ADDITIONAL® PRACTICE

SCIENCE 10

Updated Answer Key

DNA education

New Delhi- 110002

Chapter 01 Chemical Reactions and Equations

WORKSHEET - 1

Introduction to Chemical Reactions

Q A. Multiple Choice Questions:

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

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

1. products 2. ferric oxide 3. reactants
4. precipitate 5. hydrogen

Q C. Balance and rewrite the following equations:

1. $2NH_3 + 3CuO \longrightarrow 3Cu + N_2 + 3H_2O$
2. $Al_2(SO_4)_3 + 6NaOH \longrightarrow 2Al(OH)_3 + 3Na_2SO_4$
3. $4Fe + 3O_2 \longrightarrow 2Fe_2O_3$
4. $2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$
5. $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$

Q D. Complete the following table:

Aspect of Equation	Symbol
Precipitate	↓
Gas	(g)
Aqueous solution	(aq)
Liquid	(l)
Solid	(s)

Q E. Very Short Answer Questions:

1. Hydrogen gas
2. Magnesium oxide
3. A chemical reaction is a chemical change which forms new substances.
4. Balancing of a chemical equation is entirely based on law of conservation of mass.
5. Aqueous state of a compound refers to a solution where the solvent is water.

Q F. Short Answer Questions (Type I):

1. (a) Precipitate formation
   (b) Evolution of gas
2. Two characteristics of this reaction are:
   (i) Hydrogen gas is evolved.
   (ii) It is an exothermic reaction.
3. (a) Reaction of iron with copper sulphate:
   $Fe + \underset{\text{(Blue)}}{CuSO_4} \longrightarrow \underset{\text{(Green)}}{FeSO_4} + Cu$
   (b) Reaction of quick lime with water:
   $CaO + H_2O \longrightarrow Ca(OH)_2 + \text{Heat}$

Q G. Short Answer Questions (Type II):

1. (a) $BaCl_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(s) + 2NaCl(aq)$
   (b) $3Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2(g)$
2. (a) Large amount of heat is released.
   (b) The gas evolved (CO_2) turns lime water milky.
   (c) The solution will change colour from purple to colourless.
3. $6CO_2(aq) + 12H_2O(l) \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \underset{\text{(Glucose)}}{C_6H_{12}O_6(aq)} + 6O_2(aq) + 6H_2O(l)$

Q H. Long Answer Questions:

1. To make a chemical equation more informative, the physical states of the reactants and products are mentioned along with their chemical formulae. The gaseous, liquid, aqueous and solid states of reactants and products are represented by the notations (g), (l), (aq) and (s), respectively. The word aqueous (aq) is written if the reactant or product is present as a solution in water. Sometimes the reaction conditions, such as temperature, pressure, catalyst, etc. are also specified in chemical equation.
2. Different steps of balancing a chemical equation are:

   Step I: To balance a chemical equation, first draw boxes around each formula. Do not change anything inside the boxes while balancing the equation.

   Step II: List the number of atoms of different elements present in the unbalanced equation.

   Step III: It is often convenient to start balancing with the compound that contains the maximum number of atoms. It may be a reactant or a product. In that compound, select the element which has the maximum number of atoms. To equalise the number of atoms, it must be remembered that we cannot alter the formulae of the compounds or elements involved in the reactions.

   Step IV: Finally, to check the correctness of the balanced equation, we count atoms of each element on both sides of the equation.

   Step V: To make a chemical equation more informative, the physical states of the reactants and products are mentioned along with their chemical formulae.

WORKSHEET - 2

Types of Chemical Reactions

Q A. Multiple Choice Questions:

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

Q B. Give one word for the following:

1. Decomposition reaction 2. Catalyst 3. Magnesium
4. Rancidification 5. Slaked lime

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

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

Q D. Fill in the boxes to complete the given equations:

1. CO_2 2. Fe_2O_3 3. O_2
4. Mg 5. AgCl

Q E. Very Short Answer Questions:

1. Decomposition reaction
2. Example of displacement reaction: when iron is added to a copper sulphate solution, it displaces the copper metal.
3. White precipitate of barium sulphate is formed.
4. $2\ H_2O(l) \longrightarrow 2\ H_2(g) + O_2(g)$
5. A type of chemical reaction in which two different atoms or groups of atoms (ions) are exchanged is called a double displacement reaction.

Q F. Short Answer Questions (Type I):

1. A chemical reaction in which a more reactive element is displaced by the less reactive element from its compound is called a displacement reaction.

Example:

When the iron is added to a copper sulphate solution, it displaces the copper metal from copper sulphate solution to form iron sulphate and copper.

$Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$

2. (a) It turns lime water milky.

$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$

(b) With continuous passage of CO_2, the milkiness disappears.

$CaCO_3 + CO_2 + 2H_2O \longrightarrow Ca(HCO_3)_2 + H_2O$

3. Respiration is considered as an exothermic reaction because in respiration oxidation of glucose takes place which produces large amount of heat energy.

Q G. Short Answer Questions (Type II):

1. (a) Combination reaction

(b) Decomposition reaction

(c) Decomposition reaction

2. The reaction in which two or more reactants combine to form a single product is called a combination reaction.

(a) $CaO + H_2O \longrightarrow Ca(OH)_2$ + Heat

(b) $N_2 + O_2 \xrightarrow{\Delta} 2NO$

3. When lead nitrate is heated, it breaks down into lead monoxide, nitrogen dioxide, and oxygen gases.

$2Pb(NO_3)_2(s) \longrightarrow 2PbO(s)+4NO_2(g) +O_2(g)$

Q H. Long Answer Questions:

1. In a displacement reaction, a more reactive metal displaces a less reactive metal from its salt solution.

E.g., $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$

In a double displacement reaction, the ions of both the metals are exchanged.

E.g., $BaCl_2 + Na_2SO_4 \longrightarrow BaSO_4 + 2NaCl$

2. This is because in decomposition reaction, a single reactant breaks down to form two or more products while in a combination reaction, two or more reactants combine to form a single product.

$2H_2 + O_2 \longrightarrow 2H_2O$ (Combination reaction)

$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$ (Decomposition reaction)

WORKSHEET - 3

Redox Reactions and their Effects in Daily Life

Q A. Multiple Choice Questions:

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

Q B. Match the following:

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

Q C. Define the following terms:

1. The addition of oxygen or removal of hydrogen is called oxidation.
2. The removal of oxygen or addition of hydrogen is called reduction.
3. An exothermic reaction in which a substance reacts with oxygen is called combustion.
4. The process by which a metal is attacked by substances like moisture, acids, etc., is called corrosion.
5. Rancidity refers to the spoilage of food in such a way that it becomes undesirable for consumption.

Q D. Give reasons for the following:

1. Rusting of iron
2. Bags of chips are flushed with nitrogen gas to prevent the chips from oxidizing.
3. Because of the process called surface oxidation.
4. When Zinc oxide reacts with carbon, it gives zinc and carbon monoxide.

Here, ZnO $\longrightarrow$ Reduced to Zn (Because it loses oxygen)

C $\longrightarrow$ Oxidised to CO (Because it gains oxygen)

Here, zinc oxide is reduced to zinc; as it loses oxygen and carbon is oxidized to carbon monoxide; as it gains oxygen. Thus, here oxidation and reduction both take place simultaneously. Hence, this is an Oxidation-Reduction Reaction or Redox Reaction.

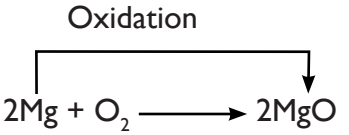
5. Fat containing food gets oxidized slowly by the process of rancidity.

Q E. Very Short Answer Questions:

1. Respiration
2. A reducing agent is a chemical species that "donates" an electron to an electron recipient.
3. An oxidizing agent is a substance in a redox chemical reaction that gains or "accepts"/"receives" an electron from a reducing agent.
4. Black coating on silver and the green coating on copper are formed due to corrosion.
5. Vitamin E

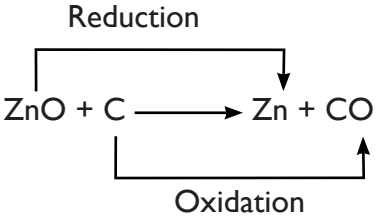
Q F. Short Answer Type Questions (Type I):

1. Anti-oxidants are substances which prevent or slow down the process of oxidation. They are added to fatty and oily food to prevent rancidity.
2. (a) H_2O_2 (b) PbS
3. Magnesium is being oxidised to MgO.



Q G. Short Answer Type Questions (Type II):

1. A reaction in which one reactant is oxidised while the other is reduced is called a redox reaction.



2 When a metal is attacked by substances around it such as moisture, acids, etc., it is said to corrode and this process is called corrosion. The black coating on silver and the green coating on copper are some examples of it.

$4Fe + 3O_2 + 6H_2O \longrightarrow 4Fe(OH)_3$

3. (i) Substances which prevent oxidation (antioxidants) are added to foods containing fats and oil.

   (ii) Keeping food in air tight containers helps to slow down oxidation.

Q H. Long Answer Questions:

1. (a) The reddish brown colour of Cu metal is restored with release of water.

   (b) $CuO + H_2 \longrightarrow Cu + H_2O$

   (Black) (Reddish-brown)

   (c) Redox reaction

2.

Category	Reactions				
	a	b	c	d	e
Substance oxidised	Ca	CO	S	Al	HCl
Substance reduced	Cl_2	Fe_2O_3	Fe	MnO_2	MnO_2
Oxidising agent	Cl_2	Fe_2O_3	Fe	MnO_2	MnO_2
Reducing agent	Ca	CO	S	Al	HCl

WORKSHEET - 4

Based on Complete Chapter

Q A. Multiple Choice Questions:

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

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

1. Oxidising agent 2. Reducing agent 3. Cupric oxide 4. Corrosion 5. Rancid

Q C. Differentiate between the following:

1. Substances taking part in a reaction are called reactants while the substances formed during a reaction are called products.
2. The reactions in which energy is released are called exothermic reactions while those in which energy is absorbed are called endothermic reactions.
3. Two or more reactants combine to form a single product in a combination reaction while a single reactant breaks into two or more products in a decomposition reaction.

Q D. Name the type of reaction represented by the following equations:

1. Decomposition 2. Combination 3. Double displacement
4. Oxidation 5. Displacement

Q E. Very Short Answer Questions:

1. $2\,H_2O(l) \xrightarrow{\text{electricity}} 2\,H_2(g) + O_2(g)$
2. To remove magnesium oxide formed over the surface of magnesium.
3. Light green
4. Iron is more reactive than copper. Hence, Cu will not displace iron from iron sulphate, hence, no reaction will take place.
5. The decomposition of ozone to oxygen in the atmosphere is an example of photolytic decomposition reaction.
6. Slaked lime is not very white. When applied on the wall, CO_2 gas present in air reacts with calcium hydroxide to form calcium carbonate. It is quite white and therefore, imparts white look to the wall.
7. Copper

Q F. Short Answer Questions (Type I):

1. $2KI + Pb(NO_3)_2 \longrightarrow 2KNO_3 + PbI_2$
   (i) Yellow precipitate of PbI_2 is formed.

(ii) A double displacement reaction takes place.

2. Quick lime and water combine chemically to form slaked lime and release heat.

$CaO + H_2O \longrightarrow Ca(OH)_2$

3. To cut off the direct contact of metal with oxygen and moisture in air and thereby prevents corrosion.
4. Because on heating, the water of crystallisation is removed.

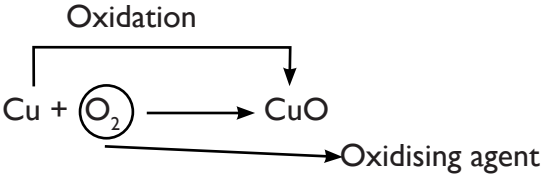
$CuSO_4.7H_2O \xrightarrow{\Delta} CuSO_4 + 7H_2O$

(Blue) (White)

5. Aluminium reacts with air to form a thin coating of Al_2O_3 which prevents further reactivity of aluminium. Hence, it protects the food from spoilage.

Q G. Short Answer Questions (Type II):

1. In a redox reaction, an oxidising agent oxidises another substance, while getting reduced itself. Hence, oxidising agent brings about oxidation in a reaction.



2. (a) The unbalanced chemical equation in which the total mass of reactants is not equal to that of products is called a skeletal type chemical equation.

(b) It simply represents the reacting species taking part in the reaction and the products formed.

3. In a balanced chemical equation, the number of moles of the reacting species is indicated such that the total mass of reactants is equal to that of the products. On the other hand, in an unbalanced equation, the number of moles of the reacting species is indicated such that the total mass of reactants is not equal to that of the products.

Examples: Balanced equation: $2H_2 + O_2 \longrightarrow 2H_2O$

Unbalanced equation: $H_2 + O_2 \longrightarrow H_2O$

4. (a) Cathode – Hydrogen

Anode – Oxygen

(b) This is because in a water molecule (H_2O), hydrogen and oxygen are present in a ratio of 2:1. Hence, hydrogen collected is double of oxygen.

(c) Bring a burning candle near cathode and hydrogen burns with a pop sound. Also, when a burning splinter is brought near oxygen carrying anode, it burns brilliantly and then goes off.

5. When chlorine (as a gas or dissolved in water) is added to sodium bromide solution, the chlorine takes the place of the bromine. Because chlorine is more reactive than bromine, it displaces bromine from sodium bromide. The solution turns brown. This brown colour is the displaced bromine. The chlorine has gone to form sodium chloride. In this equation, the Cl and Br have swapped places:

chlorine + sodium bromide $\longrightarrow$ sodium chloride + bromine

$Cl_2(aq) + 2NaBr(aq) \longrightarrow 2NaCl(aq) + Br_2(aq)$

This type of reaction happens with all the halogens. A more reactive halogen displaces a less reactive halogen from a solution of one of its salts.

Q H. Long Answer Questions:

1. (a) During electrolysis of water in liquid state, hydrogen gas and oxygen gas are evolved.

$2\ H_2O(l) \xrightarrow{\text{electricity}} 2\ H_2(g) + O_2(g)$

(b) When quick lime (CaO) is added to water, a large amount of heat is released and the reaction mixture turns hot.

$CaO + H_2O \longrightarrow Ca(OH)_2$

2. (a) $CuSO_4$ (Copper sulphate)
   (b) Blue
   (c) Copper sulphite (CuS) + Heat
   (d) $CuSO_4(aq) + H_2S(g) \longrightarrow CuS(s) + H_2SO_4$ (aq)
   (e) Redox reaction takes place. $CuSO_4$ is reduced to CuS and H_2O is oxidised to H_2SO_4.

Q I. Assertion-Reason Questions:

1. (d) 2. (c) 3. (c)

Q J. Case-based Questions:

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

Chapter

02 Acids, Bases and Salts

WORKSHEET - 1

Acids and their Properties

Q A. Multiple Choice Questions:

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

Q B. Match the following:

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

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

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

Q D. Complete the following table:

Source	Acid present
Vinegar	Acetic acid
Tamarind	Tartaric acid
Curd	Lactic acid
Tomato	Oxalic acid
Orange	Citric acid

Q D. Very Short Answer Questions:

1. Litmus and turmeric
2. Methanoic acid (formic acid)
3. Hydronium is the common name for the aqueous cation H_3O^+.
4. When pH of rain water is less than 5.6, it is called acid rain.
5. Tooth decay starts when the pH of the mouth is lower than 5.5.

Q F. Short Answer Questions (Type I):

1. Yes, acidic solutions also contain OH^- ions. However, the concentration of H^+ ions is more than OH^- ions in acidic solutions because of which their pH turns acidic.
2. Strong acids: HCl, H_2SO_4
   Weak acids: CH_3COOH, HF
3. (a) Sodium chloride
   (b) Zinc Sulphate

Q G. Short Answer Questions (Type II):

1. (a) Hydrogen gas
   (b) Burning of gas with pop sound
   (c) $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(s) + H_2(g)$
2. The substances which release H^+ ions in aqueous medium are called acids. Characteristics of acid are:
   (i) They have sour taste.
   (ii) They turn blue litmus red.
   (iii) They have pH less than 7.
   (iv) They are corrosive in nature.
3. Mixing of acid and water is an exothermic process. If water is added to acid, enormous amount of energy is released which may break the vessel and splash out the acid. This may cause burns to skin. Therefore, it is always safer to add acid to water, and not water to acid.

Q H. Long Answer Questions:

1. (a) An indicator is a substance which indicates the presence of an acid or a base by producing specific colour changes in the solution.
   (b) Litmus, phenolphthalein, methyl orange.
   (c) No colour change is there. It remains yellow.
2. (a) $2HCl + Na_2CO_3 \longrightarrow NaCl + CO_2 + H_2O$
   When HCl reacts with Na_2CO_3, NaCl and H_2O are formed and CO_2 is evolved.
   (b) CO_2 gas is released.
   (c) When carbon dioxide gas formed in the form of brisk effervescence is passed through lime water, it turns the lime water milky. If excess carbon dioxide gas is passed through the milky lime water, the solution becomes clear again. This confirms the presence of carbon dioxide gas.

WORKSHEET - 2

Bases and their Properties

Q A. Multiple Choice Questions:

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

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

1. Less than 6 2. Alkali 3. Bitter
4. Basic 5. Red, blue

Q C. Give one word for the following:

1. Neutralisation Reaction 2. Calamine solution 3. Hydroxide ions
4. Alkali 5. Antacid

Q D. Give reasons for the following:

1. Acid produced by bacteria dissolves the tooth enamel and teeth start to decay. Toothpastes that are basic in nature, neutralise the acid produced by bacteria.

2. Turmeric is a natural indicator containing tartaric acid which turns reddish-brown on reaction with base.

3. Plants can grow well only in an optimum pH range. Too much acidic or too much basic soil decreases plant growth.
4. The pH scale measures the H^+ and OH^- ion concentration. Solutions with pH less than 7 are acidic, hence have more H^+ ion concentration, while solutions with pH more than 7 are basic solutions having less H^+ ion concentration.
5. Because in alkaline soil, a bacterium-like organism, *Streptomyces scabies*, causes scab disease in potato crops.

Q E. Very Short Answer Questions:

1. pH determines the strength of a basic solution as it measures concentration of H^+ ions in solution.
2. Slightly basic
3. Bases turn red litmus paper into blue
4. Sodium hydroxide
5. Sodium hydroxide (base), as it reacts with zinc metal, gives hydrogen gas & sodium zincate.

$2NaOH + Zn \longrightarrow H_2 + Na_2ZnO_2$

Q F. Short Answer Questions (Type I):

1. When the soil has turned acidic, the farmer would treat it with quick lime or slaked lime.
2. (a) A, C, D (b) B, E, F
3. (a) 7
   (b) Green colour, because sugar is neutral in nature, and when dissolved in water, it does not ionise.

Q G. Short Answer Questions (Type II):

1. (a) An antacid releases base to react with excess acid in the stomach and neutralises the acid.
   (b) Baking powder and milk of magnesia.
2. (a) More the H^+ ion concentration, lower is the pH value, and higher is the acidic character.
   (b) More the OH^- ion concentration, higher is the pH value, and more basic is the nature of the solution.
   (c) The soap is basic.
3. Eating chocolates and sweets cause tooth decay because sugar in them remains struck to teeth and gets converted into acids by chemical reaction in presence of enzymes which leads removal of calcium from tooth. We can prevent it by brushing our teeth two times in a day with fluoride toothpaste.

