshall and Reborn Warren.
10. Dengue, malaria, elephantiasis.
11. He should use handkerchief while sneezing.
12. He should visit the doctor and get himself diagnosed.

**QVII. Short Answer Questions:**

1. (a) Influenza spreads easily with rapid transmission in crowded areas including schools and nursing homes. When an infected person coughs or sneezes then the proximity person gets infected.  
(b) Malaria parasites, enter the blood after an infective mosquito bite infect the red blood cells. At the end of that infection cycle, red blood cells rupture. This causes lowering of RBC's and leads to anemia.
2. Antibiotics are medications used to fight infections caused by bacteria. They're also called antibacterials. They treat infections by killing or decreasing the growth of bacteria by breaking their cell walls.
3. (a) The garbage thrown in open places, overflowing drains or sewer water, stagnant water, etc., are the places where disease-causing microbes multiply and mosquitoes and flies breed. These mosquitoes and flies act as carriers of disease-causing microbes. As a result, diseases may spread in the community and affect individual health. Thus, public cleanliness is important for individual health  
(b) Personal health and community health are inter-related. The health of the community depends on the health and personal hygiene of the individuals of the community. If the individuals of the community stay healthy and behave responsibly towards the environment and surroundings, create a lively, healthy and hygienic environment, then the community on the whole would be healthy.
4. (a) Diarrhoea diseases are an intestinal infection including food poisoning. The causative organism of diarrhoea is Staphylococcus.  
(b) (i) Diminished appetite  
(ii) Dehydration symptoms are sunken eyes and hollow cheeks.  
(c) Clean water : 1 litre (5 cups), add six spoons of sugar and half teaspoon of salt to it. Stir the mixture till the sugar dissolves.
5. (a) A vaccine is a biological preparation that imparts immunity to a particular disease.  
(b) It is a technique in which a preparation of antigenic proteins of pathogens or weakened or dead pathogens are injected into a person to develop immunity in him without infection.

6. Infectious diseases are generally spread through air, water, sexual contact, vectors, physical contact with affected person and through articles of use of affected person.
7. (a) A state of complete physical, mental and social well-being and not merely an absence of disease or infirmity.  
 In other words, WHO recognizes three dimensions of health :  
 (i) Physical dimension           (ii) Mental dimension           (iii) Social dimension
- (b) (i) Physical dimension : It implies perfect functioning of all the body parts.  
 (ii) Mental dimension : It implies harmony between the individual and its environment.  
 (iii) Social dimension : It implies social interaction and behaviour.
8. (a) The disease is AIDS, the causative agent of disease is retrovirus - HIV.  
 (b) (i) Unprotected sexual inter course with an infected partner. It is a sexually transmitted disease.  
 (ii) Use of contaminated needles, razors, syringes etc.  
 (iii) Organ transplant, artificial insemination.  
 (c) (i) Use of disposable needles and syringes.  
 (ii) Avoidance of sharing of razor for shaving.  
 (iii) Refraining high-risk groups from donating blood.  
 (iv) Educating people about AIDS, particularly those in high risk group.

### QVIII. Long Answer Questions:

1. (a) **Causes of Jaundice:**  
 (i) Jaundice is caused by a buildup of bilirubin, a waste material, in the blood.  
 (ii) An inflamed liver or obstructed bile duct can lead to jaundice, as well as other underlying conditions.  
 (iii) This leads a yellow tinge to the skin and whites of the eyes, dark urine and itchiness
- (b) **Long term effect of Jaundice:**  
 Jaundice usually goes away on its own after mild treatment. However, if a severe case of jaundice is left untreated for too long, the baby can get kernicterus, a form of brain damage. As result, other complications can occur, including cerebral palsy.
2. (a) If a person having above symptoms, then he is suffering from the disease called Tuberculosis. It is especially among poor people living in dirty; ill- ventilated, congested localities of big cities. It is caused by bacterium. Mycobacterium tuberculosis is responsible for TB. It affects lungs.  
 (b) (i) Infection spreads by tiny droplets of sputum sprayed by the infected person by sneezing, coughing.  
 (ii) One can also get infected indirectly by taking contaminated milk of cow having bovine T.B.  
 (c) The patient can be immunised with the BCG vaccine.  
 (d) Edward Jenner discovered this vaccine. He tested his vaccination theory in May, 1976. He deliberately gave cowpox to people and found they were now resistant to smallpox.

## WORKSHEET 2

### QI. Multiple Choice Questions:

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

### QII. Classify following as acute, chronic, infectious or non-infectious diseases:

1. infectious                      2. acute                      3. chronic                      4. infectious  
 5. non-infectious                6. infectious                7. infectious                8. infectious

**QIII. Give reasons for the following statements:**

1. This is because in India majority of children get exposed to hepatitis A virus in their early childhood. As a result, these children develop immunity against it.
2. Because these disease last for long time period, even as much as a little time.
3. Since these diseases are spread from infected person to other through physical contact, air, water food, etc.
4. This is because anti bacterial medicines block the formation of cell wall of the bacteria. When, bacterias dont have cell wall, they dont divide and hence they die. While, viruses dont have their machinery of own. When they enter into our body, they use our cells as their machinery. So, to kill viruses we've to kill some of our cells as well.