Q H. Long Answer Questions:

1. (a) No. The statement is false. The correct statement is: Lesser the pH, stronger is the acid.
   (b) A pH of greater than 7 indicates a base.
   (c) Bases are used as antacids to relieve the problem of acidity.
   Bases are also used to treat acidic soil and restore its fertility.
2. (a) When bases react with non-metal oxides, they form metal salt and water.

$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

(Base) (Non-metal oxide) (Salt) (Water)

(b) Bases do not react with metallic oxides because they are basic in nature.

WORKSHEET - 3

Salts and their Properties

Q A. Multiple Choice Questions:

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

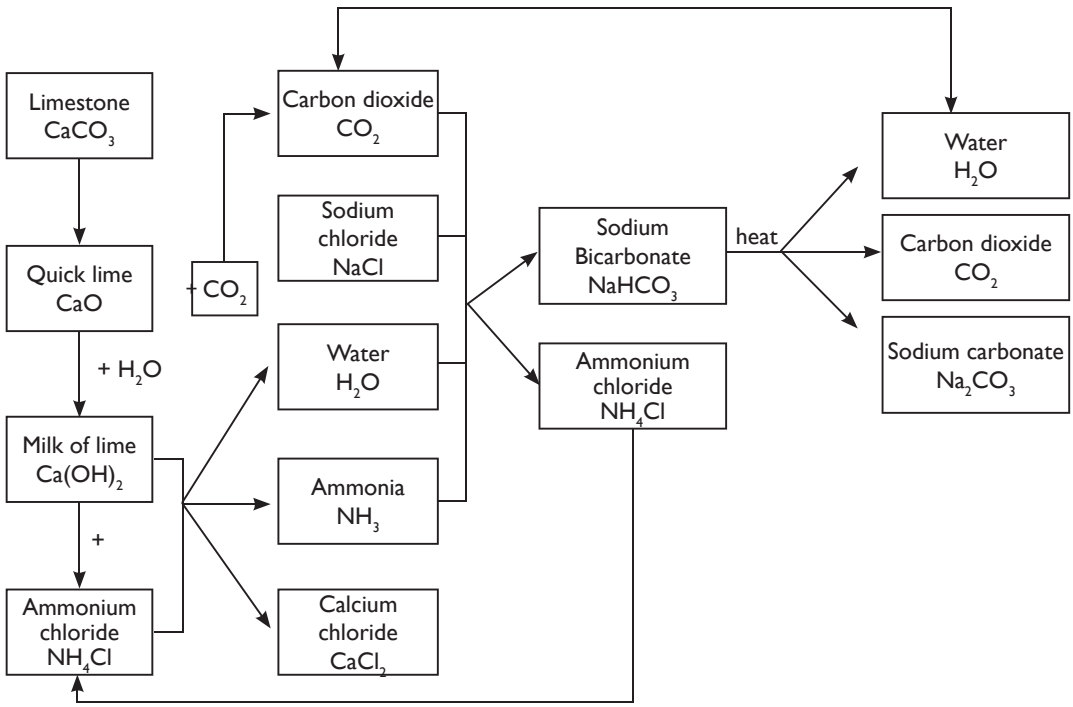
Q B. Define the following terms:

1. Salt is a chemical compound formed from the reaction of an acid with a base.
2. An aqueous solution of sodium chloride is called brine.
3. An agent which makes things white or colourless.
4. It refers to the water molecules forming an essential part of the crystal structure of some compounds.
5. It is the migration of a salt to the surface of a porous material, where it forms a coating.

Q C. Write the common names and the chemical formulae of the following:

1. Washing soda $Na_2CO_3.10H_2O$
2. Plaster of paris $CaSO_4.(^1/_2)H_2O$
3. Epsom salt $MgSO_4$
4. Green vitriol $FeSO_4.7H_2O$
5. Bleaching powder $CaOCl_2$

Q D. Complete the flowchart given below:



Q E. Very Short Answer Questions:

1. It maintains body fluid balance, helps the nerves transmit signals and also maintains blood pressure.
2. • It occurs in the form of mineral rocks on earth's crust.
   • It is found in dissolved form in oceans and seas.

3. The substance is an efflorescent substance.
4. Baking powder on heating produces carbon dioxide gas which causes bread or cake to rise making it soft and spongy.
5. The salts having the same positive ions are said to belong to a family of salt.

Q F. Short Answer Questions (Type I):

1. • It is a basic salt.
   • It has 10 molecules of water of crystallisation.
2. When bleaching powder dissolves in water, if forms HOCl and OCl^- ions. The chlorine kills pathogens by breaking the chemical bonds in their molecules.
3. Moist copper sulphate crystals are blue in colour while the dry ones are white.

Q G. Short Answer Questions (Type II):

1. (a) • Used in baking industry to make food fluffy and spongy.
   • Used as an antacid to treat acidity.
   (b) • Used in the field of medicine to fix fractures.
   • Used in whitewashing.
   (c) • It is used to remove permanent hardness of water.
   • It is used in the manufacture of glass, soap, paper.
2. (a) Gypsum is a soft sulphate mineral composed of calcium sulphate dihydrate. When gypsum is heated at 100°C, the water of crystallisation is evaporated, and it is converted into Plaster of Paris, i.e., calcium sulphate hemihydrate.
   $CaSO_4.2H_2O \xrightarrow{100°C} CaSO_4.½H_2O$
3. (a) Baking soda is $NaHCO_3$, while baking powder is a mixture of $NaHCO_3$ and a mild acid. Baking soda decomposes on heating to give Na_2CO_3, H_2O and CO_2, whereas baking powder decomposes into CO_2, H_2O and sodium salt of acid.
   (b) Saturating a solution of sodium carbonate with carbon dioxide produces sodium hydrogen carbonate (baking soda).
   $NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$ (baking soda)
   (c) $NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$

Q H. Long Answer Questions:

1. (a) When a concentrated solution of NaCl is electrolysed, it decomposes into sodium hydroxide, chlorine and hydrogen gas. It is called chlor-alkali process.
   $2NaCl(aq) + 2H_2O(l) \xrightarrow{electricity} 2NaOH(aq) + Cl_2(g) + H_2(g)$
   (b) This is because the products formed in this reaction are chlorine gas (chlor) and sodium hydroxide (alkali).
   (c) Sodium hydroxide, hydrogen gas and chlorine gas.
2. (a) The bulb will glow brightly in beaker B as KCl is a strong electrolyte. Bulb will glow with dim light in beaker C as acetic acid is a weak electrolyte. But, the bulb will not glow in beaker A as ethanol is a non-electrolyte.
   (b) If ethanol is replaced by NaOH solution, the bulb in beaker A will also glow brightly as NaOH is a strong electrolyte.

WORKSHEET - 4

Based on Complete Chapter

Q A. Multiple Choice Questions:

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

Q B. Differentiate between the following:

1. A hydrated salt contains water of crystallisation, whereas anhydrous salt is completely dry without any water of crystallisation.
2. Acids release H^+ ions in their aqueous solutions and have pH <7, while OH^- ions are released by bases and have pH >7.
3. Neutral salts are formed from a strong acid and a strong base, while acidic salts are made from a strong acid and a weak base.

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

1. 7 2. Water 3. indicators
4. Sodium hydrogencarbonate 5. Washing soda

Q D. Complete the following table:

Indicator	Colour in acids	Colour in bases
Universal indicator	Red	Purple
Red litmus	No effect	Blue
Blue litmus	Red	No effect
Phenolphthalein	Colourless	Pink
Methyl blue	Blue	Colourless

Q E. Very Short Answer Questions:

1. An acid ionises in its aqueous solution and releases H^+ ions. These ions are responsible for conduction of electricity.
2. The pH of milk increases and it turns lightly alkaline. This prevents the milk from getting spoiled easily.
3. Aqueous solution of washing soda is alkaline.

$$Na_2CO_3 + H_2O \longrightarrow \underset{\text{(alkaline)}}{2NaOH} + CO_2$$

4. Quick lime and wood ash.
5. Lemon juice < Blood < NaOH solution
6. In the absence of litmus and other indicator like methyl orange, phenolphthalein etc. can be used . Otherwise a natural indicator like turmeric can also be used.
7. In cakes and sweet baked goods production, tartaric acid is used as a fast-acting leavening acid.

Q F. Short Answer Questions (Type I):

1. (a) It will turn blue litmus red while no change on red litmus.

(b) A < C < B

2. (a) No action
   (b) It turns red litmus blue.
3. (a) When an acid is diluted with water, the concentration of hydronium ions (H_3O^+) decreases.
   (b) A dilute solution of HCl has more pH because it has lesser H^+ ion concentration.
4. (a) Salt is formed with evolution of carbon dioxide gas.

$$NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2$$

   (b) Hydrogen gas is evolved which burns with a pop sound.

$$2HCl + Zn \longrightarrow ZnCl_2 + H_2\uparrow$$

5. (a) Curds and other sour foods stuff (like lemon, juice, etc.) are acidic in nature. As acids react with metals to produce hydrogen gas, it spoils the food and forms some toxic metal compounds which poison the food.
   (b) By using pH indicator strips.

Q G. Short Answer Questions (Type II):

1. (a) Common salt is hygroscopic in nature and absorbs moisture. It hence becomes sticky in rainy season.
   (b) On heating, blue vitriol loses its water of crystallisation which turns it white.

$$\underset{\text{(Blue)}}{CuSO_4.7H_2O} \xrightarrow{\Delta} \underset{\text{(White)}}{CuSO_4} + 7H_2O$$

   (c) H_2SO_4 is highly hygroscopic in nature. It absorbs moisture from the atmosphere and its volume hence increases and it starts flowing out of the bottle.
2. (a) A pale green precipitate of $Fe(OH)_2$ is formed. This is a double displacement reaction.

$$2NH_4OH + FeSO_4 \longrightarrow Fe(OH)_2 + (NH_4)_2SO_4$$

   (b) Double displacement reaction occurs with formation of ammonium chloride and aluminium hydroxide.

$$3NH_4OH + AlCl_3 \longrightarrow 3NH_4Cl + Al(OH)_3$$

   (c) $NH_4OH\ (l) + HCl\ (aq) \longrightarrow NH_4Cl\ (aq) + H_2O\ (l)$
3.

Salt	Sodium Chloride	Ammonium Nitrate
Acid	HCl	HNO_2
Base	NaOH	NH_3
Nature	Neutral	Acidic

4. (a) When the seas bygone ages dried-up beds of rock salts were formed. Rock salts are deposits of solid salts. It is brown in colour due to impurities present in it.
   (b) Methanoic acid is injected into the skin. Therefore, baking soda is applied to soothe itching and neutralizing acid.
5. (a) Plaster of Paris

(b) $CaSO_4.2H_2O \xrightarrow[373\ K]{\Delta} CaSO_4.\frac{1}{2}H_2O$

(c) It is used to fix fractures of bones in hospitals.

Q H. Long Answer Questions:

1. (a) When electricity is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form sodium hydroxide. The process is called the chlor-alkali process because of the products formed– chlor for chlorine and alkali for sodium hydroxide.

$$2NaCl(aq) + 2H_2O(l) \longrightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$$

(b) Four uses of common salt:

- for flavoring
- for preserving food
- in tanning, dyeing and bleaching
- production of pottery, soap, and chlorine

2. In the manufacture of hydroxide, hydrogen gas and chlorine gas (X) are formed as by product. Chlorine gas reacts with lime water to give bleaching powder, a bleaching agent . Thus, X is chlorine gas (Cl_2 gas),

Two uses of bleaching powder:

- To bleach washed clothes in laundry.
- To disinfect drinking water and make it germ free.

Q I. Assertion- Reason Questions:

1. (d) 2. (b) 3. (d)

Q J. Case-based Questions:

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

Chapter

3 Metals and Non-metals

WORKSHEET - 1

Physical Properties of Metals and Non-Metals

Q A. Multiple Choice Questions:

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

Q B. Give one word for the following:

1. Lead 2. Aluminium 3. Mercury
4. Carbon 5. Metallic lustre

Q C. Match the following:

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

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

1. Malleability 2. Poor 3. allotropes
4. Caesium 5. Aluminium

Q E. Very Short Answer Questions:

1. Because metals are malleable and ductile.
2. Metals which produce deep sound are said to be sonorous.
3. Mercury and lead are two poor conductors of heat.
4. Malleability is a property of a material by which it can be beaten to form thin sheets.
5. To keep us from getting electric shocks.

Q F. Short Answer Questions (Type I):

1. Gold and silver.
2. (a) They are good conductors of heat.
   (b) They are highly ductile metals.
3. Non-metals are brittle.

   Non-metals are bad conductors of heat and electricity (except graphite).

Q G. Short Answer Questions (Type II):

1. (a) The property of a material by which it breaks easily without significant deformation is called brittleness.
   (b) Non-metals

(c) Phosphorus and iodine.

2. (i) Metals are lustrous, e.g., gold.
   (ii) Metals are ductile, e.g., copper.
   (iii) Metals are sonorous, e.g., aluminium.
3. Some metals react with atmospheric oxygen and form a dull coating of metal oxide which prevents further corrosion.

Q H. Long Answer Questions:

1. (a) When a piece of a metal is inserted in an electric circuit, the bulb glows which shows that metals conduct electricity.
   (b) Copper and aluminium
2. (i) Metals have lustre while non-metals lack lustre.
   (ii) Metals are generally hard while non-metals are soft and brittle.
   (iii) Metals are sonorous while non-metals are non-sonorous.
   (iv) Metals are generally solids at room temperature while non-metals are liquids or gases.

WORKSHEET - 2

Chemical Properties of Metals

Q A. Multiple Choice Questions:

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

Q B. Complete and balance the following equations:

1. $3Fe(s) + 4H_2O(g)$ (Red hot) $\longrightarrow Fe_3O_4(s) + 4H_2(g)$
2. $4Na(s) + O_2(g) \longrightarrow 2Na_2O(s)$
3. $Cu(NO_3)_2(aq) + Zn(s) \longrightarrow Zn(NO_3)_2 + Cu(s)$
4. $Na_2O(s) + H_2O(l) \longrightarrow 2NaOH(aq)$
5. $Al_2O_3 + 2NaOH \longrightarrow H_2O + 2NaAlO_2$

Q C. State whether the following statements are true or false.

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

Q D. Complete the given by putting a (✓) mark where reaction occurs and a (×) mark where reaction does not occur:

Metal	$MgSO_4$	$FeSO_4$	$ZnSO_4$	$CuSO_4$
Mg	×	✓	✓	✓
Fe	×	×	×	✓
Zn	×	✓	×	✓
Cu	×	×	×	×

Q E. Very Short Answer Questions:

1. Layer of Aluminium oxide or Alumina (Al_2O_3) is formed.
2. Amphoteric oxides

3. Magnesium
4. Aluminium
5. Anodising is a process of forming a thick oxide layer of aluminium.

Q F. Short Answer Questions (Type I):

1. (a) Copper is more reactive because copper can displace silver from its salt solution.
2. (a) $4Na(s) + O_2(g) \longrightarrow 2Na_2O$
   (b) $2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$
3. Cu will displace Ag from the solution. The copper strip develops holes and solution turns blue due to formation of copper nitrate.

Q G. Short Answer Questions (Type II):

1. (a) Aqua-regia is a freshly prepared mixture of conc. HCl and conc. HNO_3 in the ratio of 3:1.
   (b) Gold and platinum.
2. (a) Sodium hydride (NaH)
   (b) Hydrogen sulphide (H_2S)
   (c) Sodium hydroxide (NaOH)
3. (a) Because sodium is a very reactive metal which can react with oxygen in air and catch fire if exposed to air.
   (b) White phosphorus is very reactive and ignites at 30°C in moist air. So it is stored under water to prevent exposure to air.
   (c) No. Because sodium is hygroscopic in nature and will absorb water if kept immersed in it.

Q H. Long Answer Questions:

1. (a) Na_2O is a basic oxide. If forms NaOH when dissolved in water.
   $Na_2O(s) + H_2O(l) \longrightarrow 2NaOH(aq)$
   (b) SO_2 is an acidic oxide. It forms sulphurous acid when dissolved in water.
   $SO_2 + H_2O \longrightarrow H_2SO_3(aq)$
2. (a) $Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$ (Basic oxide)
   $Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$ (Acidic oxide)
   (b) Zinc forms amphoteric oxides.
   $ZnO + H_2SO_4 \longrightarrow ZnSO_4 + H_2O$ (Acid)
   $ZnO + 2NaOH + H_2O \longrightarrow Na_2[Zn(OH)_4]$ (Base)

WORKSHEET - 3

Occurrence and Extraction of Metals

Q A. Multiple Choice Questions:

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

Q B. Define the following terms:

1. Heating of metal sulphide ores in excess oxygen to convert them into oxides is called roasting.
2. Smelting is the process of obtaining metal from its ore in molten state by heating and melting.

3. The impurities like sand, mud, rocky substances etc. that are present in an ore are called gangue.
4. Flux, in metallurgy, is a chemical cleaning agent or purifying agent.
5. The process by which carbonate ores are heated strongly in limited oxygen and converted into oxides is called calcination.

Q C. Complete the following table:

S.No	Metal	Name of its Ore	Chemical Composition of Ore
1.	Aluminium (Al)	Bauxite, Cryolite	$Al_2O_3.2H_2O$, Na_3AlF_6
2.	Copper (Cu)	Copper pyrite, Copper glance	$CuFeS_2$, Cu_2S
3.	Tin (Sn)	Casseterite	SnO_2
4.	Iron (Fe)	Haematite, Magnetite	Fe_2O_3, Fe_3O_4
5.	Calcium (Ca)	Dolomite, Fluorspar	$CaCO_3$, $MgCO_3$, CaF_2

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

1. Thermite 2. Calcination 3. Bottom 4. Anode 5. Mercuric oxide

Q E. Very Short Answer Questions:

1. Cathode - Pure Copper
   Anode - Impure Copper
2. Electroplating with metals
3. Because Oxygen have very high electronegativity and it can form stable bonds with almost all the metals to form oxide.
4. $Fe_2O_3 + 2Al \longrightarrow 2Fe + Al_2O_3 + heat$
5. Electrolytic refining is a technique that is used for the extraction and purification of metals that are obtained by refining methods.

Q F. Short Answer Questions (Type I):

1. At anode: $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$
   At Cathode:- $Cu^{2+} + 2e^- \longrightarrow Cu(s)$
2. All ores are minerals, and metals can be extracted commercially. But all minerals are not ores because some of the minerals have unwanted substances.
3. Metals of low reactivity series are generally extracted by the process of roasting and calcination. Roasting is the extraction of metals by heating in presence of oxygen. While calcination is the heating of the ore without oxygen.

Q G. Short Answer Questions (Type II):

1. The ore of zinc other than zinc oxide (zincite) is zinc carbonate (calamine). It has the formula $ZnCO_3$. Calamine is converted into zinc oxide by calcination i.e., by heating strongly in the absence of air.
   $ZnCO_3(s) \xrightarrow{Heat} ZnO(s) + CO_2(g)$
2. The metals placed in the middle of activity series are moderately reactive and then often are present in nature are sulphides or carbonates. Iron, zinc, lead, copper, etc. are the examples of there metals. These metal sulphides are converted into metal oxides by heating strongly in the presence of excess air. This process is roasting. The carbonate ores are heated strongly in the presence of limited air and it is called calcination.