Hence, making anti-viral drugs is more difficult than making anti-bacterial drugs.

5. Because after that disease is caused, his body has produced antibodies. So if the germs of small pox enters his body again then they would be killed.

**QIV. Fill in the blanks using the suitable words given in the brackets:**

1. fungal
2. Leishmaniasis
3. malaria
4. immunity
5. WBCs

**QV. Name the following:**

1. AIDS & Pelvic Inflammatory Disease
2. COVID-19 & INFLUENZA
3. Contagious
4. Tsetse flies
5. Malaria & Leishmaniasis

**QVI. Very Short Answer Questions:**

1. Scurvy and diabetes
2. Small intestine.
3. Penicillin
4. Bubonic Plague
5. Edward Jenner
6. Rabies (Hydrophobia)
7. HIV - HUMAN IMMUNODEFICIENCY VIRUS
8. Viruses
9. 1.5 to 6 months
10. It is a medicine obtained by microbes themselves to kill them. Example, penicillina nd streptomycin.
11. Polio virus.
12. No, it will not be useful. The target organ is liver.

**QVII. Short Answer Questions:**

1. A disease in which the function or structure of the affected tissue or organs changes for the worse over time.  
Example : Osteoarthritis, Osteoporosis and Alzheimer's. etc
2. In the particular country to which you will be going to their may be wide spreading deadly diseases that may have health concerns and thus you must get vaccinated.
3. It is the disease caused by the virus called as Herpes simplex virus, which cause cold sores and genital herpes.
4. When a microbe infects the tissue of the body of an individual in a particular type of disease.
5. AIDS : retrovirus - HIV, Typhoid - Salmonella typhi

Tuberculosis - Mycobacterium tuberculosis

Malaria : Plasmodium, kala-azar - leishmania

6. (a) Symptoms of swine flu are body aches, cough, headache, sore throat, fever, tiredness etc.  
(b) (i) Best way to prevent swine flu is to get flu vaccination.  
(ii) Wash your hands properly using soap and sanitiser.  
(iii) Avoid contact with people suffering from swine flu, wear mask on mouth.
7. (a) The chances of mother having chicken pox is nil because she became immune to this disease. When the immune system first encounters an infectious microbes. It responds against it and then remembers it specifically. So when next time particular microbe enters into the body, the immune system responds the greater vigour and eliminates the infection more quickly.  
(b) It is a infectious disease can be spread by air, water, food, physical contact, etc.

### QVIII. Long Answer Questions:

1. (a) **Immediate causes** : It is the real or primary cause of the disease. For infectious disease - the pathogens as virus, bacteria etc are immediate causes.

**Contributory causes** : These are causes or factors that do not cause the disease themselves but provide conditions for the disease to occur. It makes a person prone for catching a disease - second level causes.

- (b) For example - contaminated food or water induces disease in healthy persons.

Vector	Infection Agent
a. A vector is an organism that does not cause disease itself but which spreads infection by conveying pathogens from one infected host to a healthy host	a. An agent which is capable of producing infection by a chemical, physical or biological effect such as a disease.
b. These organisms act as an intermediaries.	b. The infection agent lives inside the vector and reproduce itself.
c. A vector that is essential in the life cycle of a pathogenic organisms.	c. It never harm the vector or carrier through which it is entered to the target host.
d. Female Anopheles mosquito is the carrier of a parasite called Plasmodium, which is responsible for the malaria disease.	d. These are commonly known as pathogens-include-bacteria, viruses, fungi etc.

2. (a) It is a viral disease, which is spread by mosquitoes. The target organ of this disease is brain. It is also called brain fever.  
(b) The causative agent of this disease is a virus named Japanese encephalitis virus (JEV). It happens because of a mosquito bite, carrier or vector of the JEV  
(c) This disease causes the symptoms of headache, vomiting, fever, confusion and seizures.  
(d) As the vaccination against Japanese encephalitis is not 100% effective, one should protect himself against mosquito bites while travelling or staying in at risk areas.  
(e) (i) Eat antioxidant foods, including fruits, such as blueberries, cherries and tomatoes and vegetables. (guards-pumpkin, cucumber etc) It can help your immune system tight off illness.  
(ii) Drink enough fluids generally 6-8 glasses day.  
(iii) Eat whole grain breads and cereals, provide essential fibers.  
(iv) Eat at least 5 servings of fruits and vegetables a day, eating things of varying colors can provide a range of nutrients.