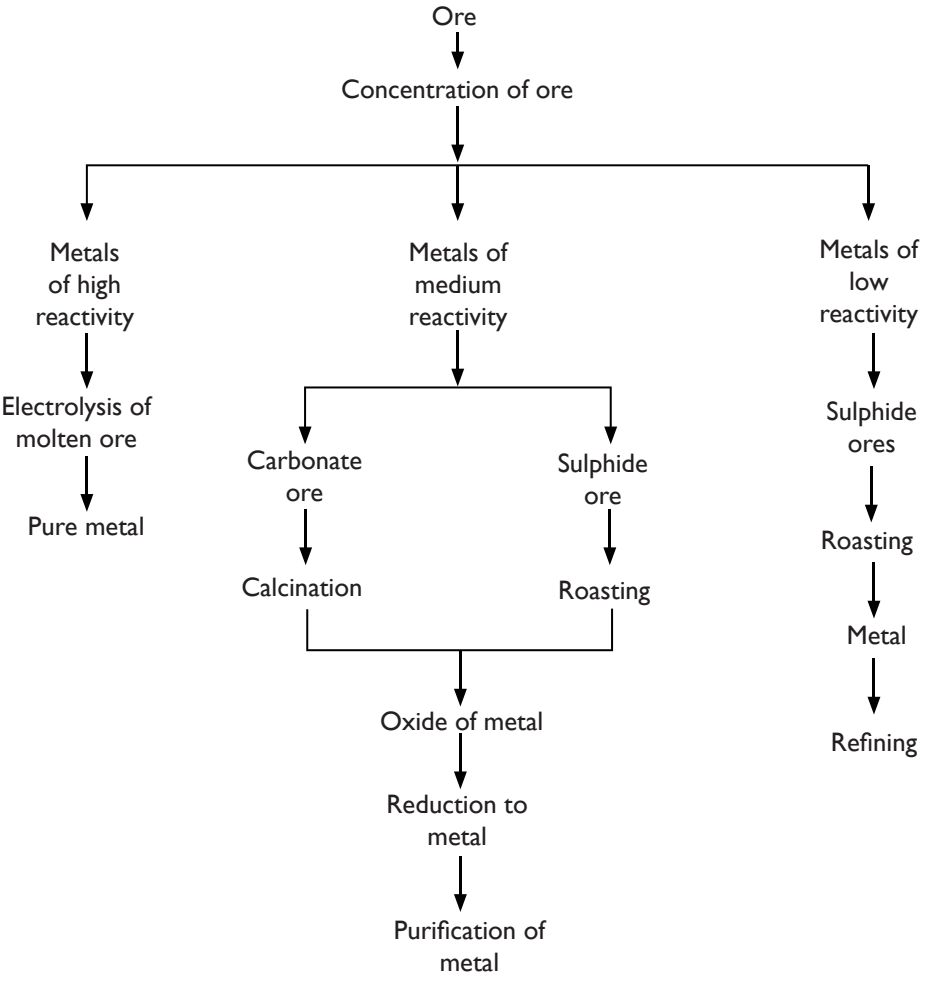
3. Cinnabar is the main ore of mercury. Cinnabar (HgS) is heated in air, converted to its oxide and then reduced to mercury.

$HgS + O_2 \xrightarrow{\Delta} HgO + SO_2$

$HgO \xrightarrow{\Delta} Hg + O_2$

Q H. Long Answer Questions:

1.



2. (a) (i) Electrolytic refining of copper
   (ii) X - Cathode and Y - Anode
   (iii) Impurities (anode mud)

   (b) When current is passed through the electrolyte, the impure metal from the anode is dissolved in the electrolyte and an equal amount of pure metal from the electrolyte is deposited on the cathode.

WORKSHEET - 4

Ionic Compounds and Corrosion of Metals

Q A. Multiple Choice Questions:

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

Q B. Complete the following table:

Element	Atomic Number	Electronic configuration			Metal/Non-metal
		K	L	M	
Carbon	6	2	4	–	Non-metal
Magnesium	12	2	8	2	Metal
Neon	10	2	8	–	Non-metal
Sodium	11	2	8	1	Metal
Aluminium	13	2	8	3	Metal

Q C. Differentiate between the following:

1. In galvanisation, zinc is coated over iron to prevent rusting. In tinning, tin is coated on iron. Zn is toxic while tin is non-toxic.
2. Brass in an alloy of copper and zinc. Bronze is an alloy of copper and tin mixed with Al, Mn or Si. Brass is yellowish, while bronze is reddish brown.
3. Painting is a method of preventing rusting where a layer of paint is applied on metal, while in greasing, grease or oil layer is applied on metal surface to cut-off contact with air.

Q D. Give reasons for the following statements:

1. Solder is used for welding electrical wires because it has less melting point.
2. Because of oxidation of silver to black silver oxide.
   $2Ag + O_2 \longrightarrow 2AgO$ (Black)
3. Iron reacts with moist air and rusts easily. Hence, it is never used in its pure form.
4. 1 carat gold is 1/24 part of pure gold. Hence, 24 karat gold is pure gold.
5. Aluminium acquires a coating of Al_2O_3 which prevents further corrosion of the metal.

Q E. Very Short Answer Questions:

1. In molten state, the electrostatic forces between ions are overcome by heat and ions can move freely. Hence, only molten state of ionic compounds conducts electricity.
2. The series which arranges metals in the decreasing order of reactivity is known as the reactivity series.
3. Mg > Al > Zn > Fe > Cu
4. Solid because of strong force of attraction between ions.
5. Galvanisation is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.

Q F. Short Answer Questions (Type I):

1. Pure water cannot conduct electricity. It is almost non-electrolyte.
2. The electrical conductivity and melting point of an alloy is less than that of pure metals. For example, brass, an alloy of copper and zinc (Cu and Zn), and bronze, an alloy of copper and tin (Cu and Sn), are not good conductors of electricity whereas copper is used for making electrical circuits.
3. (a) D < C < A < B

(b) No, because no metal was able to displace zinc from zinc sulphate solution.

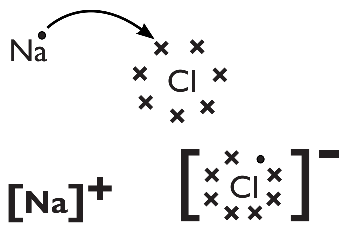
Q G. Short Answer Question (Type II):

1. (a) 1. Presence of oxygen. 2. Presence of moisture.
   (b) 1. Galvanisation 2. Painting
2. (a) An alloy is a mixture of two or more metals or a metal and a non-metal. It is made by mixing elements in molten state.
   (b) Iron and carbon.
3. (a) Titanium is called a strategic metal as it is used in producing aircrafts and missiles.
   (b) 1. It is resistant to acid corrosion.
   2. It is resistant to salt water corrosion.
   3. It is highly durable.

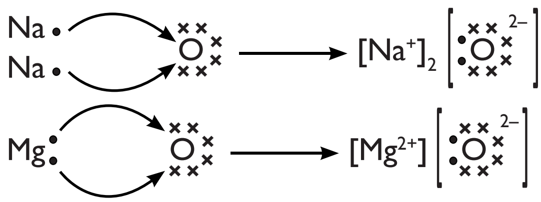
Q H. Long Answer Questions:

1. (a) 

   (b) Electrovalent bond
   Electron-dot structure of NaCl is given below



   (c) Because they form ionic compound (NaCl) held by strong electrostatic forces of attraction.

2 . (a) 

   (b) Na^+ and O^{2-}
   Mg^{2+} and O^{2-}

WORKSHEET - 5

Based on Complete Chapter

Q A. Multiple Choice Questions:

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

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

1. metalloids 2. rise 3. Roasting
4. Amalgam 5. Galvanisation

Q C. The pieces of metals given below were heated in air and the products obtained were dissolved in water. Complete the given table on the basis of the results of this activity.

Metal	Flame colour	Colour of product	Nature of product	Solubility in water
Al	White	White	Amphoteric	Insoluble
Cu	Blue-green	Black	Basic	Insoluble
Fe	Orange-brown	Reddish-brown	Basic	Insoluble
Na	Yellow	White	Basic	Soluble
Mg	White	White	Basic	Soluble

Q D. Give one word for the following:

1. Metallurgy 2. Calcination 3. Lustre 4. Slagging 5. Stainless steel

Q E. Very Short Answer Questions:

1. $3MnO_2 + 4Al \longrightarrow 3Mn + 2Al_2O_3 + heat$
2. The extraction of copper from copper pyrites is done by self-reduction.
   $Cu_2S + 2Cu_2O \longrightarrow 6Cu + SO_2$
3. Carbon
4. A mixture of copper carbonate and copper hydroxide.
5. Non-polar molecules will be soluble in non-polar solvents and insoluble in polar solvents. As sodium chloride is polar molecule it will be soluble in polar solvents like water and insoluble in kerosene (as it is non-polar solvent).
6. Non-metals
7. Sulphide ore

Q F. Short Answer Questions (Type I):

1. The galvanised iron article is protected against rusting even if the zinc layer is broken because zinc is more easily oxidised than iron. So, when zinc layer on the surface of galvanised iron article is broken, then zinc continues to corrode but iron article does not corrode or rust.
2. Because bond strength is very high and requires a large amount of bond breaking or dissociation energy. Thus, the salts have high melting and boiling points.
3. (a) Alloys are used in electrical heating devices rather than pure metals because the resistivity of an alloy is more than the resistivity of a pure metal. Moreover, alloys do not burn easily even at high temperature.
   (b) 24 carat of gold is very soft and hence cannot be used for making jewellery. So, some amount of other metal is added in order to make gold a bit harder and give it a shape.
4. Calcium reacts with cold water to form CaOH and H_2 gas. Heat produced is so less and is not enough to burn hydrogen gas. The Ca metal floats on water because bubbles of H_2 gas formed during reaction stick to the surface. Magnesium metal reacts to form MgOH and H_2 gas. Mg floats on water because the bubbles of H_2 stick to the surface.
5. (a) Sodium
   (b) Copper, zinc, tin and nickel are refined by electrolysis.

Q G. Short Answer Questions (Type II):

1. Properties of Aluminium metal responsible for its great demand in industry are:
   (i) Aluminium is corrosion resistant.

(ii) It is a light weight metal.

(iii) It is soft and malleable.

2. (a) Duralumin (b) Solder (c) Brass

3. (a) *Electrolytic reduction:* Electrolysis process is used for reduction. Oxides of highly reactive metals are reduced by this process.

$Al^{3+} + 3e^- \xrightarrow[\text{reduction}]{\text{Electrolytic}} Al$ (Aluminium metal)

Reduction with carbon: Carbon is used as reducing agent. Oxides of moderately reactive metals are reduced by carbon.

$ZnO + C \longrightarrow Zn + CO$

Zinc oxide carbon Zinc Carbon monoxide

4. (a) Roasting is the process in which the ore is heated below its melting point in presence of air to oxidise the impurities. Calcination is the process of heating the ore below its melting point in the abscence of air to remove volatile impurities like arsenic, etc.

(b) Roasting is the method used for sulphide ores. Roasting is used because it is easier to purify the oxides of a substance than the other ores.

5. (a) Basic (b) Metal (c) Sodium oxide (Na_2O)

Q H. Long Answer Questions:

1. (a) Iron being more reactive than copper displaces it from its solution and thereby the blue colour of $CuSO_4$ fades away. But iron is less reactive than zinc, therefore no change takes place.

$CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$

$ZnSO_4 + Fe \longrightarrow$ No change

(b) Iron is placed above copper and below zinc in the reactivity series.

(c) (i) Extraction of zinc from zinc sulphide:

$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$

This is known as roasting. Now zinc oxide is smelted.

$ZnO + C \longrightarrow Zn + CO$

(ii) Extraction of zinc from carbonate ore

$ZnCO_3 \longrightarrow ZnO + CO_2$

This is calcination. Now zinc oxide is smelted.

$ZnO + C \longrightarrow Zn + CO$

2. (a) Mercury, Hg

(b) Cinnabar (HgS)

(c) $2HgS(s) + 3O_2(g) \xrightarrow{\Delta} 2HgO(s) + 2SO_2(g)$

$2HgO(s) \xrightarrow{\Delta} 2Hg(l) + O_2(g)$

(d) Thermometer

(e) No. Because Hg is less reactive than Cu.

Q I. Assertion-Reason Questions:

1.(a) 2.(c) 3.(d)

Q J. Case-based Question:

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

CHAPTER-4

CARBON AND ITS COMPOUNDS

WORKSHEET-1

Bonding in Carbon-The Covalent Bond

Q A. Multiple Choice Questions:

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

Q B. Define the following terms:

1. Covalency is the maximum number of covalent bonds that an atom can form using its empty orbits.

2. Allotropes are two or more forms of the same element existing in the same physical state (either solid, liquid, or gas) that differ from each other in their physical, and sometimes also in chemical, properties.

3. Fullerene is a crystalline allotrope of carbon.

4. A covalent bond is a chemical bond that involves the sharing of electron pairs between atoms.

5. Heteroatomic molecules do not have the same atoms making up the molecule. E.g., lithium is different from fluoride. Lithium fluoride is a molecule.

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

1. 0.02%

2. Covalent

3. Graphite

4. Two

5. Ionic

Q D. Give reasons for the following statements:

1. Diamond grit is very hard and sharp so it can cut through hard materials like marble and granite.

2. Carbon contains four electrons in its outer shell. Therefore, it can form four covalent bonds with other atoms or molecules.

3. Because of the force of attraction between carbon compounds are not very strong.

4. Because in silicon, Si-Si bond is small and weak.

5. Graphite is used to lubricate the parts of a machine because of its slippery nature.

Q E. Very Short Answer Questions:

1. There are 7 electrons present in the valence shell of chlorine atom.

2. Two shared pairs of electrons.

3. Fullerenes have a spherical shape that resembles shape of a football.

4. Graphite, natural gas

5. Because they do not contain ions in the molten state or in the aqueous solutions.

Q F. Short Answer Questions (Type I):

1. (a) Buckminsterfullerene is an allotrope of carbon-containing clusters of 60 carbon atoms joined together to form spherical molecules.

(b) It burns on heating to form carbon dioxide and nothing is left behind. This shows that it is made up of carbon only like diamond and graphite.

2. Two points of difference between the properties of diamond and graphite:

- In diamond, carbon atoms are linked to four other carbon atoms. In graphite, the carbon atom is joined to only three other carbon atoms.
- In diamond, crystal has a tetrahedral arrangement. In graphite, a crystal has a hexagonal ring structure.

3.

Q G. Short Answer Questions (Type II):

1. Carbon has 4 electrons in the valence shell. It can neither lose electrons nor it can gain electrons and hence, it shares electrons.

2. (a) (i) The structure of graphite.

(ii) The structure of diamond.

(iii) The structure of C-60 Buckminsterfullerene.

(b) Diamond bears more of a tetrahedral structure, whereas graphite takes the form of layers. The presence of layers means that atoms can slide over each other easily.

3. (a) Compound X will have low melting point as it is a covalent compound.

(b) Being a covalent compound, it will not be a good conductor of electricity.

(c) Being a covalent compound, it will dissolve in organic solvent.

Q H. Long Answer Questions:

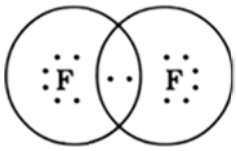
1. (a) Graphite is a crystalline form of the element carbon with its atoms arranged in a hexagonal structure.

It is the most stable form of carbon under standard conditions.

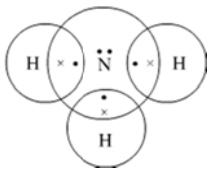
(b) Graphite mixed with clay can be used in lead pencils. Since it is a good conductor of electricity, it is used for making electrodes. Graphite is smooth and slippery so it is used as a lubricant.

Diamond is used as a gemstone in jewellery. Diamond is also used as an abrasive to cut marble and granite. Diamonds are also used in knives to perform eye surgery.

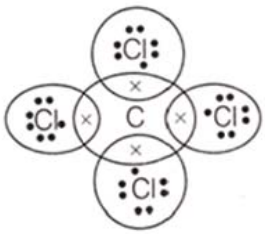
2. (a) (i) F_2



(ii)NH_3

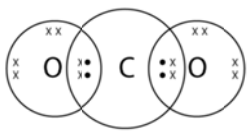


(iii) CCl_4



(b)(i) A covalent bond is formed. X represents carbon having four valence electrons and Y represents oxygen having 6 valence electrons.

(ii) Atomic structure will be C = O = C



CO_2

WORKSHEET-2

Carbon Compounds – Structure and Nomenclature

Q A. Multiple Choice Questions:

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

Q B. Give IUPAC names of the following compounds:

1. Pentane

2. Isopropyl alcohol

3. Butanoic acid

Q C. State whether the following statements are true or false.

1. False

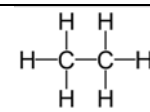
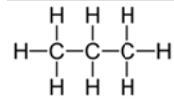
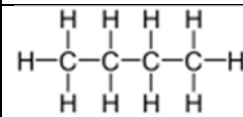
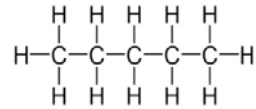
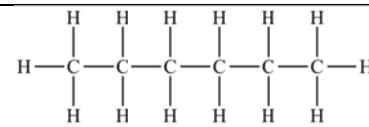
2. False

3. True

4. True

5. False

Q D. Complete the table given below:

Alkane	**Formula**	**Structural**
Ethane	C_2H_6	
Propane	C_3H_8	
Butane	C_4H_{10}	
Pentane	C_5H_{12}	
Hexane	C_6H_{14}	

Q E. Very Short Answer Questions:

1. Methane

2. Ethanal or acetaldehyde

3. Catenation

4. Alkenes: C_nH_{2n}

Alkynes: C_nH_{2n-2}

5. C_5H_{10}

Q F. Short Answer Questions (Type I):

1. But-1-ene and But-2-ene are examples of position isomers. Explanation: The isomerism which is due to the difference in the position of double bond in the same carbon chain is called position isomerism.

2. (a) C_3H_4

(b) C_3H_6O

(c) $CH_3CH_2CH=CH_2$

(d) $C_3H_6O_2$

3. (i) 2-methylpropene
(ii) Butan-2-one

Q G. Short Answer Questions (Type II):

1. (a) Two or more compound having same molecular formula but different structural Formulas are called isomers.

(b) All isomers have the same number of atoms.

Isomers have different structural arrangements.

2. (a) Alkanes are said to be saturated because they contain only single covalent bonds.

Alkenes, alkenes are said to be unsaturated because they contain double and triple bonds respectively apart from single bonds.

(b) As carbon can form 4 bonds each, in ethane, a carbon will form one carbon-carbon bond. Remaining each carbon can form 3 bonds and we have 6 hydrogen. Thus, 2 carbons can have 6 C-H bond.

3.

Compound	Alkyl part	Functional group
(a)	CH_3	Cl
(b)	C_2H_5	CHO

(c)	C_3H_7	COOH

Q H. Long Answer Questions:

1. (a) CH_3-CH_2-CH_2-CH_2-Cl

1-chlorobutane

(b) CH_3-CH_2-CH_2-CH_2-OH

Butane-1-ol

(c) CH_3–CH_2–CH_2–CHO

Butanal

(d) CH_3-CO-CH_2-CH_3

2-Butanone

(e) CH_3-CH_2-CH_2-COOH

Butanoic acid

2. (a) Chain isomerism: Chain isomerism arises due to the difference in arrangement of carbon (**C**) atoms in the chain.

For example, there are two isomers of butane, $\mathbf{C_4H_{10}}$. In one of them, the carbon atoms lie in a straight chain whereas in the other the chain is branched.

Position isomerism: It is due to the difference in position of functional groups.

For example, there are two structural isomers with the molecular formula $\mathbf{C_3H_7Br}$. In one of them, the bromine atom is on the end of the chain, whereas in the other it is attached in the middle.

$\mathbf{CH_3–CH_2–CH_2–Br}$

1– bromopropane

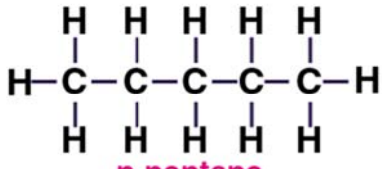
$$\mathbf{CH_3–\underset{\displaystyle Br}{\underset{|}{CH}}–CH_3}$$

2– bromopropane

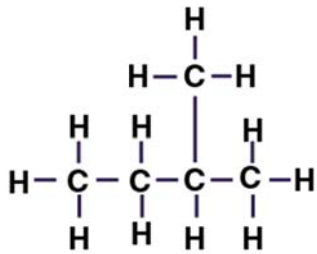
$CH_3-CH_2-CH_2-CH_3$

$$CH_3-\underset{\displaystyle CH_3}{\overset{|}{CH}}-CH_3$$

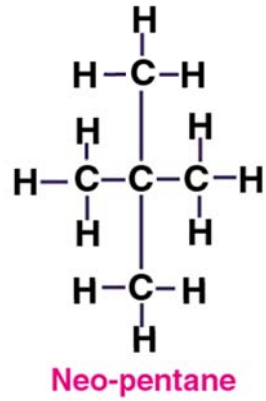
(b) Pentane has three structural isomers that are n-pentane, Iso-pentane (methyl butane) and neopentane (dimethylpropane). Therefore three structural isomers can be drawn from pentane.



n-pentane



Iso-pentane



Neo-pentane

WORKSHEET- 3

Chemical Properties of Carbon Compounds

Q A. Multiple Choice Questions:

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

Q B. Define the following terms:

1. When a reactant loses electrons during a reaction, it is called *oxidation*.

2. The reaction in which an unsaturated hydrocarbon combines with another substance to give a single product is called an addition reaction.

3. The reactions in which an atom or group of atoms in a molecule is replaced or substituted by different atoms or group of atoms are called substitution reaction.

4. Combustion refers to the process where a substance burns in the presence of Oxygen, giving off heat and light in the process.

5. A substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change is called a catalyst.

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

1. Saturated 2.substituiton 3.oxidation 4.gaseous 5.incomplete

Q D. Match the following:

Column A	Column B
1. $CH_4 + 2O_2$	(c) $CO_2 + 2H_2O$ + heat +light
2. $C_4H_{10} + 13/2O_2$	(e) $4CO_2 + 5H_2O$ + heat + heat
3. $C_6H_6 + 15/2O_2$	(a) $6CO_2 + 3H_2O$ +heat +light
4. $C_2H_4 + 3O_2$	(b) $2CO_2 + 2H_2O$ +heat +light
5. $C_2H_6 + 7/2O_2$	(d) $2CO_2 + 3H_2O$ +heat +light

Q E. Very Short Answer Questions:

1. Combustion

2. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

3. An oxidizing agent (oxidizer or oxidant) is a chemical species that tends to oxidize other substances.

4. Nickel and Platinum

5. Coal and natural gas

Q F. Short Answer Questions (Type I):

1. To provide sufficient air (or oxygen) supply for the complete combustion of fuel.

2. While cooking, if the bottom of the utensil is getting blackened on the outside, it means that:

- The food is not cooked completely.
- The fuel is not burning completely.
- The fuel is wet.

3. Substitutions reactions are a characteristic property of saturated hydrocarbons (Alkanes). For example: Methane reacts with chlorine in the presence of sunlight to form chloromethane and hydrogen chloride.

Q G. Short Answer Questions (Type II):

1. Ethanol is converted into ethanoic acid by the addition of oxygen released by potassium permanganate in the reaction mixture.

The equation for the above reaction is given below:

$CH_3CH_2OH + 2[O] \rightarrow CH_3COOH + H_2O$

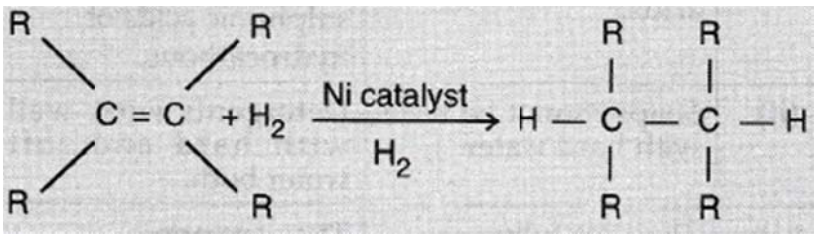
2. Only those substances, which vapourise during burning, produce flames. For example, kerosene oil and molten wax rise through the wick and are vapourised during burning and form flames.

On the other hand, those substances which do not vapourise during burning do not give flame. For example, when coal is burnt, it does not produce a flame. The main reason why coal does not burn with a flame is that it does not vapourise during burning.

3. The Bromine Water Testing is used to distinguish between unsaturated chemicals such as alkenes and alkynes and saturated chemicals. For this purpose, bromine is used in the form of water. The solution of bromine in water is called bromine water. Saturated Hydrocarbons do not react with Bromine water whereas unsaturated hydrocarbons change the color of Bromine water.

Q H. Long Answer Questions:

1. (a) Hydrogenation: The process in which unsaturated Compounds reacts with hydrogen in the presence of nickel (as a catalyst) to form saturated compounds are called hydrogenation. This reaction is commonly used in the hydrogenation of vegetable oils. Vegetable oils have long unsaturated carbon chains, which are converted into vegetable ghee i.e., saturated fatty acids.



(b) Vegetable oil contains unsaturated fatty acids that are essential for our well-being, whereas saturated fatty acids like those present in ghee are not healthy. So, we should choose vegetable oils for cooking.

2. Coal and petroleum have been formed from remains of dead animals and plants which have been subjected to various biological and geological processes. Coal is the remains of trees, ferns and other plants that lived millions of years ago. These were crushed under the earth by earthquakes or volcanic eruptions. They were pressed down under the layer of earth and rock and slowly decayed into the coal under the high temperature and pressure.
Oil is the remains of millions of tiny plants and animals that lived in the sea. When they died, their bodies sank to the sea bed. Bacteria attacked the dead remains and changed them into oil under high pressure.

WORKSHEET-4

Some Important Carbon Compounds

Q A. Multiple Choice Questions:

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

Q B. Write the balanced chemical equations for the following:

1.

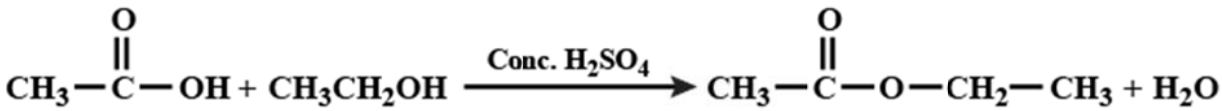
$$\underset{\text{Ethyl alcohol}}{CH_3CH_2OH} \xrightarrow[443\,K]{\text{Conc. } H_2SO_4} \underset{\text{Ethene}}{CH_2=CH_2} + \underset{\text{Water}}{H_2O}$$

2. $2CH_3CH_2OH+2Na \rightarrow 2CH_3CH_2ONa+H_2$

3. $CH_3COOH+NaOH \rightarrow CH_3COONa+H_2O$

4. $CH_3COOH + Na_2CO_3 \rightarrow CH_3COONa + NaHCO_3$

5.



Q C. State whether the following statements are true or false.

1. False

2. True

3. False

4. False

5. True

Q D. Define the following:

1. A process such as a chemical reaction that removes water is called dehydration.

2. Saponification is the hydrolysis of an ester to form an alcohol and the salt of a carboxylic acid in acidic or essential conditions.

3. Detergents are cleansing agents possessing ammonium or sulphonate salts of long chain carboxylic acids that are used to clean clothes in hard water.

4. Esterification is the process of combining an organic acid (RCOOH) with an alcohol (ROH) to form an ester (RCOOR) and water.

5. A spherical aggregate of soap molecules is formed in the soap solution in water is called a micelle.

Q E. Very Short Answer Questions:

1. Physical efficiency loss and loss of senses.

2. Calcium (Ca^{2+}) and magnesium (Mg^{2+}) are the two major cations that induce water hardness.

3. Molasses is a viscous product produced by refining sugar beets or sugar cane into sugar.

4. Mineral acids are stronger acids than carboxylic acids because mineral acids are completely ionised whereas carboxylic acids are partially ionised.

5. Soap solution appears cloudy because they form micelles in water and they are larger enough to scatter light.

Q F. Short Answer Questions (Type I):

1. Ethyl acetate reacts with sodium hydroxide when the two are mixed. The reaction, called ester hydrolysis, yields products ethyl alcohol and sodium acetate.

2. Ethanol is used in the manufacture of drugs, plastics, lacquers, polishes, plasticizers, and cosmetics.

3. Soap is a kind of molecule in which both the ends have different properties. The first one is the hydrophilic end which dissolves water and is attracted to it whereas the second one is the hydrophobic end that is dissolved in hydrocarbons and is water repulsive in nature.

Q G. Short Answer Questions (Type II):

1. Physical properties of ethanol-

- Ethanol is a liquid at room temperature.
- Ethanol is water soluble in all proportions.

Chemical properties of ethanol-

- Pure ethanol is a flammable, colorless liquid with a boiling point of 78.5° C.
- Ethanol exhibits acidic behavior because it reacts with sodium evolving hydrogen gas and salt sodium ethoxide is also produced.

2. (a) Two uses of ethanoic acid

In the manufacture of rayon

In the rubber and silk industry

(b) Ethyl alcohol has ethyl group whereas acetic acid has carboxylic acid group.

Acetic acid turns litmus solution red but ethyl alcohol does not.

3. (a) When ethanol reacts with ethanoic acid in the presence of a little concentrated sulphuric acid, a sweet-smelling ester called ethyl ethanoate is formed.

(b) When ethanoic acid reacts with sodium hydroxide, a salt called sodium ethanoate along with water is formed.

(c) Sodium carbonate reacts with ethanoic acid to form sodium ethanoate, carbon dioxide and water.

Q H. Long Answer Questions:

1. (a) Hard water is the water that contains higher concentrations of minerals such as calcium and magnesium.

(b) When hard water and soap are mixed, the magnesium ion reacts with soap molecules and forms a solid material called a precipitate, which does not dissolve. This precipitate (soap scum) reduces the ability of the soap to make bubbles.

(c) Detergents are cleansing agents possessing ammonium or sulphonate salts of long chain carboxylic acids that are used to clean clothes in hard water.

Detergents are better than soaps because they are less affected by hard water, as the hydrocarbon chains in detergents do not precipitate with calcium, magnesium and other metal ions.

2. (a) A = CH_3COOH (Ethanoic acid)

B = Ethyl ethanoate

(b) Through Saponification reaction

(c) Process involved = Esterification

$CH_3\text{-}COOH + C_2H_5OH + Conc.H_2SO_4 \rightarrow CH_3\text{-}COOC_2H_5 + H_2O$

WORKSHEET-5

Based on Complete Chapter

Q A. Multiple Choice Questions:

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

Q B. State whether the following statements are true or false.

1. True

2. False

3. True

4. False

5. True

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

1. Alkenes

2. hydrocarbons

3. chemical

4. propanol

5. clean

Q D. Differentiate between the following:

1. Ionic compounds are formed by the transfer of electrons that are positively and negatively charged, whereas, covalent compounds are formed by sharing the electrons.

The melting and boiling points of ionic compounds are much higher compared to those of the covalent compounds.

2. Soaps are prepared from vegetables and oil but detergent are prepared from the hydrocarbons obtained from petroleum.

Soaps are bio degradable but detergents are non biodegradable.

Soap do not cause water pollution but detergent cause water pollution

3. Each carbon atom in a diamond is linked to four other carbon atoms. Each carbon atom in graphite is linked to three other carbon atoms. Diamond is poor conductor of electricity due to the absence of free electrons. Graphite is good conductor of electricity due to the presence of free electrons in its structure.

Q E. Very Short Answer Questions:

1. Ethanol (CH_3CH_2OH) should be oxidised to prepare ethanoic acid (CH_3COOH).

2. Carbon compounds are used as fuel because they burn with a clean flame and no smoke is produced.

3. When we will put a drop of soap solution on a blue litmus paper, no change in its color will be observed. When we put a drop of soap solution on a red litmus paper, color change will be observed and red litmus paper will turn into blue. It gives us the conclusion that soap solutions are alkaline in nature.

4. Unsaturated hydrocarbons show addition reaction as they contain multiple bonds in them. Saturated hydrocarbon consists of only sigma bonds which are strong and single only hence they are not easily broken down and these compounds do not undergo addition reaction.

5. (a) Aldehyde group (b) ketone group

6. Carboxylic acids (organic acids) are less ionised in solution as compared to mineral acids due to this reason, these are weaker acids than the mineral acids.

7. Oxygen, there is a double covalent bond in oxygen molecule.

Q F. Short Answer Questions (Type I):

1. (a) C_3H_6O

(b) C_4H_8O

2. Alcohols are slightly acidic in nature and can be detected by their reaction with sodium.

3. When propanoic acid is warmed with methanol in the presence of a few drops of concentrated sulphuric acid, esterification takes place and an ester (methyl propanoate) is formed along with water. The chemical equation for the reaction is given below:

$C_2H_5COOH+CH_3OH \rightarrow C_2H_5COOCH_3+H_2O$

4. (a) bromoethane (b) Cyclohexene

5. (a) methanol (b) butanone

Q G. Short Answer Questions (Type II):

1. (a) Alcohol, ethanol

(b) Aldehyde group, ethanal

(c) Ketone, Cyclopropanol

2. (a) Ethene is a unsaturated carbon compound and ethane is a saturated carbon compound. Therefore when ethene is in contact with bromine water it goes under addition reaction whereas ethane does not.

(b) A molecule of ethanol contains six hydrogen atoms while that of ethanoic acid contains four hydrogen atoms since oxidation involves removal of hydrogen, therefore conversion of ethanol to ethanoic acid is an oxidation reaction.

3. Complete the following table:

Hydrocarbon	IUPAC name	Common Name	Formula
Methane	Methanol	methyl alcohol	CH_3OH
Propane	Propanol	Propyl alcohol	C_3H_8
Ethane	Ethanoic acid	acetic acid	CH_3COOH
Methane	Methanoic acid	Formic acid	HCOOH
Propane	propanoic acid	Propionoic acid	CH_3CH_2COOH or $C_3H_6O_2$

4. (a) The available information suggests that the organic compound with molecular formula $C_2H_6OC_2H_6O$ is ethanol. It reacts with sodium metal to evolve hydrogen gas which is evolved with a brisk effervescence and burns with a pop sound.
$2C_2H_5OH$ (C_2H_6O (A)) $+2Na \rightarrow 2C_2H_5ONa + H_2$

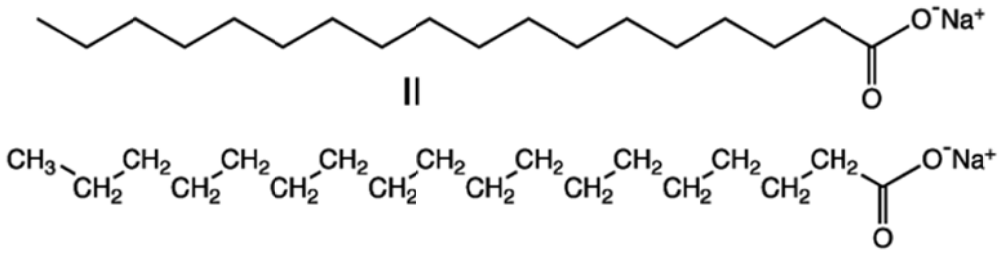
(b) Upon heating compound 'A' at 443 K with excess of concentrated sulphuric acid, ethene gas evolves. The reaction is known as acidic dehydration.
$C_2H_5OH \rightarrow CH_2 = CH_2 + H_2O$

5. (a) Letter 'B' and 'D' represent the family of alkynes.
(b) Letter 'E' and 'F' do not represent any hdyrocarbon.
(c) 'C' can be converted into 'A' by passing hydrogen H_2in the presence of Ni at 473K.

Q H. Long Answer Questions:

1.(a) A soap is a water-soluble compound which is made via a process called saponification by the reaction between sodium hydroxide or potassium hydroxide with vegetable or animal oil (fats).

(b) A soap molecule has two parts: the long-chain organic part and the ionic part containing the $-COO^-Na^+$ group. It has to be remembered that this is not an ion, the atoms are all covalently bonded, the electrical charges show how the charges get polarized in the group. A soap molecule has a tadpole-like structure.

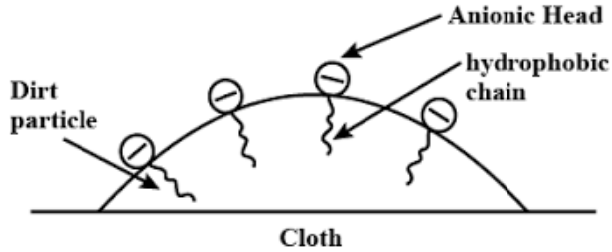


(c) The cleaning action of soap has been explained below:

Polar end (end with sodium or potassium ion) of soap is hydrophilic (attracted towards the r) and the non-polar end (the hydrocarbon part) is hydrophobic (attracted towards hydrocarbons).

On dissolution in water, the hydrophobic ends attach themselves to dirt and remove it from the cloth.

Soap molecules form micelle and trap the dirt at the centre of the cluster. They remain suspended in water like particles of colloidal solution. The trapped dust particles are easily rinsed away with water.



2. (a) Methane

(b) Two properties are:

- Colourless and odourless gas at room temperature and pressure.
- It is slightly soluble in water and completely soluble in organic solvents like ethanol, diethyl ether, benzene, toluene, etc.

(c) When methane, reacts with oxygen, the result is carbon dioxide and water, along with heat, hence making it an exothermic reaction.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ + Energy

(d)Gas produced during burning is carbon dioxide.

When carbon dioxide reacts with the lime water , it forms calcium carbonate $CaCO_3$,which turns lime water milky.

$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

Q I. Assertion-Reason Questions:

1. (d) **2.** (c) **3.**(d)

Q J. Case-based Question:

1. (b) **2.** (a) **3.**(b) **4.** (b) **5.**(b)

CHAPTER-5

LIFE PROCESSES

WORKSHEET-1

Nutrition in Plants and Animals

Q A. Multiple Choice Questions:

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

Q B. Match the following:

Column A	Column B
1. Trypsin	(c) Pancreas
2. Amylase	(d) Saliva
3. Bile	(a) Liver
4. Pepsin	(b) Gastric glands
5.Villi	(e) Small intestine

Q C. Give one word for the following:

1. Photosynthesis

2. Heterotrophs

3. Autotrophs

4. Gall bladder

5. Guard cell

Q D. Differentiate between the following:

1. *Reactants:* The substances that react with one another are called *reactants*.