## WORKSHEET 1

## QI. Multiple Choice Questions:

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

## QII. Match the followings:

## Column A

1. Carbon dioxide
2. Ground Water
3. CFC
4. Terracing and afforestation
5. Plant, trees and microbes

## Column B

- (c) Green house gas
- (e) Renewable resource
- (a) Gas causing in ozone layer
- (d) Prevents soil erosion
- (b) Biotic components

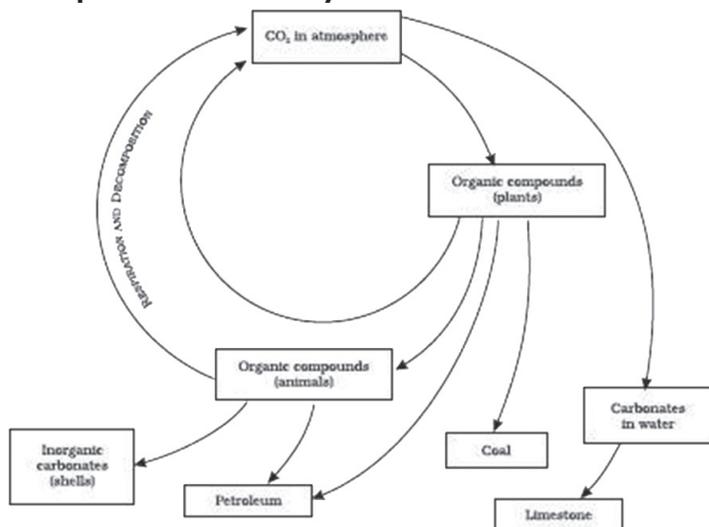
## QIII. Give two examples for each of the following:

1. Solar Energy / Wind Energy
2. Salt / Oil
3. Fossil Fuels / Coal
4. Sulfates / Carbonates
5. Ozone / Carbene Monoxide

## QIV. Give one word for the following:

1. Carbondioxide
2. Oxygen
3. Solar Energy
4. Sulpher dioxide  $\text{SO}_2$
5. Rhizobium

## QV. Complete the carbon cycle shown below:



1.

<b>Exhaustible resources</b>	<b>Inexhaustible resources</b>
a. These resources cannot be renewed after exhaustion.	a. These resources have an ability to renew themselves in a given period of time
b. These are non-renewable or non-replenishable resources.	b. These are renewable or replenishable resources.
c. They require conservation steps to be taken, so that they can be used in future also.	c. They don't require conservation step to be taken can be, renewed.
e.g. iron, coal, etc.	e.g. sunlight, water etc.

2.

<b>Renewable resources</b>	<b>Non-Renewable resources</b>
a. They are present in the atmosphere of the earth.	a. They are typically found in the underground layers of the earth.
b. They are replaced by nature itself in a very short period.	b. They cannot be replaced by nature during time of human life span.
c. They are obtained free of cost.	c. Very costly and not easily available.
d. They don't cause pollution in the environment.	d. Pollute the earth by releasing various types of pollutants.

#### **QVI. Very Short Answer Questions:**

1. Abiotic factors, including lithosphere, hydrosphere and atmosphere.
2. Smog: Dirty, poisonous air that cover a whole city. It is a mixture of fos and smoke.
3. Plant, fungi
4. Ultraviolet
5. Solar energy
6. 78% of  $\text{NO}_2$ , 21% of  $\text{O}_2$
7. Land and water
8. They contain nitrogen fixing bacteria that help the plant take up nitrogen from the soil.
9. Rivers while flowing through land dissolved minerals and deposit them in sea water.
10. Because they are continuously being involved in a cycle of being used up and being generated by various sources.
11. Because of greenhouse effect.
12. Oxygen is utilised and carbon dioxide is released.

#### **QVII. Short Answer Questions:**

1. Effect of air pollution on our health: watery eyes, coughing and difficulty breathing are acute and common reactions.
2. Eutrophication means excessive growth of algae plants on the surface of water due to over use of nitrogen fertilizers.
3. (a) Widening of ozone hole has consequences on humans, animals and plants. This typically results from higher UV levels reaching us on earth and, UV rays causes non-melanoma skin cancer etc.  
(b) When fossil fuels such as coal and petroleum products are burnt, produce oxides of nitrogen and sulphur. On dissolving in rain, these oxides of nitrogen and sulphur form nitric acid and sulphuric acid respectively. This causes acid rain
4. Soil is the thin layer of material covering the earth's surface and is formed from the weathering of rocks. The methods of preventing or reducing of soil erosion are:  
(i) Afforestation (ii) Contour ploughing (iii) Vegetation (iv) Mulch
5. Water harvesting can provide 50% of a family's water needs. This is not only saves water, but saves money and reduces our impact on the environment.  
Water harvesting is carried out through catchment areas and conduits.