Heterotrophs: An organism that eats other plants or animals for energy and nutrients is called heterotrophs.

2. The organism, which grows on dead and decaying material for its growth, is known as a saprophyte. It shows extracellular digestion.

The organism, which depends upon another organism for its nourishment and growth, is known as a parasite. It has intracellular digestion.

3. The liver is the largest gland or chemical factory in the body. It is like a sponge shaped like a wedge. It has many metabolic and secretory functions.

The pancreas is a gland which releases digestive enzymes and hormones. It has functions both in the digestive system and the endocrine system.

Q E. Very Short Answer Questions:

1. (a) Carbon dioxide (b) Oxygen

2. A is glucose and B is starch.

3. Cell membrane

4. (a) Absorption of water is performed by large intestine

(b) Absorption of food takes place in small intestine

5. Apart from carbon dioxide and water, name four other raw materials which are needed by the plants are oxygen, water, light, and space

Q F. Short Answer Questions (Type I):

1. The basic functions performed by living organisms to maintain their life on this earth are called life processes. The basic life processes common to all living organisms are

- Nutrition and Respiration
- Transport and Excretion
- Control and Coordination
- Growth
- Movement and Reproduction

2. Trypsinogen, chymotrypsinogen, elastase, carboxypeptidase, pancreatic lipase, nucleases and amylase.

3.(a) As sunlight has an essential role in photosynthesis and due to clouds in morning, sunlight will not be able to reach the plants for photosynthesis.

- Thus, the rate of photosynthesis will decrease.
- When bright sunshine happens in the afternoon, the rate will increase.

(b) Dust on leaves, will decrease the rate of photosynthesis as the stoma present on leaves will be covered with dust, due to which necessary exchange of gases won't be possible.

- Due to absence of carbon dioxide, photosynthesis won't take place.

Q G. Short Answer Questions (Type II):

1. Through the process of endocytosis, an Amoeba obtains its food. As its cell membrane is flexible enough, food particles are engulfed forming a food vacuole girdling it which is assisted by the pseudopodia. Amoeba secretes digestive enzymes to bring about digestion of the engulfed particle once the food is trapped.

2. X is Guard cell, Y is Choloroplast, and Z is Stomata Pore.

Functions:

Guard cell regulates opening and closing of stomata pore.

Chloroplast contains Chlorophyll, the green pigment necessary for Photosynthesis.

Stomata pore is the site of exchange of gases.

3. Function of the saliva

- Chemical digestion: breaks down starch by the function of "salivary amylase"
- Lubricating effect: moisturizes the inside of the mouth and creates smoother speech.
- Solvent effect: dissolves food and allows the tongue to taste food.

Q H. Long Answer Questions:-

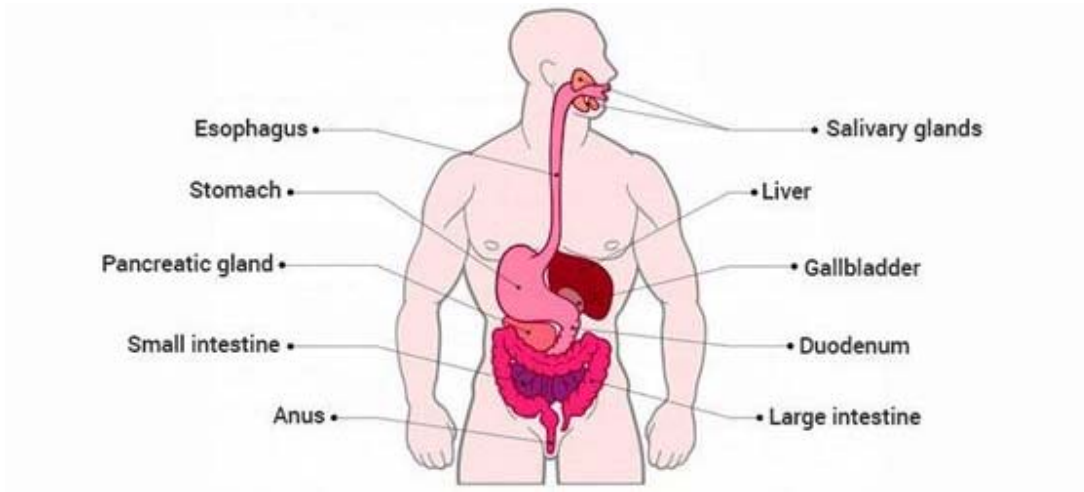
1. The process by which plants make food is named photosynthesis. Photosynthesis is the process in which green plants use sunlight to make their own food. Photosynthesis requires sunlight, chlorophyll, water, and carbon dioxide gas. Chlorophyll is a substance in all green plants, especially in the leaves. Plants take in water from the soil and carbon dioxide from the air. Plants can perform photosynthesis only through leaves and not by other parts of the plant and they are called producers. They form the first level trophic level of the ecosystem. Leaves have a special green pigment called chlorophyll which helps in the absorption of energy from the sun. The chloroplast present in the cells plays a vital role in this process.

The various steps involved in the process of photosynthesis are given below:

- Absorption of light energy through the sun by chlorophyll present in leaves.
- Conversion of light energy chemical energy. In this process, the water molecule splits into its respective components hydrogen and oxygen.
- Carbon dioxide is reduced into carbohydrates like glucose by light energy utilizing the hydrogen and oxygen produced in the above step.

2. Digestion is a vital process where complex food substances are broken down into simpler and absorbable molecules so that it could be easily absorbed by the different cells and tissues.

The digestive system plays a significant role in the digestion process, which is composed of the alimentary canal and other associated glands. The alimentary canal is divided into five main parts- mouth, esophagus, stomach, small intestine, small intestine and lastly large intestine.



Human Digestive System

WORKSHEET - 2

Respiration in Organisms

Q A. Multiple Choice Questions:

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

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

1. mitochondria

2. ATP

3. lactic acid

4. aquatic

5. cell surface

Q C. Give reasons for the following statements:

1. Because availability of oxygen is less in water than on land.

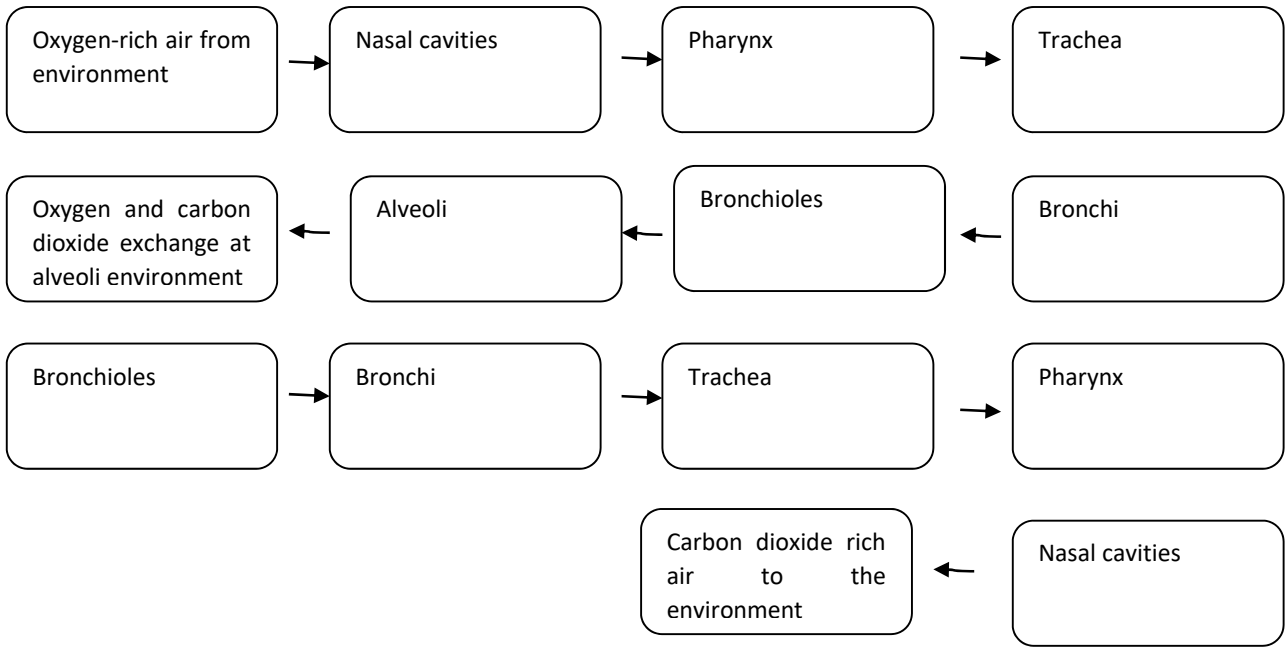
2. Because it shows anaerobic respiration so as oxygen is not required in anaerobic respiration it can live without oxygen.

3. Because they are included in the respiratory processes.

4. Due to the accumulation of Lactic acid.

5. In plants, the movements are usually at the cellular level and hence a far less amount of energy is required by plants as compared to animals.

Q D. Complete the flowchart of pathway of air in human respiratory tract given below:



Q E. Very Short Answer Questions:

1. Breathing means taking in air rich in oxygen and giving out air rich in carbon dioxide with the help of respiratory organs.

2. Glycolysis

3. Alcohol fermentation, lactic acid fermentation

4. The normal respiratory rate for healthy adults is between 12–20 breaths per minute.

5. Carbon dioxide is more soluble in water than oxygen and hence is mostly transported in the dissolved form in our blood.

Q F. Short Answer Questions (Type I):

1. (a)Yeast can live without oxygen as it can respire anaerobically.

(b) Lactic acid or ethanol + CO_2

2. (a) Oxygen

(b) Carbon dioxide

3. (a) Respiration

(b) Photosynthesis

Q G. Short Answer Questions (Type II):

1. (a) Alveoli

(b) The pulmonary alveolus is a sac roughly 0.2 to 0.5 mm in diameter. These alveoli are located at the ends of air passageways in the lungs. Sometimes, people compare alveoli structures to the appearance of a raspberry or a “bunch of grapes.” In the average adult lung, there is an average of 480 million alveoli.

Things can be said about the alveolar shape and structure:

- Largely polyhedral shape
- Open at one end, like a cup
- The walls of the alveoli are composed of the pulmonary capillary sheet
- Alveolar surfaces are covered in a thin (200 nm) layer of surfactant which acts as the interface with the gas

2. (a) Larynx: The main function of the larynx is sound production. It facilitates respiration and also protects the lower respiratory tract.

(b) Alveoli: Thin-walled sac like structures for exchange of gases.

(c) Diaphragm: It is pulled up when we breathe

3. (a) Roots of plant respire by taking air trapped in the soil using epidermal growth called root hairs. Once the exchange of gases is done, then the process of respiration in same in every part of plants.

(b) Lenticels are the lens-shaped small pores on the surface of the stems of woody plants. Lenticels consist of thin-walled loosely arranged cells with intercellular spaces. In the stem, they help in gaseous exchange.

(c) The leaves of plants have tiny pores called stomata which help in gaseous exchange by simple diffusion process. The rate of respiration in plants is much slower than animals as the energy requirement of the animals is low. During daytime when photosynthesis is also going on in the leaves, oxygen for respiration is obtained by photosynthesis itself while excess oxygen is given out. During night time, when there is no photosynthesis stomata take in oxygen and give out carbon dioxide as all organisms. Once oxygen is inside the cells of the leaves glucose is oxidised to release energy in the form of ATP molecules and is used for various metabolic activities.

Q H. Long Answer Questions:

1. (a) (i) Anaerobic respiration (Alcoholic fermentation)

(ii) Aerobic respiration

(iii) Anaerobic respiration (lactic acid fermentation)

(b) In the anaerobic respiration that takes place in yeast, the end products are C_2H_5OH and CO_2.
In the aerobic respiration that takes place in human cells in the presence of oxygen, the end products are CO_2 and H_2O.
In the anaerobic respiration that takes place in animal tissues like muscle cells, the end product is lactic acid.

2. (a) It is dangerous to inhale air containing carbon monoxide as it binds very strongly with hemoglobin in the blood and prevents it from carrying oxygen to the brain and other parts of the body. Due to lack of oxygen the person cannot breathe properly and may become unconscious or may even die.

(b) ATP (Adenosine triphosphate) is the energy currency in living organisms. It is produced at the end of respiration and is produced in the mitochondria.

WORKSHEET-3

Transportation in Plants and Animals

Q A. Multiple Choice Questions:

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

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

1. False

2. True

3. True

4. True

5. True

Q C. Match the following:

Column A	Column B
1. Heart	(c) Pumping organ
2. Arteries and veins	(a) Blood vessels
3. Xylem vessels	(d) Water transport in plants
4. RBCs	(e) Carriers of oxygen
5. Platelets	(b) Clotting of blood

Q D. Define the following terms:

1. Tracheids are elongated cells in the xylem of vascular plants that serve in the transport of water and mineral salts.

2. Transpiration is the loss of water in the form of water vapour from the aerial parts (leaves and stem) of the plant.

3. Short and tiny blood vessels, found within the tissues are called capillaries.

4. Platelets are minute fragments of blood cells that help in the formation of clots in the body to stop bleeding.

5. Pulse is a rhythmic beat felt in an artery. It is an indicator of the pumping action of the heart.

Q E. Very Short Answer Questions:

1. Blood absorbs oxygen in alveoli present in the lungs.

2. (a) The largest artery in the body is Aorta that pumps oxygenated blood into the body.

(b) The largest vein in the body is Vena Cava (Inferior/Superior) that returns deoxygenated blood to the heart.

3. Blood

4. In the human body, blood and lymph are two liquids that help in the transport of substances.

5. Hypertension is the other term used to describe high blood pressure.

Q F. Short Answer Questions (Type I):

1. (a) Water (b) Food

2. (a) away from the heart - Arteries

(b) back to the heart – Veins

3. Transpiration helps plants to supply water from roots to top parts of plants thereby distributing water to all parts of the plant.

Q G. Short Answer Questions (Type II):

1. Xylem tissue is a vascular tissue in plants which carries water and minerals from the roots to the various of the plant.

Xylem tissue is made up of four different types of cells- tracheids, vessels, xylem parenchyma and xylem fibres.

Out of the four, barring xylem parenchyma, all the other cells are dead cells.

2. (a)Transport of soluble product of photosynthesis or food from leaves to other parts of plants is called translocation.

(b)The liquid part of blood is called plasma, which is composed of salts, water, and proteins.

Functions of platelets in the blood:

- Platelets are a type of blood cell called thrombocytes that are responsible for clotting blood.
- They also produce vasoconstrictors, which constrict blood vessels and cause vascular spasms in ruptured blood arteries.

3. (a) The upper parts of the heart are called atria.

(b) The lower parts of the heart are called Ventricles.

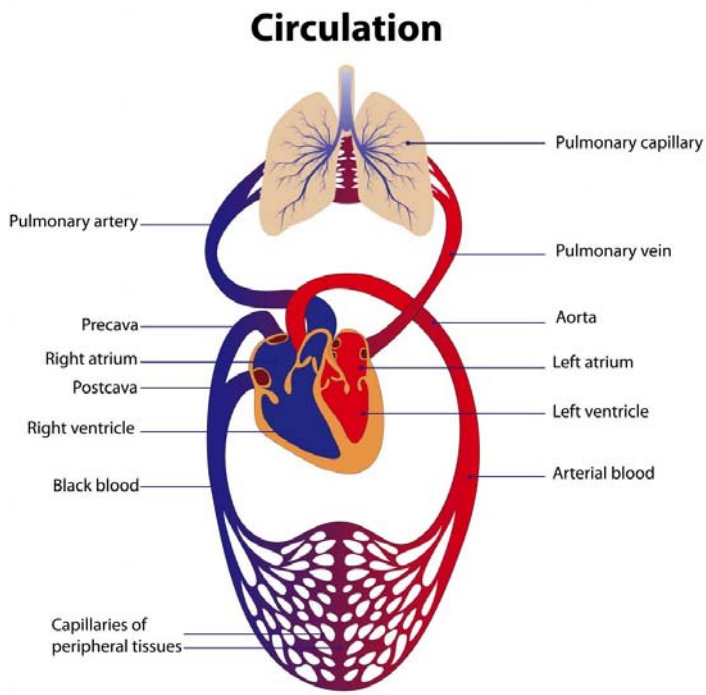
(c) Lymph is a light yellow liquid which is unidirectional in its flow. It is cellular part consists of only leukocytes and no blood platelets. It is non cellular part consists of water (94%) and the non-cellular part is composed of solids consisting of proteins, fats, carbohydrates, enzymes and antibodies (6%).

The two main functions of the lymph are as follows

- It drains away excess tissue fluid and metabolites, returns proteins to the blood from tissue spaces in addition to absorbing fats from the intestines through the lacteals.
- Lymphocytes and monocytes of the lymph function to defend the body by removing bacteria from the tissues, along with the lymph nodes. The antibodies it produces help to localise the infection and prevent it from spreading to the entire body for e.g. the tonsils.

Q H. Long Answer Questions:

1. The deoxygenated blood comes to the heart through veins. It is oxygenated in the lungs and comes back to the heart. From heart oxygenated blood is distributed to all parts of the body. Since blood flows twice through the heart in one cycle, it is called double circulation.



2. (a) B - Pulmonary Artery

Function: The pulmonary artery carries Carbon-dioxide rich blood to the lungs.

C - Pulmonary veins

Function: The pulmonary vein carries oxygen-rich blood to the lungs.

(b) Right atrium (E)

(c) Aorta (A)

The aorta is responsible for transporting oxygenated blood out of the heart and to the rest of the body.

WORKSHEET- 4

Excretion in Plants and Animals

Q A. Multiple Choice Questions:

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

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

1. False

2. True

3. False

4. False

5. True

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

1. dialysis

2. transpiration

3. lungs

4. bladder

5. liver

Q D. Complete the following table:

Structure	Function
Nephron	It produces urine in the process of removing waste and excess substances from the blood
Ureter	It carries urine from the kidney to the urinary bladder.
Bladder	It stores urine, allowing urination to be infrequent and controlled.
Bowman's capsule	It surrounds the glomerular capillary loops and participates in the filtration of blood from the glomerular capillaries.
Renal artery	It carries a large volume of blood from the heart to the kidneys.

Q E. Very Short Answer Questions:

1. Carbon dioxide and oxygen

2. Nephrons

3. Carbon dioxide

4. Amino acid, glucose, salts and major amount of water.

5. About 180 L daily

Q F. Short Answer Questions (Type I):

1. Four ways of excretion in plants are:

- Gaseous wastes, like CO_2 and O_2, are expelled from the stomata.
- Water vapour from the leaves through transpiration.