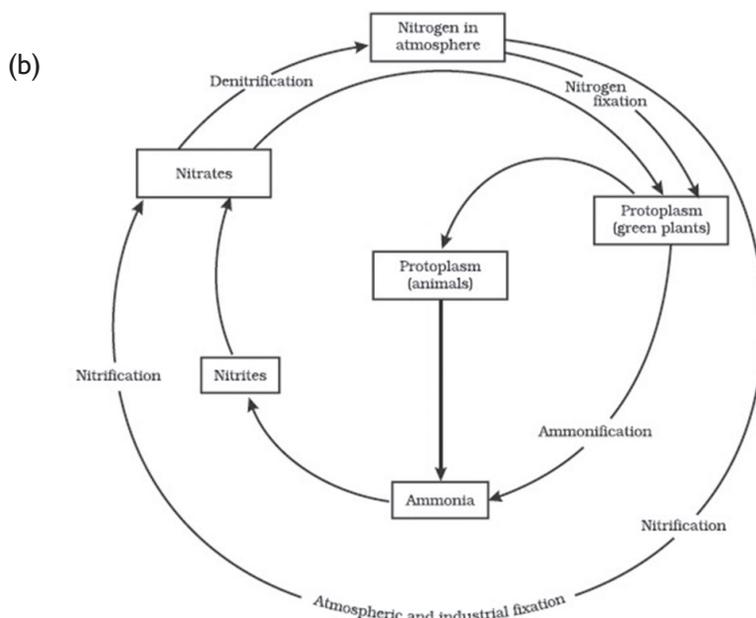
**Catchment** : By this the surface which receives rainfall directly.

**Conduits** : Through pipelines the harvested water collects from the rooftop etc.

6. (a) "Water of Yamuna river resembles a drain".  
It stated that Delhi doesn't have a proper drainage system. Yamuna is movely a drain. It doesn't have fresh water after wazirabad. Out of 30 Sewage Treatment Plants (STPs), It is noted, that they are underutilised up to 37% so, the court told the bench that the yamuna turns into a drain after wazirabad since industrial and domestic effluents are indiscriminately dumped into it.
- (b) Yes, The solubility of oxygen and other gases will decrease as temperature increases. This means that colder lakes and streams can hold more dissolved oxygen than warmer water. If water is too warm, it will not hold enough oxygen for aquatic organisms to survive.
7. (a) The crops have used up all the nutrients from the soil and the soil has now become infertile.  
(b) By practicing crop rotation or mixed farming or by leaving the land uncultivated for a year or so between two crops.

### QVIII. Long Answer Questions:

1. (a) Nitrogen exists as free nitrogen in the atmosphere.  
Atmospheric invert nitrogen gas is converted into usable nitrogenous form for the various lip form by:
- (i) Blue green algae and bacteria.
  - (ii) This bacteria found in the nodules of roots of legumes. such as, gram, bean, etc.
- Plants take compounds containing nitrogen from the soil. From plants nitrogen passes into food web. Decay of dead plants, animals and excreta like urine, faeces, causes veteran of nitrogen compounds to the soil.



2. (a) To prevent runoff of water.  
(b) In this, sprtsteps are made and cropping is done on a straircase like land.  
(c) Afforestation, contouring, etc. can prevent soil erosion.

## WORKSHEET 2

### QI. Multiple Choice Questions:

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

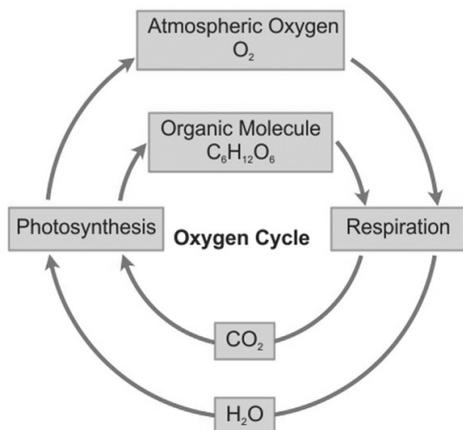
**QII. Give reasons for the following statements:**

1. The cycling process of all these gases maintains their percentage in the atmosphere at constant level.
2. Because moon has no atmosphere. Earth's atmosphere protects life on the earth by absorbing UV radiation coming from the sun and maintaining the average temperature.
3. During the day, the air above the land gets heated faster and starts rising. So, flying kites near seashore is easy as compared to anywhere else.
4. It releases chemicals like sulphur and nitrogen oxides which rise into the atmosphere mix with rain and oxygen and cause acid rain which corrods the marble of Taj Mahal. This causes yellowing of Taj Mahal.

**Q.III Match the followings:**

- | <b>Column A</b>       | <b>Column B</b>                     |
|-----------------------|-------------------------------------|
| 1. Skin cancer        | (a) UV rays                         |
| 2. Green house effect | (b) Keeps the earth warm            |
| 3. Global warming     | (c) Rise in temperature of earth    |
| 4. ODS                | (d) Another name of CFCs            |
| 5. Blue green algae   | (e) Nitrogen fixer                  |
| 6. Lichens            | (f) Biological agents of weathering |

**QIV. Complete the oxygen cycle shown below:**



**QV. Name the following:**

1. Solar Energy
2. Natural resources
3. Renewable and Non Renewable
4. Hydropower
5. Fossils

**QVI. Very Short Answer Questions:**

1. Desertification is the process by which fertile land becomes desert, typically as a result of drought.
2. 60% of humans body is made up of water.
3. SPM are finely divided solids or liquids that may be dispersed through the air from combustion process industrial activities or natural sources.
4. Wind is the perceptible natural movement of air, especially in the form of a current of air blowing form a particular direction.
5. Molecules of different gases (Like nitrogen, oxygen, argon, etc.)
6. Cycling process keeps the temperature on earth steady
7. Carbon cycle and nitrogen cycle
8. Burning of fossil fuels is the largest source of air pollution

9. Abiotic: Wind, water, sunlight, temperature  
Biotic: Microbes, lichens and plants.
10. Lichens grow in non-polluted areas. As Delhi is more polluted, they do not grow here.
11. It can lead to eutrophication.
12. This can kill aquatic flora and fauna.

### QVII. Short Answer Questions:

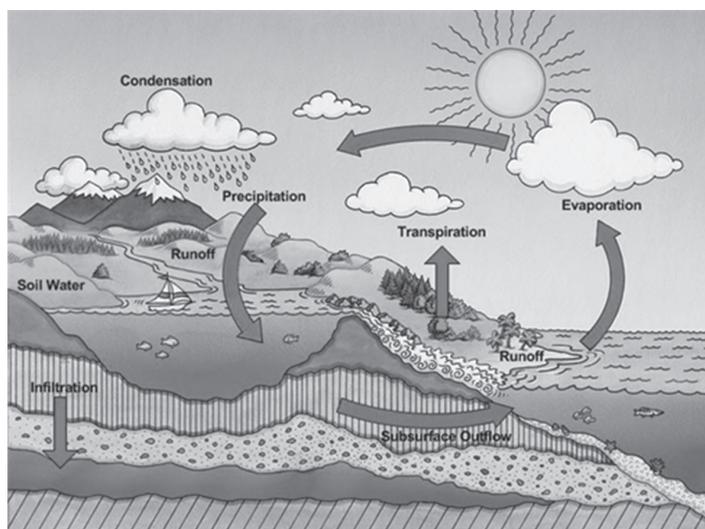
1. Two human activities which lead to environmental pollution are:
  - (a) Deforestation, which would increase the amount of  $\text{CO}_2$
  - (b) Uses of chemicals in the industries
2. Role of respiration in oxygen cycle is to release carbon dioxide which is then taken up by the plants to carry out photosynthesis, that release oxygen which is used up by human beings in respiration to produce  $\text{CO}_2$  for plants again and this cycle goes on.
3. The some different types of soil are below:
  - (a) **Black soil** : This soil will be usually found in the volcanic regions as it is formed by lava rocks after they undergo a decomposition process. This black colour is due to the presence of iron in it.
  - (b) **Red soil** : Red soils are found in regions with warm, moderate and moist climates. This soil mainly formed due to crumbling and weathering.
  - (c) **Laterite soil**: The soil contains high amount of iron and Aluminum oxide. It is highly weathered red soil which is found in area with tropical to moderate climate.
4. The Layers of the atmosphere are:
  - (a) **Troposphere** : It is the first layer above the surface and contains half of the Earth's atmosphere. Weather occurs in this layer.
  - (b) **Stratosphere** : Many jet aircrafts fly in the stratosphere because it is very stable. Also, the ozone layer absorbs harmful rays from the sun.
  - (c) **Mesosphere** : Meteors or rock fragments burn up in this layer.
  - (d) **Thermosphere** : It is a layer with auroras. It is also where the space shuttle orbits.
  - (e) **Exosphere**: This is the upper layer of our atmosphere. It merges into spaces in the extremely thin exosphere.
5.
  - (a) **Fossil fuels** : A natural fuel such as coal or gas. Formed in the geological past from the remains of living organisms.
  - (b) Fossil fuels release nitrogen into the atmosphere, which contributes to nutrient pollution in our air. Also, they release nitrogen oxides into the atmosphere, which contribute to the formation of smog and acid.
6.
  - (a) The direction of air currents in coastal areas during 'day time' towards the land.
  - (b) During Night towards the sea.  
This happens because during the daytime, land gets heated faster than water and radiated heat from land, heats the air above it. During the night, since the water cools down slower than the land and the air above water will be warmer than the air above land.
7. The mechanism of pedogenesis:
  - **The Sun**: The Sun heats up rocks during the day so that they expand. At night, these rocks cool down and contract. Since all parts of the rock do not expand and contract at the same rate, this results in the formation of cracks and ultimately the huge rocks break up into smaller pieces.
  - **Water**: Water helps in the formation of soil in two ways. One, water could get into the cracks in the rocks formed due to uneven heating by the Sun. If this water later freezes, it would cause the cracks to widen. Can you think why this should be so? Two, flowing water wears away even hard rock over long periods of time. Fast flowing water often carries big and small particles of rock downstream. These rocks rub against other rocks and the resultant abrasion causes the rocks to

wear down into smaller and smaller particles. The water then takes these particles along with it and deposits it further down its path. Soil is thus found in places far away from its parent-rock.