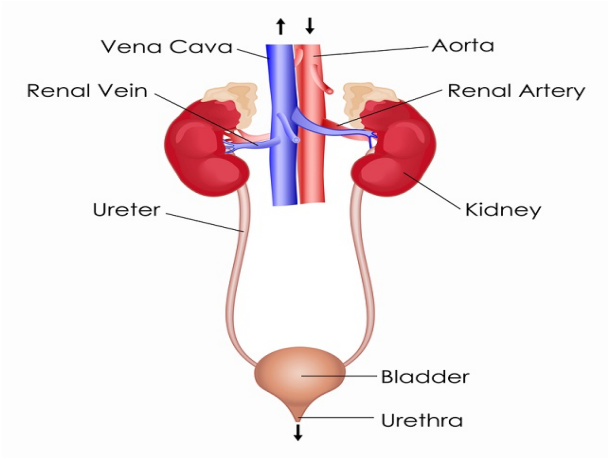
- Solid wastes, stored in the plant body through shedding of leaves, peeling of bark, falling of fruits.
- Gums and Resins excreted from the lenticels in the bark.

2. Stomata in the leaves and lenticels in the stems are two parts through which a plant releases its gaseous waste products into the air.

3. The main function of the glomerulus is to filter plasma to produce glomerular filtrate, which passes down the length of the nephron tubule to form urine.

Q G. Short Answer Questions (Type II):

1.



(a) The right kidney is found much lower than the left because it has to accommodate the liver, the largest gland in the human body.

(b) 'X' is kidney. It produces urine.

2. The 3 main steps in urine formation are- Glomerular filteration, reabsorption and secretion.

Glomerular filtration: Blood containing useful substances (glucose, amino acids, vitamins, hormones, electrolytes) and harmful substances (urea, uric acids, creatinine, ions, etc.) reaches the kidneys for filtration. This takes place through the semi permeable walls of the glomerular capillaries and Bowman's capsule.

Selective reabsorption: Wastes dissolved in water is filtered out as urine in the kidneys.

Tubular secretion: Ureters carry urine to the urinary bladder.

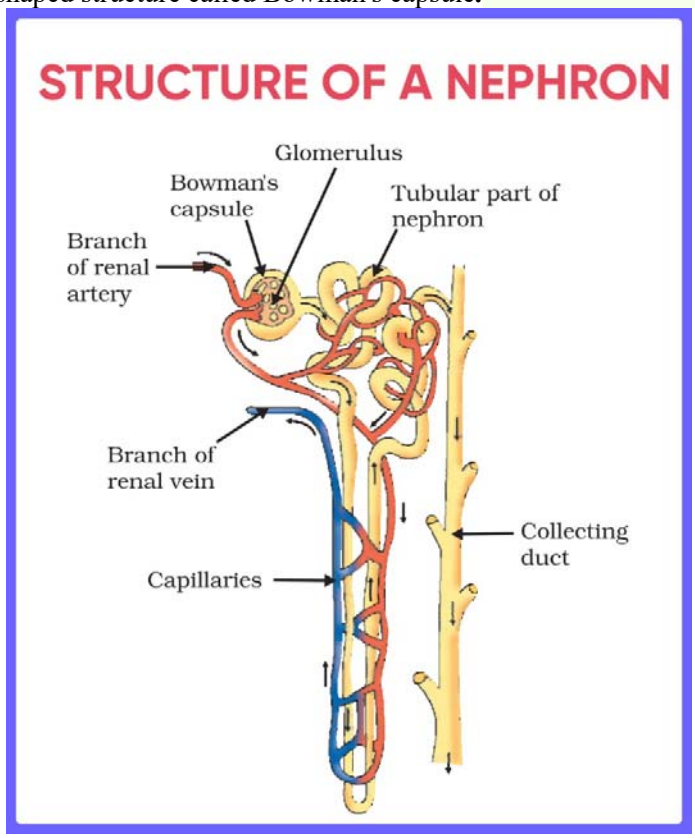
3. (a) Urea

(b) Ureters

(c) The urethra carries urine from the urinary bladder to the outside of the body.

Q H. Long Answer Questions:

1. The nephron is the minute or microscopic structural and functional unit of the kidney. It is composed of a renal corpuscle and a renal tubule. The renal corpuscle consists of a tuft of capillaries called a glomerulus and a cup-shaped structure called Bowman's capsule.



2. (a) Some people need to use the dialysis machine as the kidneys of those people are unable to work efficiently due to some diseased condition or kidney damage.

(b) One needle will slowly remove blood and transfer it to a machine called a dialyser or dialysis machine. The dialysis machine is made up of a series of membranes that act as filters and a special liquid called dialysate.The membranes filter waste products from your blood, which are passed into the dialysate fluid.

WORKSHEET- 5

Based on Complete Chapter

Q A. Multiple Choice Questions:

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

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

1. Heterotrophs

2. Starch

3. alveoli

4. anerobic

5. wastes

Q C. Give one word for the following:

1. Sphygmomanometer

2. Nephron

3. Phloem

4. Parasitic

5. Pepsin

Q D. Differentiate between the following:

1. Aerobic respiration: It takes place in presence of oxygen. Carbon dioxide and water are the end products of aerobic respiration. The amount of energy released in aerobic respiration is very high.

Anaerobic respiration: It takes place in absence of oxygen. Alcohol is the end product of anaerobic respiration. The amount of energy released in the anaerobic respiration is low.

2. Arteries: It is a blood vessel having a thick wall. It carries blood from the heart to different parts of the body. It doesn't contain any valve.

Veins: It is a blood vessel having a thin wall. It brings blood from different parts of the body to the heart. It contains valves that allow the blood to flow in one direction towards the heart.

3. RBCs: RBCs (Red Blood Cells) are bi-concave disc shaped, and have no nucleus. It is produced in red bone marrow.RBC do not have nuclei in humans.

WBCs: WBCs (White Blood Cells) are irregular in shape, but have a nucleus and an outer buffer coat. It is produced in lymph nodes, spleen, etc.WBC have nuclei in humans.

Q E. Very Short Answer Questions:

1. The process by which an organism regulates the water balance in its body and maintains the homeostasis of the body is called osmoregulation.

2. Amylase

3. Lungs are attached to the two bronchi.

4. Saprotrophic

5. Double circulation is a process during which blood passes twice through the heart during one complete cycle.

6. During running, the sportsman requires large amount of energy instantly. In order to release more energy, pyruvate is converted into lactic acid in the absence of oxygen. Accumulation of lactic acid in the muscles causes cramps.

7. The plant which is kept in continuous light will live longer. We know that plant release carbon dioxide during respiration. In case of plant which is being kept in dark, carbon dioxide will accumulate in the container. This will finally result in lack of oxygen for the plant and plant would die. In case of plant which is being kept in light, carbon dioxide shall be utilized during photosynthesis and Oxygen will be released. This will help in maintaining the availability of oxygen for respiration. As a result, this plant will live longer.

Q F. Short Answer Questions (Type I):

1. Digestion of fat takes place in the small intestine. Fat reaches the small intestine in the form of large globules. The liver releases bile juice which emulsifies the fat i.e. it breaks down the large globules into smaller globules. Lipase acts and breaks down the globules into molecules.

2. Tooth decay, also known as dental caries or cavities, is a breakdown of teeth due to acids made by bacteria. Dental caries is caused by the action of acids on the enamel surface.

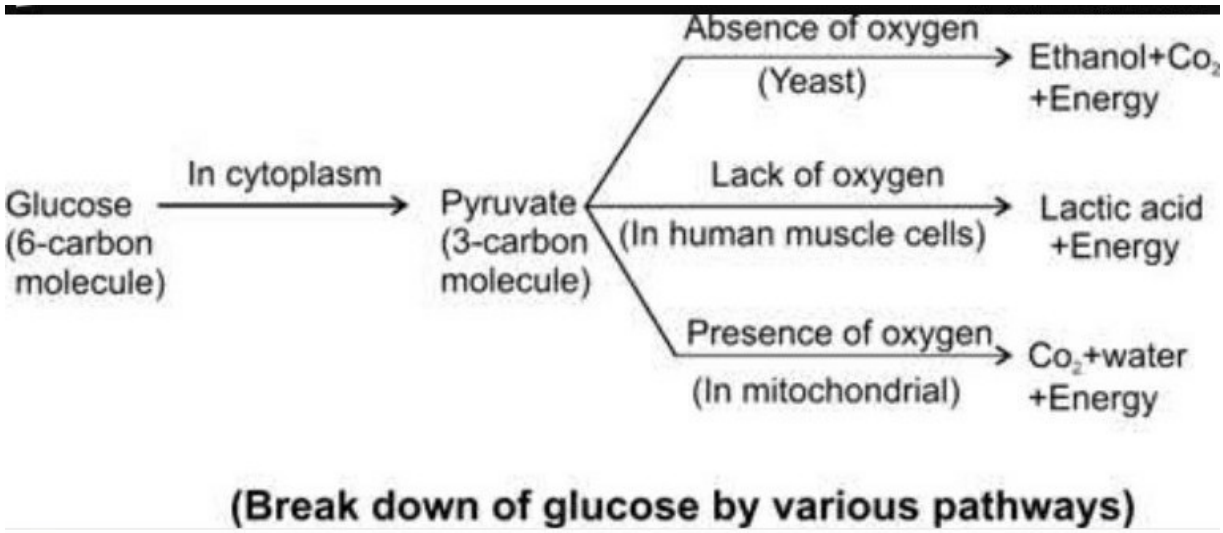
3. If conducting tubes of a circulatory system develops a leak, the blood clots. After a leak the number of platelets would get increased that minimize the leakage and inactive thrombin becomes active thrombin in the presence of thromboplasm. This active Thrombin converts the inactive fibrinogen into active fibrin and it results with a clot.
But, if a person does not develop with blood clot, immediate medical attention must be given. Otherwise it may lead to death.

4. Human excretory system includes organs that facilitate the removal of nitrogenous wastes from the body. The main excretory organs include kidney, ureter, urinary bladder and urethra. Kidneys filter the blood and urine is the filtrate obtained.

5. The breathing cycle involves inhalation and exhalation of air due to alternate expansion and contraction of thoracic cavity. Thus it is a rhythmic process. But exchange of gases is a continuous process as it takes place between the blood and each and every cell, by diffusion.

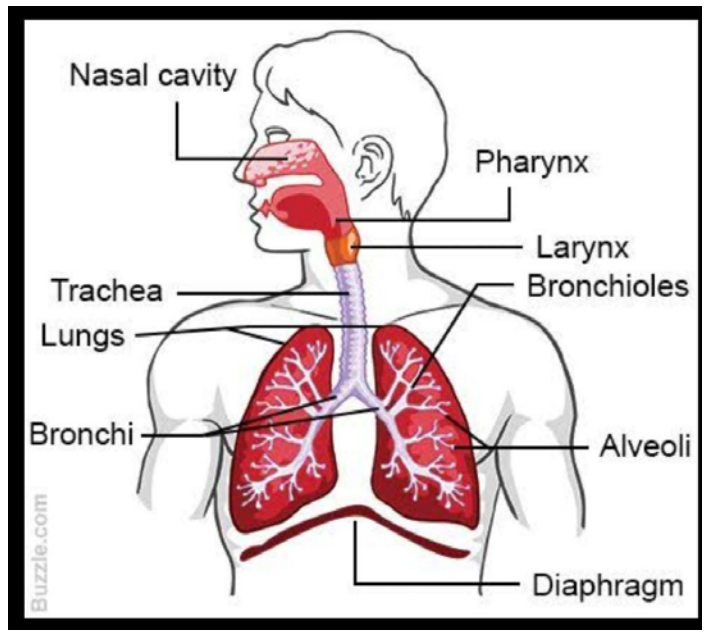
Q G. Short Answer Questions (Type II):

1. The intermediate and the end product of glucose breakdown in aerobic respiration is Carbon dioxide (CO_2), Water (H_2O) and the energy (38 molecules of ATP).



(Break down of glucose by various pathways)

2. The epiglottis is a leaf-shaped flap in the throat that prevents food and water from entering the windpipe and the lungs.



3. (a) Nasal cavity: It allows the air to pass through our body to lungs .
(b) Diaphragm: It helps increase capacity of lungs to hold more a air.
(c) Alveoli: It helps in the exchange of gases that are oxygen and carbon dioxide.
4. The opening and closing of stomata is controlled by the guard cells. When water flows into the guard cells, they swell up and the curved surface causes the stomata to open. When the guard cells lose water, they shrink and become flaccid and straight thus closing the stomata.

5. (a) Dental plaque is a sticky film that coats *teeth* and contains bacteria.

(b) It can cause tooth decay.

(c) Brushing of teeth regularly after eating food prevents the formation of plaque.

Q H. Long Answer Questions:

1. (a) Diffusion is insufficient to meet the oxygen requirements of large multicellular organisms like humans because the volume of human body is so big that the oxygen cannot diffuse into all the cells of the human body quickly and oxygen will have to travel large distances to reach each and every cell of the body.

(b) Large organisms contain a respiratory pigment called haemoglobin which carries the oxygen from the lungs to all the body cells very efficiently.

(c) A terrestrial animal has an advantage over an aquatic animal in regard to obtaining oxygen for respiration that it is surrounded by an oxygen rich atmosphere from where it can take any amount of oxygen.

2 (a) Liquid X is Lymph. (ii) Colour of Y is light yellow .

(b) Lymphocytes

A lymphocyte is a type of white blood cell that is part of the immune system. There are two main types of lymphocytes: B cells and T cells. The B cells produce antibodies that are used to attack invading bacteria, viruses, and toxins

(c) Plasma

(d) No. It does not contain red blood cells having the red pigment haemoglobin.

Q I. Assertion-Reason Questions:

1. (a) 2. (c) 3.(c)

Q J. Case-based Question:

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

CHAPTER-6

CONTROL AND COORDINATION

WORKSHEET-1

Neurons and Reflex Actions

Q A. Multiple Choice Questions:

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

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

1. Receptors

2.synapse

3. neurons

4. Relay

5. Sensory

Q C. Differentiate between the following:

1. Afferent neurons: They carry sensory impulses towards the CNS. They are unipolar. The cell body is situated in the dorsal root of the ganglion of the spinal cord.

Efferent neurons: They carry motor impulses away from the CNS. They are multipolar. The cell body is situated in the ventral root of the ganglion of the spinal cord.

2. Dendrites: Dendrites receive electrochemical impulses from other neurons, and carry them inwards and towards the cell body. They are short and heavily branched in appearance. There are many dendrites enclosed within a nerve cell

Axon: Axons carry the impulses away from the cell body. They are much longer. There is only one axon available per nerve cell

3. Central nervous system (CNS): It consists of the brain and spinal cord of the vertebrates. The sensory information can be received by the CNS and they processed the information to the effector organ. The nerve axons consist of slender projections and carry short nerve impulses in it.

Peripheral nervous system (PNS): It consists of the somatic nervous system and automatic nervous system. PNS sends information to the CNS and sends responses from CNS to effector organs. It is composed of long nerve fibers.

Q D. Define the following terms:

1. A stimulus is anything that can trigger a physical or behavioral change.

2. Synapse is the gap between nerve ending of one neuron and dendrites of another.

3. Neurons are the fundamental unit of the nervous system specialized to transmit information to different parts of the body.

4. Axon is a tube-like structure that carries electrical impulse from the cell body to the axon terminals that pass the impulse to another neuron.

5. Cyton is a large part of the fiber of a nerve, or neuron.

Q E. Very Short Answer Questions:

1. Electrical

2. Reflex action

3. The part of neuron that acquires information is dendrite and information travels as an electrical impulse.

4. Epinephrine

5. (a) gustatory (b) Olfactory

Q F. Short Answer Questions (Type I):

1. The components of the reflex arc are receptor, sensory neurons, association neurons, motor neurons and effector.

2. The neuromuscular junction is a synaptic connection between the terminal end of a motor nerve and a muscle.

3. Two benefits of a reflex arc

- It helps to protect the body from stimulus.
- It is quick and hence effective.

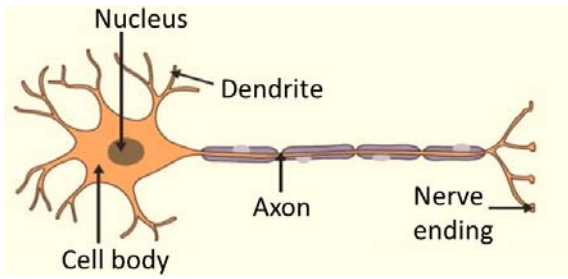
Q G. Short Answer Questions (Type II):

1. Three differences between nervous control and chemical control

- Nervous control is a very fast process whereas chemical control is a very slow process.
- Neurons are less persistent, and chemical control is a highly persistent process.
- Nervous control is valuable for connected cells only and chemical control is a universal process.

2. (a) Spinal cord controls the reflex arcs.

(b)



3. A reflex action is an automatic (involuntary) and quick reaction to a stimulus that protects the body from potentially dangerous situations like touching something hot. A reflex action often involves a very simple nervous pathway called a reflex arc. A reflex arc starts off with receptors being excited. They then send signals along a sensory neuron to spinal cord, where the signals are passed on to a motor neuron. As a result, one of muscles or glands is stimulated.

Q H. Long Answer Questions:

1. Synapse is the gap between nerve ending of one neuron and dendrites of another.

Transmission of nerve impulses between two neurons takes place through the synapse. The axon terminal of a neuron releases specialized chemicals called neurotransmitters. These chemicals travel through the synapse and reach the dendrites of the successive neuron..

The transfer of chemical messengers across the synapse carries the message in the form of an electrical impulse.

2. A – Receptor: It detects a stimulus.

B-Sensory neurons: It conducts the nerve impulses towards the central nervous system (CNS).

C-Relay Neuron: It connects sensory neurons to motor neurons.

D- Motor neuron: It conducts the response nerve from the CNS to the effector organ.

E- Effector: It responds to stimulus.

WORKSHEET-2

The Human Brain

Q A. Multiple Choice Questions:

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

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

1. Vertebral column

2. PNS

3. Fore-brain

4. fore-brain

5. Pons

Q C. Give one word for the following:

1. Brain

2. Involuntary actions

3. Medulla oblongata

4. Hypothalamus

5. Medulla oblongata

Q D. Match the following:

Column A	Column B
1. Brain box	(b) Cranium
2. Respiratory centre	(e) Pons
3. Body balance	(a) Cerebellum
4. Thinking	(c) Cerebrum
5. Cerebral fluid	(d) Shock absorber

Q E. Very Short Answer Questions:

1. Central nervous system

2. The brain can be divided into three basic units: the forebrain, the midbrain, and the hindbrain.

3. Cerebellum

4. Medulla oblongata

5. In a reflex action, the brain plays no part.

Q F. Short Answer Questions (Type I):

1. Cerebellum controls the voluntary action of our body. So, if it is not functioning properly, voluntary actions of our body like maintaining the posture, balance, etc., will be affected.