- **Wind:** In a process similar to the way in which water rubs against rocks and wears them down, strong winds also erode rocks down. The wind also carries sand from one place to the other like water does.
  - Living organisms also influence the formation of soil. The lichen that we read about earlier, also grows on the surface of rocks. While growing, they release certain substances that cause the rock surface to powder down and form a thin layer of soil. Other small plants like moss, are able to grow on this surface now and they cause the rock to break up further. The roots of big trees sometimes go into cracks in the rocks and as the roots grow bigger, the crack is forced bigger.
8. (a) Carbonates, coal, limewater. etc.  
 (b) Respiration  
 (c) Various human activities including respiration release carbon dioxide in the atmosphere, thereby increasing its levels.

### QVIII. Long Answer Questions:

1. (a) (i) Ocean water - 97.2% (ii) Glaciers and other ice - 2.15%  
 (iii) Ground water - 0.61% (iv) Fresh water lakes - 0.009%  
 (v) Inland seas - 0.008% (vi) Soil moisture - 0.005%  
 (b) (vii) Atmosphere - 0.001% (viii) Rivers - 0.0001%



2. (a) Ozone layer is found in atmosphere in the stratosphere layer.  
 (b) Ozone hole is an area of the ozone layer that is seasonally depleted of ozone. The depletion is caused by the destruction of ozone by CFCs and by other compounds.  
 (c) Ozone hole is located in the Ozone layer at the stratosphere of earth's atmosphere.  
 (d) Ozone  $\rightarrow$   $O_3$
3. This happens in the following ways:  
 (i) Animals take in  $O_2$  through the process of respiration. And release  $CO_2$  into the atmosphere.  
 (ii)  $CO_2$ , released by animals is used in plants in the process of photosynthesis.  
 (iii) Plant release  $O_2$  into the atmosphere as a by-product of photosynthesis  
 (iv) Fuels need oxygen for combustion so they take oxygen and release  $CO_2$  into the atmosphere as a by product along with other gases like  $N_2$  etc.  
 (v)  $CO_2$  is released into air in the process of decaying of dead animals and plants.  
 (vi) This  $CO_2$  is taken by plants for the process of photosynthesis and  $O_2$  is released, and this process continues.

# Chapter 15 IMPROVEMENT IN FOOD RESOURCES

## WORKSHEET 1

### QI. Multiple Choice Questions:

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

### QII. Match the followings:

Column A	Column B
1. Kharif	(a) Rice
2. Rabi	(b) Wheat
3. Tilling	(c) Ploughing
4. Fertilizer	(d) Urea
5. Weed	(e) Amaranthus

### QIII. Give one word for the following statements:

- Mixed Cropping
- Intercropping
- Organic Farming
- Fungicide
- Irrigation

- QIV. 1. *Kharif* crops - Green gram , Rice  
 2. *Rabi* crops - Peas , Mustard  
 3. Indian breeds of cows - Sahiwal , Gir  
 4. Pests - Rodents , Weeds  
 5. Fertilizers - Nitrogen , Phosphorus  
 6. Weeds - Bull thistle , Garlic  
 7. Macronutrients - Lipids , Proteins  
 8. Micronutrients - Calcium , Iron

### QV. 1. Composting and Vermicomposting

Composting	Vermicomposting
The compost is obtained by decomposition of organic waste like animal excreta, plant waste, etc. naturally due to decomposition by bacteria.	To hasten the process of decomposition earthworms are added to this organic matter to obtain compost.

### 2. Layer and broiler

Layer	Broiler
a. The egg-laying poultry bird is called layer. The ration for broilers is protein-rich with adequate fat.	a. The poultry bird groomed for obtaining meat is called broiler.
b. The levels of vitamins A and K is kept high in the poultry feeds.	b. While broilers require protein rich diet or ration with adequate fat.

### 3. Apiculture and Sericulture

Apiculture	Sericulture
It is technique of growing or keeping bees in hives on large scale for the purpose of extraction of honey and wax.	It is the rearing of the silkworms to obtain silk. During a stage of its life cycle, the silkworm weaves a cocoon around itself and silk is obtained from the cocoon.

### 4. Intercropping and Crop rotation

Intercropping	Crop Rotation
It involves growing two or more crops simultaneously on the same field in definite proportion or pattern.	The growing of different crops on a piece of land in a pre-planned succession is known as crop rotation.
e.g. - soyabean + maize, etc	e.g. - corn, mixed grass, etc.

### QVI. Very Short Answer Questions:

- Red sindhi and sahiwal
- '*Apis Cerana Indica*' and '*Apis dorsata*'
- It slows runoff velocity and promotes infiltration.
- Smallpox and cattle plague
- FCI and CWC
- (18-25)%
- (a) Nature of crop plants  
(b) Nature of soil of the crop fields
- Rice is a crop that can tolerate water logging in the field while examples of crops that cannot tolerate water logging are wheat and cotton
- Hybridization is the process of interbreeding between individuals of different species or genetically divergent individuals from the same species.  
Its types are:  
(a) Single cross hybrids  
(b) Double cross hybrids  
(c) Triple cross hybrids  
(d) Population hybrids
- Animal husbandry provides livestock production. It is an integral part of crop farming and contributes significantly to household nutritional security.
- Fibres or roughage.
- Manures and compost.