2. (a) The cerebellum is situated at the back side of the skull

(b) Temporal lobe in cerebrum is under the lateral fissure

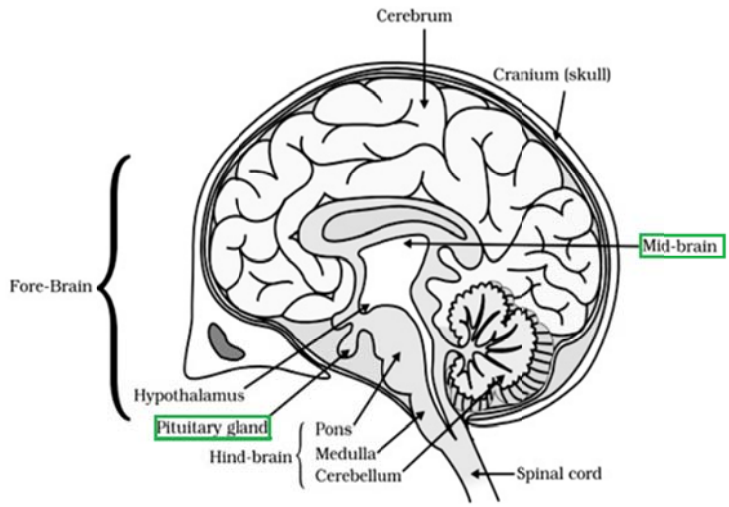
3. A **voluntary action** is under the control of one's will, means under the control of the brain.
Examples - Dancing, Eating, Writing, etc.

An **involuntary action** is not under the control of one's will, it is controlled by the spinal cord.
Examples- Breathing, Respiration, Blinking eyelids etc.

Q G. Short Answer Questions (Type II):

1. The muscle cells move by contraction and relaxation by utilizing the energy in the form of ATP. Muscle contraction is initiated by the signal sent by the CNS to the muscle fibres. During contraction, the muscles fibres shorten, the muscle pulls on the ligaments that connect the bones and the movable body parts. During relaxation the muscle fibres come to their original position. This movement of muscles cells or the muscle fibres results in the movement of the body parts.

2.



3. The nerves of the peripheral nervous system are responsible for relaying information between the body and the brain. This includes involuntary body functions such as breathing, blood flow, and heartbeat as well as sensory information and control of voluntary movement.

Q H. Long Answer Questions:

1. (a) Cerebellum: It controls body balance & Muscles coordination.

(b) Cerebrum: It controls thinking, speech, Planning, Memory etc.

(c) Medulla: It controls most of the involuntary activities of the body such as heartbeats, breathing, etc.

(d)Pons: It is involved in transferring information between the cerebellum and motor cortex. It controls the magnitude and frequency of the respiration.

(e) Mid-brain: It acts as a bridge and transmits signals from hindbrain and forebrain.

2. (a) Brain is protected from injuries by a brain box also called cranium. And protected by cerebrospinal fluid that prevent shocks.

(b) A protective layer of bone called the vertebral column covers and protects your spinal cord.

(c) The spinal cord houses the all-important nerves that transmit messages between the brain and the body.

The brain is the most important organ in the human body. It controls and coordinates actions and reactions, allows us to think and feel, and enables us to have memories and feelings.

Therefore, it is essential to protect brain and spinal cord.

WORKSHEET-3

Coordination in Plants

Q A. Multiple Choice Questions:

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

Q B. Differentiate between the following:

1. Phototropism: Phototropism is the direction of growth of a plant in response to the direction of the light. Example - Movement of shoot of plant upwards towards light.

Geotropism: The movement of a plant in response to gravity is called geotropism. Example - Root growing downward.

2. Plant coordination: In plants control and co-ordination is done by chemical substances called plant hormones or phytohormones. They do not have nervous system. They lack glands that produce and secrete hormones. Instead each plant cell produces hormones.

Animal coordination: In animals control and co-ordination is done by nervous system and endocrine system. In animals nervous system is well developed and consists of brain, spinal cord and nerves. In animals hormones are secreted by endocrine glands.

3. Electrical transmission: It transmits the signals in the neural system. Here, transmission takes place in the form of electric potential. It transmits faster.

Chemical transmission: It transmits the signals in the hormonal system. Here, transmission takes place through chemicals. It transmits slower.

Q C. Give reasons for the following:

1. Because of changes in orientation of plant in response to external and internal stimuli.

2. Because it is a sensitive plant which when touched responds by folding up its leaves.

3. Hydrotropism requires a root to bend from a drier to a wetter soil zone. Roots require water to grow so roots that happen to be in moist soil will grow and branch much more than those in dry soil.

4. Sunlight is required for photosynthesis. The shoot of the plant bends towards sunlight to synthesize its food. This type of movement is called as a phototropic movement.

5. Because cytokinins induce cell division and are concentrated in the parts or regions where cell division takes place vigorously.

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

1. False

2. False

3. True

4. True

5. False

Q E. Very Short Answer Questions:

1. Phototropism and Geotropism

2. The growth of pollen tube down to the ovule in the ovary through the stigma and style during fertilization in order to respond to the presence of sugars in the style.

3. Mimosa pudica and Venus fly trap

4. Tropic movement is the movement of the plant in response to the stimulus present in the environment, this movement is in response to root and shoot growth. For example, phototropism is the movement of a plant in response to light.

5. (a) Stem tips (b) Roots

Q F. Short Answer Questions (Type I):

1. Plant hormones are signal molecules that occur in extremely low concentrations within the plants. Plant hormones control all aspects of plant growth and development, from stress tolerance to reproductive development. Growth of the stem is regulated by Gibberellins.

2. Cytokinins are present in greater concentration in fruits and seeds. The main function of cytokinins is to increase cell division, thus creating new cells that make the plant grow.

3. A tendril is a specialized stem, leaf with a threadlike shape that is used by climbing plants for support and attachment. The tendrils are sensitive to touch. When they come in contact with any support, the part of the tendril in contact with the object does not grow rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it.

Q G. Short Answer Questions (Type II):

1. (a) Phototropism

(b) Auxin

(c) Auxin moves to the darker side of the plant, causing the cells there to grow larger than corresponding cells on the lighter side of the plant. This produces a curving of the plant stem tip toward the light, a plant movement known as phototropism. Auxin also plays a role in maintaining apical dominance.

2. Hydrotropism is a plant's growth response toward water sources.

Activity to demonstrate hydrotropism:

Take a plant (pea seedling) in a nude jar filled with sand. Now place a porous pet filled with water in the wide jar.

Roots of the plant will green towards water and bond towards the water source showing hydrotropism.

3. Multicellular organisms need another means of communication between cells besides nervous coordination because there are multiple cells in the body and it is not possible for the nervous tissues to reach to each cell.

Q H. Long Answer Questions:

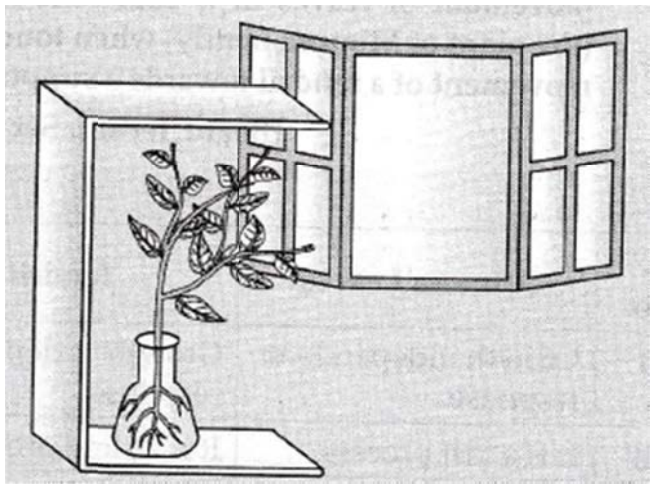
1. (a) Growth movement of the shoot in plants in response to a light stimulus is called phototropism.
(b) This happens as follows:

- When sunlight falls straight on the plant, the auxin hormone synthesized at the tip of the stem spreads uniformly down the stem and due to an equal concentration of auxin, shoot grows straight.
- When sunlight falls on only one side of the plant, the auxin diffuses toward the shady side of the shoot. The concentration of auxin stimulates the cells to grow longer. Therefore, the stem appears to bend towards the source of light.

(c) Activity to demonstrate phototropism:

- Fill a conical flask with water.
- Cover the neck of the flask with a wire mesh.
- Keep two or three freshly germinated beam seeds on the wire mesh.
- Take a cardboard box which is open from one side.

- Keep the flash in the box in such a manner that the open side of the box faces light coming from a window.
- After two or three days, you will notice that the shoots bend towards light and roots away from light.
- Now turn the flask so that the shoots are away from light and the roots towards the light.
- Leave it undisturbed in this condition for a few days.



Folding up of the leaves of mimosa plant is an example of nastic movements.

2. Five plant hormones and their functions are:

- Auxins - promotes cell growth and differentiation especially on the tips of plants.
- Cytokinin - promotes cell division and lateral growth in plants.
- Gibberellins - helps in breaking dormancy in seeds and buds.
- Abscisic acid - promotes dormancy in seeds and buds.
- Ethylene - promotes fruit ripening.

WORKSHEET- 4

Hormones in Animals

Q A. Multiple Choice Questions:

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

Q B. State the function of the following:

1. Glucagon's role in the body is to prevent blood glucose levels dropping too low.

2. Progesterone main functions are regulating menstruation and supporting pregnancy in the female body.

3. Thymus produces progenitor cells that develop into T-cells. These T-cells help the body fight against infections. They also aid in the growth of other organs in the immune system.

4. Adrenaline is rapidly secreted in response to the stress of any kind and during emergency situations.

5. Oxytocin stimulates contraction of the uterus during childbirth and milk ejection from the mammary glands.

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

1. ducts

2. thyroid

3. pituitary

4. adrenaline

5. goitre

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

1. False

2. False

3. False

4. False

5. True

Q E. Very Short Answer Questions:

1. Swollen neck

2. Glucagon

3. Pituitary gland

4. Pancreas

5. On top of each kidney

Q F. Short Answer Questions (Type I):

1. An endocrine gland is a gland which secretes its products directly into the blood stream. Examples of endocrine glands are pituitary gland, ovaries, testes, thyroid gland, adrenal glands.

2. Deficiency of growth hormone causes dwarfness.

Excess of growth hormone causes gigantic of some people.

3. Because goitre is caused due to the deficiency of iodine in the diet and people living in coastal areas mainly feed on sea foods which contain sufficient amount of iodine. So, they usually not suffer from goiter.

Q G. Short Answer Questions (Type II):

1. Hormones are the chemical substances which coordinate and control the activities of living organisms and also their growth.

The hormone secreted by thyroid is thyroxine.

Its function is to regulate the metabolism of carbohydrates, fats and proteins in the body so as to provide the best balance for growth.

2. When adrenaline is secreted into the blood, it-

- Speeds up the heartbeat, thus providing more oxygen to the limbs.
- Increases the rate of blood circulation thus resulting in an increase in blood pressure.
- Increases the blood supply to limbs and face.
- Stimulates the liver to put more glucose into the blood.

3. When *blood sugar* rises, cells *in the pancreas* release insulin, causing the *body* to absorb *glucose* from the *blood* and lowering the *blood sugar level* to normal.

Q H. Long Answer Questions:

1. (a) A - Hypothalamus

C - Pituitary gland

G - Pancreas

I – Testis

(b) Hypothyroidism

(c) B - Pineal gland - melatonin

E - Thymus gland - thymosin

F- Adrenal gland - Adrenal cortex hormones

H – Ovary - estrogen

2. (a) He is suffering from diabetes.

(b)Deficiency of insulin causes diabetes.

(c)Pancreas secretes insulin. Insulin helps in regulating blood sugar.

(d) When the sugar level in blood increases, it is detected by the alpha-cells of the pancreas which responds by producing more insulin. As the blood sugar level falls, insulin secretion is reduced.

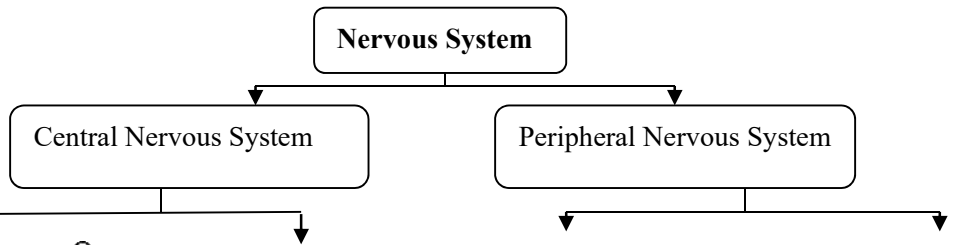
WORKSHEET-5

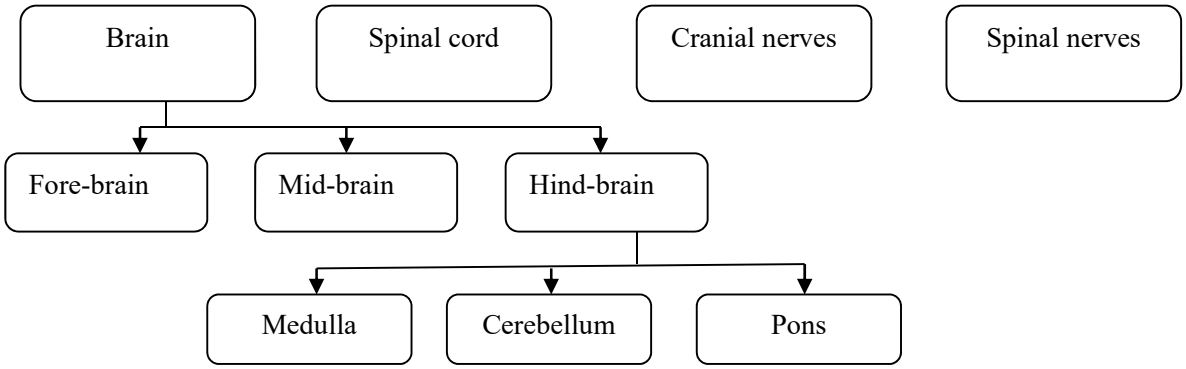
Based on Complete Chapter

Q A. Multiple Choice Questions:

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

Q B. Complete the flowchart given below:





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

1. False

2. True

3. False

4. True

5. False

Q D. Complete the following table:

Endocrine gland	Hormone secreted	Function
Pituitary	**Growth hormone**	Enhances growth in adolescents and children. It also contributes to the regulation of body fluids, fat metabolism, sugar and also the functions of the heart.
Ovary	Estrogen and Progesterone	Regulate the development and function of the uterus.
Thyroid	**Thyroxin**	Plays a crucial role in heart and digestive function, metabolism, brain development, bone health, and muscle control.
Pancreas	**Insulin**	Allows cells in the muscles, liver and fat (adipose tissue) to take up sugar (glucose) that has been absorbed into the bloodstream from food.
Pancreas	**Glucagon**	Prevent blood glucose levels dropping too low.

Adrenal	Aldosterone and cortisol	Help in maintaining blood pressure, heart function, immune system and blood glucose (sugar) levels.
Testes	**Testosterone**	Control the development of male sex organs and male characters such as deepening of voice, moustache, beard and other body hair.

Q E. Very Short Answer Questions:

1. (a) Cell division — Cytokinins

(b) Growth of the stem — Gibberellins

2. Gustatory receptors are present on the papillae of the tongue.

3. The gap between two neurons is called a synapse.

4. Iodine deficiency in our diet cause goiter. The main symptom of goiter is swelling of thyroid gland which is present in the neck.

5. (a) Parathyroid hormone is responsible for balancing calcium and phosphate.

(b) Aldosterone is the hormone that controls the Blood pressure.

6. Instead of relying on the memorized position of keys, the typist finds each key by sight and moves their finger over to press it, usually the index finger of their dominant hand.

7. It may be due to improper functioning of glands to release hormone.

Q F. Short Answer Questions (Type I):

1. Stems are positively phototropic and bend towards the direction of light. The movement is due to occurrence of more auxin on the darken side and lesser auxin on the illuminated side as a result there in more growth on the darker side which causes the stem to bend towards light.

2. The use of iodised salt is advisable because iodine is essential for the synthesis of thyroxin hormone in thyroid gland. Deficiency of iodine causes goitre. Iodised salt fulfills the requirement of iodine of body and protects against goitre disease.

3. The information passing through neurons is in the form of chemical and electrical signals, called nerve impulse.

(a) Towards the cell body: Dendrites.

(b) Away from the cell body: Axon.

4. Auxin is the hormone that promotes the growth of tendril around a support as it is synthesized in the tip of the shoot and stimulates the growth of the cells on the opposite side which causes coiling of the tendril around the support.

5. In the case of a spinal cord injury, signals coming from the nerves and the signals coming to the receptors will be disrupted. This is because both these signals meet in a bundle in the spinal cord. Hence, both these signals get disrupted.

Q G. Short Answer Questions (Type II):

1. (a) The midbrain consists of the centre for visual and auditory reflexes. It is involved in the processing of visual and auditory information. It regulates eye movement and pupil dilation. It is involved in regulating muscle movement and motor control

(b) Abscisic acid (ABA) is an important phytohormone regulating plant growth, development, and stress responses.

2. (a) Light, water, touch, chemicals and gravity.

(b)

S.NO.	Stimuli	Type of tropism.
1	Light	Phototropism: The growth of plant parts in response to light is known as phototropism.
2	Water	Hydrotropism: It is the process of growth or movement of roots towards the source of water.
3	Touch	Thigmotropism: Growth movement of plants in response to touch stimulus is called *thigmotropism*,
4	Chemical	Chemotropism: Plant movement in reaction to chemical stimuli is known as chemotropism.
5	Gravity	Geotropism: The movement of plant parts in response to the direction of gravity is known as *geotropism*.

3. (a) Testosterone

(b) Growth hormone

(c) Insulin

4. (a) A - Geotropism B – Phototropism

(b) Geotropism is the movement or growth of plant parts in response to the force of gravity. It is caused by an unequal distribution of auxin hormones. An example of geotropism is the growth of roots towards gravity (downwards).

Phototropism is the growth of plant parts in response to a light stimulus. During phototropism, the cells on the plant that are farthest from the light contain a chemical called auxin reacts, which causes the plant to have elongated cells on the furthest side from the light. Hence, shows the growth and movement

toward light. An example of phototropism is the growth of plant stem in the direction of sunlight (upward).In a plant, stem (or shoot) shows positive phototropism, as it grows towards the sunlight.

5. The function of receptors is to detect the information from the environment. These are located in our sensory organs like eye, ear, skin, nose and tongue. For example- olfactory receptor detect the smell. If these receptors do not work correctly, there will be a delay in getting information from the environment to the brain or spinal cord. And due to this, the reaction of the information is also late, which cause harmful effect on our body.

For example,- if skin receptors are damaged, then we cannot get the heat as a stimulus. And if we accidentally touch the hot object, then our hands might get burn.

Q H. Long Answer Questions:

1. (a) Hormones are intercellular chemical messengers secreted by specific endocrine glands of the body, which travel through the body to reach target organs or cells and initiate a process. Chemically, hormones are proteins.

(b) Four characteristics of hormones are:

- act as chemical messengers
- secreted by endocrine glands
- act upon specific cells/tissues/organs called target cells/tissues/organs
- either accelerate or inhibit a reaction

(c) (i) Prolactin

(ii) Parathyroid hormone

(iii) Insulin

(iv) Testosterone

2. (a) **Root**: Because root shows positive geotropism and negative phototropism.
(b) **Stem (or Shoot)**: Because stem shows negative geotropism but positive phototropism
(c) **X**: Because root exhibit positive hydrotropism and it is X denotes root.
(d) **Y**: Because stem can have tendrils on it. It is Y denotes stem.
(e) **Auxin**: Because it is the phytohormone that causes the part X (root) to exhibit negative phototropism.