### QVII. Short Answer Questions:

- (a) Photoperiod is the physiological reaction of organisms to the length of day or night. It occurs in plants and animals. Photoperiod in agriculture provides adequate light for flowering.  
(b) It is the farming in which no chemical fertilizers, pesticides or herbicides are used. But uses all organic matter for its growth like manure, neem leaves as pesticides and for grain storage.
- The main elements of animal husbandry are :  
(a) Proper feeding of animals  
(b) Providing freshwater to animals  
(c) Providing safe and hygienic shelter to animals  
(d) Proper breeding in animals

3. (a) Composite fish culture is a system in which five or six different species of fishes are grown together in a single fish pond. Fishes with different food habitats are chosen so that they don't compete for food among themselves.  
 (b) Catla, rohu, mrigals, etc.  
 (c) Catla : Surface feeders  
 Rohu : Feed in the middle - zone  
 Mrigals : Bottom feeders
4. (a) **Irrigation:** The process of supplying water to crop plants through human efforts by means of canal, wells, reservoirs, tube-wells, etc.  
 (b) It is essential, because it maintains moisture in the soil, for the growth of the roots of the crop plants, etc.  
 (c) Three effects of excessive irrigation are:
  - (i) Increase in saline and alkaline elements in soil or increase in salinity.
  - (ii) Shallowness of roots
  - (iii) More nitrate formation.
  - (iv) Reduction in temperature of roots.
5. (a) Advantages of crop rotation are:
  - (i) It prevents soil depletion.
  - (ii) Increases soil fertility.
  - (iii) Reduces soil erosion.
 (b) The three main criteria, while selecting the crops for rotation are:
  - (i) Soil and type of crop depending on duration
  - (ii) Livestock on the farm
  - (iii) Occurrence of pests and diseases
6. The factors responsible for losses of grains during storage are:
  - (a) Abiotic factors like moisture, humidity and temperature.
  - (b) Biotic factors like insects, rodents, birds, mites, bacteria and fungi.
 The various measures for safe storage of grain are:
  - (a) Be sure that there is no moisture where you are storing grain.
  - (b) Be sure that the place is free from pesticides, insecticides, etc.
7. (a) The characteristic symptoms of anthrax :  
 Flu-like symptoms, such as sore throat, mild fever, fatigue and muscle aches, which may last a few hours or days.  
 (b) The symptoms of foot and mouth disease are:  
 Fever, sore throat and sometimes a poor appetite and malaise.
8. They should practice drip irrigation, sprinkler system of irrigation and rainwater harvesting.

### QVIII. Long Answer Questions:

- I. (a) Manure and fertilizer

Manure	Fertilizer
a. Increases soil fertility by enriching the soil with organic matter and nutrients as it is prepared by the decomposition of animal excreta and plant wastes.	a. Mostly inorganic compounds which provide specific nutrients like nitrogen, phosphorus and potassium.
b. Improves soil fertility. Do not lead to pollution.	b. Excessive use may destroy soil fertility and pollution.
c. e.g. - manure waste, yard compost, etc.	c. e.g. - synthetic chemicals, nutrients etc.

- (b) Advantages of using fertilizers are:
- (i) It increases crop yield and improves poor quality land.
  - (ii) Manure improves soil texture, recycles nitrogen and introduces essential bacteria.
  - (iii) Pasture is improved so animals fatten up quicker.
- Disadvantages of using fertilizers are:
- (i) Crops grow better, but so do weeds. Therefore, herbicide sprays are required too.
  - (ii) Better quality plants attract insects so pesticides may be needed.
  - (iii) Excess nitrogen from fertilizers gets into water supply, causing fish to die.
2. (a) Well irrigation is common in alluvial plains of the country.
  - (b) Canals are second most important source of irrigation in India after wells and tube wells. The canals are irrigating those lands which have large plains, fertile soils and perennial rivers.
  - (c) Tank irrigation is more in the rocky plateau area of the country, where the rainfall is uneven and highly seasonal.
  3. (a) To kill the harmful pests and insects that can damage the crops.
  - (b) Fungicides, herbicides, and insecticides. Examples of specific synthetic chemical pesticides are glyphosate, Acephate, Deet, Propoxur, Metaldehyde, Boric Acid, Diazinon, Dursban, DDT, Malathion, etc.

## WORKSHEET 2

### QI. Multiple Choice Questions:

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

### QII. Fill in the blanks using the suitable words given in brackets:

1. fishes
2. nitrogenous
3. kharif
4. selection
5. second

### QIII. State whether the following statements are true or false:

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

### QIV.

S.No.	Disease	Causative organism	Animal affected	Symptoms
1.	Ranikhet	Virus	Poultry	Coughing, muscular tremors, depression
2.	Anthrax	Bacteria	Cattle	Fever, chills, headache
3.	Tuberculosis	Bacteria	Human	Infection of lungs
4.	Fowl typhoid	Bacteria	Poultry	Anorexia, weakness, diarrhoea
5.	Rabies	Virus	Dogs	Fever, headache

**QV. Match the followings:**

<b>Column A</b>	<b>Column B</b>
1. Spices	(a) Chilly, Black Pepper
2. Oil seeds crops	(b) Groundnut, mustard
3. Fodder crops	(c) Oats, Sudan Grass
4. Cereal crops	(d) Rice, Wheat, Maize
5. Pulses	(e) Pea, Gram, Pea

**QVI. Very Short Answer Questions:**

1. Aseel, Ghagns, Chattisgarh and Bursa.
2. 12 months
3. Apiculture is the maintenance and rearing of bee-colonies to obtain honey and bee wax.
4. Honey and wax.
5. Mixed cropping, inter-cropping and crop rotation.
6. Compost and Green manure
7. *Manganese, Zinc, Nitrogen, Phosphorus*
8. Protein - Beans, Spirulina and lentils  
Fats - Avocados, Olive oil, Sesame  
Carbohydrates - Sweet potatoes, Brown rice, Oatmeal.
9. He should select disease resistant variety with higher production.
10. Mulching the soil with weeds and using manure.
11. He should grow good variety of flowers for nectar collection by bees.
12. He should ensure proper sunlight and ventilation along with cleanliness in the shelter.

**QVII. Short Answer Questions:**

1. Useful effects of Green Revolution :  
(a) Rapid increase in wheat and rice.  
(b) Expanded use of fertilizers has had a dramatic impact on income and food supply.  
Harmful effects:  
(a) Increased pollution and soil erosion.  
(b) More pressure on water systems.
2. Feeding animals well increases their overall growth and health. Dairy animals require a balanced diet for milk production, body maintenance and good health.
3. (a) Different parameters are used to check the success of artificial insemination in animal. By regular insemination of semen after collection and frequent checking on fertility.  
(b) (i) There is no need of maintenance of breeding bull for a herd.  
(ii) It prevents the spread of certain diseases and sterility.
4. (a) Broilers are chickens raised to produce meat and layers are raised to give eggs. They are kept in free run barns while layers are kept in bars.  
(b) A broiler chicken will eat about one kg of food every day.
5. (a) Unfertilized eggs of honeybee grows into a drone bee and fertilized eggs will hatch into female worker bees.  
(b) Swarming benefit the bee colony by increasing space within a hive and expanding the range of these pollinators.
6. (a) Mixed cropping is the practice of growing two or more crops together on the same piece of land in one crop season.

- (b) Crops are selected carefully so that they do not compete with each other for light, nutrients and water. Seeds should be sown at approximate distance.
- (c) Advantages of mixed cropping:
- It acts as an insurance against the possible total crop failure in poor rainfall areas.
  - It saves time and labour of farmer.
7. Capture fisheries refers to all kinds of harvesting of naturally occurring living resources in both marine and freshwater environments.
- Inland fisheries are the commercial fishing operations taking place in freshwater.
- Aquaculture is the farming of fish, and other aquatic animals.
8. Maintenance of temperature is needed for better egg production by poultry birds. Therefore, larger size (increase in surface area of body) and no adaptability of summer may cause decline in egg production. To obtain the smaller size and higher summer adaptability, cross breeding of poultry birds are done. Small size is also needed for better housing and low feed.

### QVIII. Long Answer questions:

- The process of farming of animal and keeping it as a pet or in any other form is called domestication.
  - Horse and sheep.
  - Milk and cheese.
  - Improving the animals cooling process through proper water, shedding and ventilation. Increasing the milking frequency during a 24-hour period.
  - The two types of animal feed are:
    - Roughage:** These are rich in fibre; e.g., cowpea, berseem, etc.
    - Concentrates:** These are nutrient-rich and low on fibres; e.g., oats, maize, etc.
- Apis mellifera*
  - These species are used to produce honey at commercial level.
  - For best results in honey production, first suitable location for keeping beehives should be selected, proper management of beehives during season needs to be done. Do not add more bees to another area that is about to spread. This retains good bees and raise queens from best colonies.
- With addition of chemical fertilizers there is sudden increase in yield due to release of nutrients N, P, K, etc. in high quantity which are absorbed by the roots quickly. The gradual decline in the graph may be due to continuous use and high quantity of chemicals which kill microbes useful for replenishing the organic matter in the soil. This decreases the soil fertility.
  - Because manures work slower than chemical fertilisers.
  - The use of natural and chemical amendments is the cause.
  - Vermicompost:** It is the compost prepared in the farm by the use of farm waste and earthworms.
    - Green manure:** It is the manure made up of only organic kitchen and farm waste.
    - Biofertiliser:** Biofertilizers are substances that contain microorganisms, which when added to the soil increase its fertility and promotes plant growth.