Q I. Assertion-Reason Questions:

1. (a) 2. (b) 3. (a)

Q J. Case-based Question:

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

CHAPTER – 7

How Do Organisms Reproduce?

WORKSHEET – 1

Asexual Reproduction in Organisms

A. Multiple choice Questions:

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

B. Match the following:

	Column A	Column B
1.	*Plasmodium*	(d) Multiple Fission
2.	*Spirogyra*	(a) Fragmentation
3.	*Bryophyllum*	(e) Vegetative propagation
4.	*Rhizopus*	(c) Spore Formation
5.	*Hydra*	(b) Budding

C. Fill in the blanks using the suitable words given in the brackets:

1. Grafting
2. Reproduction
3. Spores
4. Binary
5. Stem

D. Give one word for the following:

1. Binary fission

2. Multiple Fission
3. Spore
4. Vegetative Propagation
5. Tissue culture

E. Very Short Answer Questions:

1. (a) Sexual Reproduction

(b) Asexual Reproduction

2. Rhizopus
3. Multicellular
4. Mode of reproduction is regeneration and organism is Planaria.
5. (a) Petunia and begonia

(b) African violet and Begonia rex.

F. Short Answer Questions (Type I):

1. The process by which some organisms replace or restore lost or amputated body parts is called regeneration. Planaria and starfish can regenerate**.**

2. It helps a species to survive, it also helps us to determine who is who, it helps organisms to adapt to their environment as well as to changes which do occur in the environment, however it also helps a species to emerge strong if favored by natural selection. Variation helps a species to be resistant to diseases, thus if a species is to survive there has to be variation.

3. Yes, we can because in unicellular animals there is only one cell, when it will divide form a new cell and hence new organisms.

G. Short Answer Questions (Type II):

1. Regeneration is not the same as reproduction. It is the production of new tissues, cells, organs, etc in an organism to replace lost cells. It is not a mode of reproduction. It doesn't give birth to progenies and doesn't contribute to the continuity of species.

2. Tissue culture involves the use of small pieces of plant tissue (explants) which are cultured in a nutrient medium under sterile conditions. Using the appropriate growing conditions for each explant type, plants can be induced to rapidly produce new shoots, and, with the addition of suitable hormones new roots.

3. Clone refers to offspring of an organism formed by asexual method of reproduction. Since clones possess exact copies of the DNA of their parent, they exhibit remarkable similarity.

H. Long Answer Questions:

1. A process in which a new plant is produced from vegetative parts like roots, stems and leaves is called vegetative propagation. Potato tubers possess buds which grow into new plants.

Advantages of vegetative propagation are:

The new plants contain the genetic material of only one parent, so they are essentially clones of the parent plant.

Disease-free plants can be developed in a short time using plant tissue culture.

2. (a) Fission is the division of a single entity into two or more parts and the regeneration of those parts to separate entities resembling the original. The object experiencing fission is usually a cell, but the term may also refer to how organisms, bodies, populations or species split into discrete parts.

(b) Binary fission occurs during favorable conditions, forms two daughter individuals and makes the organism immortal. Multiple fission can take place under favorable as well as unfavorable conditions, produces a number of daughter individuals and cannot make the organism immortal.

(c) Leishmania reproduces by binary fission while Amoeba reproduces by multiple fission.

WORKSHEET 2

Sexual Reproduction in Flowering Plants

A. Multiple Choice Questions:

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

B. State whether the following statements are true or false:

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

C. Fill in the blanks using suitable words given in the brackets:

1. Sexual
2. Flowers

3. Germination
4. Young
5. Pollen Grains

D. Define the following terms:

1. Pollination is the process of transferring the pollen to the stigma of the flower. This can be either self-pollination or cross pollination.
2. Fertilisation is the process which occurs after the pollination and involves fusion of male and female gametes of the plants**.**
3. Pollen can be defined as a fine or a coarse powder, which consists of micro-gemetophytes and produces the male gametes or the sperm cells.
4. A zygote is a diploid cell formed when a male gamete fertilizes a female gamete. It is a eukaryotic cell that carries an organism's blueprint for continuing the species.
5. Bisexual flowers are those which have both male and female reproductive structures, including stamens and an ovary.

E. Very Short Answer Questions

1. Stigma, Style and Ovary
2. (a) Ovules

   (b) Ovary

3. Post Fertilisation the ovary becomes the fruit and the ovule becomes the seed.
4. Example of unisexual flower is Papaya and bisexual Flower is Hibiscus
5. Insect, wind, air, birds

F. Short Answer Questions (Type I):

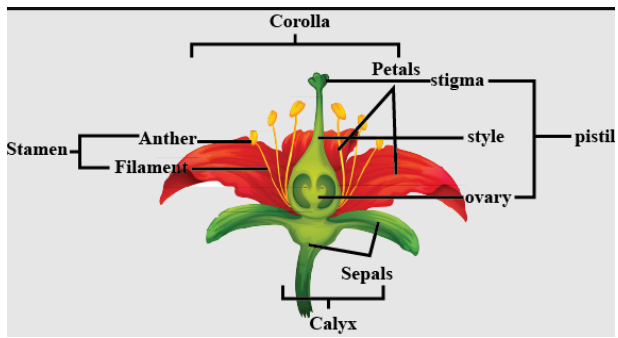
1. (a) Stamen

   (b) Carpel

2. Male gametes are produced in anthers while female gametes are produced in ovaries in flowering plants.
3. Primary function of flowers is reproduction. They mediate the joining of the sperm, contained within pollen, to the ovules, contained in the ovary.

G. Short Answer Questions (Type II):

(a)



(b) Stamen is the male reproductive part and produces pollen grains. Carpel is the female reproductive part and produces egg cells.

1. The ovary contains ovules and each ovule has an egg cell. The male germ cell produced by pollen grain fuses with the female gamete present in the ovule. This fusion of the germ cells is called fertilisation.
2. Pollination and fertilisation are different through the fact that the pollination leads to fertilisation. Pollination is the process flowering plants undergo by transferring pollen to the stigma. Fertilisation is basically the joining of sperm and egg.

H. Long Answer Questions:

1. (a) If the transfer of pollen occurs in the same flower, it is referred to as self-pollination. On the other hand, if the pollen is transferred from one flower to another, it is known as cross-pollination.

(b) Insects help in cross pollination by transferring the pollen from one flower to another.

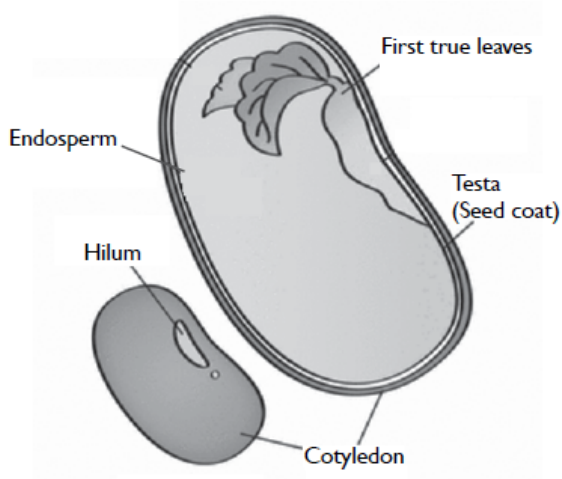
(c) Flowering plants attract pollinating insects with scent from their flowers and bright colours. If they have become infested with herbivores like caterpillars, they attract beneficial insects like parasitic wasps with the help of scent signals from their leaves.

2. Angiosperms are the type of plants which reproduce by sexual reproduction method.

(b) A seed is a fertilised ovule containing the plant embryo. A typical seed consists of the following parts:

- Testa: It is the outer coat of the seed.
- Micropyle: It is a tiny pore in the testa that lies on the opposite of the tip of the radicle.
- Hilum: It is a scar left by the stalk which attached the ovule to the ovary wall before it became a seed.

- Cotyledon: In monocotyledons, there is just one cotyledon whereas in dicotyledons there are two cotyledon
- Radicle: This is the embryonic root which will develop into the primary root of the plant.
- Plumule: This is the embryonic shoot.
- Endosperm: In many plants, a separate part for storage of starch develops and this is called the endosperm.



WORKSHEET – 3

Sexual Reproduction in Humans

A. Multiple Choice Questions:

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

B. Define the following terms:

1. Puberty is a transitional period between childhood and adulthood, during which a growth spurt occurs, secondary sexual characteristics appear, fertility is achieved, and profound psychological changes take place.

2. Implantation is the stage of pregnancy at which the embryo adheres to the wall of the uterus.

3. The gestation is the time in which a fetus develops, beginning with fertilisation and ending at birth.

4. Ovulation is the release of an egg which may then be fertilised by a sperm cell or dissolved during menstruation.

5. Menstruation is the periodic shedding of the lining of a woman's uterus. It is one of the phases of the menstrual cycle. The uterine lining breaks down into a bloody substance. It then passes down through the cervix and exits through the vagina. The process usually lasts from three to five days.

C. Differentiate between the following:

1.

Embryo	Foetus
An embryo is formed by the repeated cell division of a zygote.	A foetus is formed by the growth and development of an embryo.
An embryo is an unborn baby in the uterus in the early stages of development (upto 8 weeks).	A foetus is an unborn baby in the uterus in the later stages of development (after 8 weeks till birth).
An embryo is multicellular.	A foetus is multicellular.

2.

Menarche	Menopause
Menarche is the first menstruation of the human female on the attainment of puberty that occurs at about 13 years of age.	Menopause is the phase in the human females life when ovulation and menstruation stop that occurs at about 45-55 years of age.
It marks the beginning of reproductive life of a women.	It marks the end of the reproductive life of human female**.**

3.

Testosterone	Progesterone
Testosterone is a male reproductive hormone produced by testes	Progesterone is a female reproductive hormone produced by ovaries.

D. Give one word for the following:

1. Uterus
2. Placenta
3. Cervix
4. Prostate gland
5. Urethra

E. Very Short Answer Questions:

1. Cervix
2. 2 to 8 days
3. Fallopian tube
4. In girls, breast size begins to increase, with darkening of the skin of the nipples at the tips of the breasts. Also they begin to menstruate at around this time.
5. Boys begin to have new thick hair growth on the face and their voices begin to crack.

F. Short Answer Questions (Type I):

1. Fish and frog undergo external fertilisation. Human and lion undergo internal fertilisation**.**
2. A fertilised ovum develops into a blastocyst, an embryo, then a fetus and will be formed into a baby in just twelve weeks. The baby develops from conception to term, in a month-to-month progress, and the mature baby takes around 40 weeks' time to get fully developed.
3. The prostate and the seminal vesicles add their secretions so that the sperms are now in a fluid which makes their transport easier and this fluid also provides nutrition.

G. Short Answer Questions (Type II):

1. (a) In males the gonads are called testes while in females, the gonads are called ovaries. The usually paired gonads of humans produce both gametes and hormones necessary for reproduction.

(b) In sexual reproduction more varations are produced. Thus it ensures survival of species in a population. The new formed individual has characteristics of both parents. Variations are more viable in sexual mode than in asexual one. This is because in a sexual reproduction, DNA has to function inside the inherited cellular apparatus.

2. Two gametes (male and female) fuse together to form a zygote that gives rise to a new individual. Each of the gametes has 23 chromosomes which means half the number of chromosomes present in a diploid cell (other cells in the paternal and maternal body). Hence both parents and offspring have equal number of chromosomes.
3. If the egg is not fertilised, it lives for about a day. Since the ovary releases one egg every month, the uterus also prepares itself every month to receive a fertilised egg. Thus its line becomes thick and spongy. This would be required for nourishing the embryo if fertilisation takes place. Now this lining is not needed. So the lining breaks and comes

out through the vagina as blood and mucus. This cycle takes place every month and is known and menstruation.

H. Long Answer Questions:

1. (a) The life support system of fetus is composed of placenta, umbilical cord and amniotic sac (which is filled with amniotic fluid).

The placenta is an organ that develops in the uterus during pregnancy. This structure provides oxygen and nutrients to a growing baby. It also removes waste products from the baby's blood. The placenta attaches to the wall of the uterus, and the baby's umbilical cord arises from it.

(b) A human baby takes 8-9 months to develop before birth.

2. (a) Part A is seminal vesicle and part B is urinary bladder.

(b) The hormone secreted by testis (organ X) is testosterone. The role of this hormone is the production of sperms for fertilisation.

(c) Tubes C and D transport sperms.

WORKSHEET – 4

Reproductive Health and Birth Control Methods

A. Multiple Choice Questions:

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

B. Give one word for the following

1. Tubectomy
2. Copper T
3. Estrogen and progestin
4. AIDS
5. Chlamydia infection

C. Give reasons for the following:

1. Prenatal sex determination is banned because of the following reasons:
- Indiscriminate female foeticide and desire for a male child.
- Declining female-male sex ratio**.**

2. Because only condoms offer the best available protection against STDs by acting as a physical barrier to prevent the exchange of semen, vaginal fluids or blood between partners.
3. The number of females is reducing in some societies of our country because of the low status of women in some society; discrimination against women in almost all spheres of life including minimum level of nutrition, access to health, education and other services and amenities; female illiteracy; neglect of the female child and girls; and the deep rooted preference for sons to daughters leading to heinous practices like female infanticide and female foeticide.
4. Some women experience side effects on taking oral contraceptive pills due to special health problems.
5. Because AIDS weakens the immune system of the patients to the extent that other opportunistic infections (OIs) cannot be prevented and lead to death.

D. State whether the following statements are true or false:

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

E. Very Short Answer Questions:

1. Rate of Birth and Rate of Death
2. Warts are a type of skin infection caused by the human papillomavirus (HPV). The infection causes rough, skin-colored bumps to form on the skin. The virus is contagious.
3. Oral contraceptive pills have side effects because they change the hormonal balance in body.
4. Large population require more land. Large population requires more resources.
5. Physical barriers such as condoms and diaphragm.

F. Short Answer Questions (Type I)

1. (a) Acquired Immune deficiency Syndrome

   (b) Human Immune Virus

2. (a) Neisseria Gonorrhea bacterium

   (b) HIV

3. (a) Condom

   (b) Diaphragm

G. Short Answer Questions (Type I)

1. The bacteria, viruses or parasites that cause sexually transmitted diseases may pass from person to person in blood, semen, or vaginal and other bodily fluids.
2. The main drawback of surgical method of contraception is that they are poorly reversible.
3. (a) The permanent birth control method of contraception in men is called vasectomy in which tubes (vas deferens) are cut and tied. The permanent birth control method for women is tubal ligation (fallopian tubes tied) or hysterectomy.

   (b) Male condom, female condom (diaphragm) and spermicidal foam.

H. Long Answer Questions:

1. Contraception or birth control is a method or device used to prevent pregnancy. Different methods of contraception are as follows:
   - Long-acting reversible contraception, such as the implant or intrauterine device (IUD).
   - Hormonal contraception, such as the pill or the Depo Provera injection.
   - Emergency contraception, such as the emergency contraceptive pill (ECP) or a copper IUD.
   - Barrier methods, such as condoms.
   - Permanent contraception, such as vasectomy and tubal ligation.
2. (a) Copper T prevents pregnancy in two ways:

(i) The released copper creates changes in the cervical mucus and inside the uterus that kill sperms or make them immobile.

(ii) The Copper T changes the lining of the uterus, preventing implantation.

Side effects of copper T are:

- They don't provide protection against STD.
- They can cause hormonal imbalance.

(b) Sexually transmitted diseases (STDs) are infections that are passed from one person to another through sexual contact. The causes of STDs are bacteria, parasites, yeast, and viruses. There are more than 20 types of STDs, including chlamydia, genital warts, genital herpes, gonorrhea, HIV/AIDS, HPV, syphilis etc. Most STDs affect both men and women, but in many cases the health problems they cause can be more severe for women.

Two example of bacterial STD are: Gonorrhea, syphilis

Two example of Viral STD are: Genital herpes and HIV

WORKSHEET – 5

Based on Complete chapter

A. Multiple Choice Questions:

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

Analysing & Evaluating Questions

6. ()
7. (a)

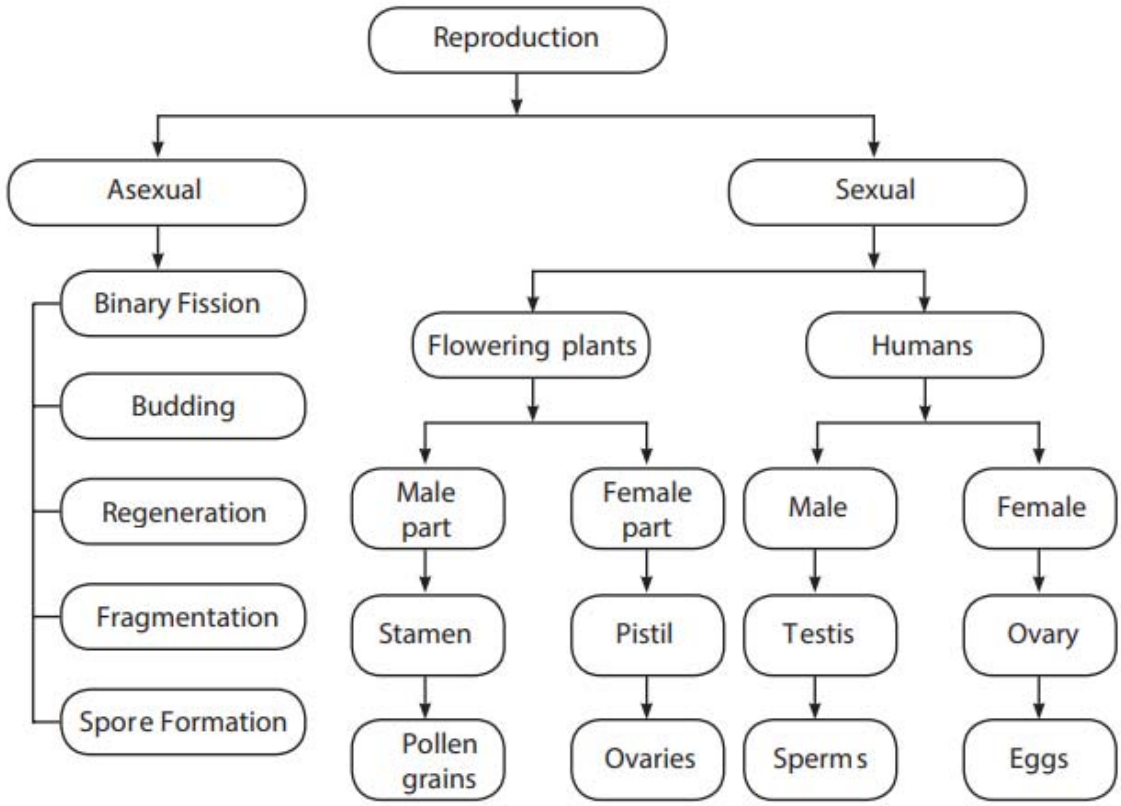
B. Give one word for the following:

1. Regeneration
2. Vegetative Propagation
3. Pistil
4. Menstruation
5. Birth Control

C. Fill in the blanks using the suitable words given in the brackets:

1. Barrier
2. Zygote
3. Oviducts
4. Leaves
5. Petals

D. Complete the flowchart given below:



E Very Short Answer Questions:

1. Uterus
2. (a) Grafting

(b) Budding

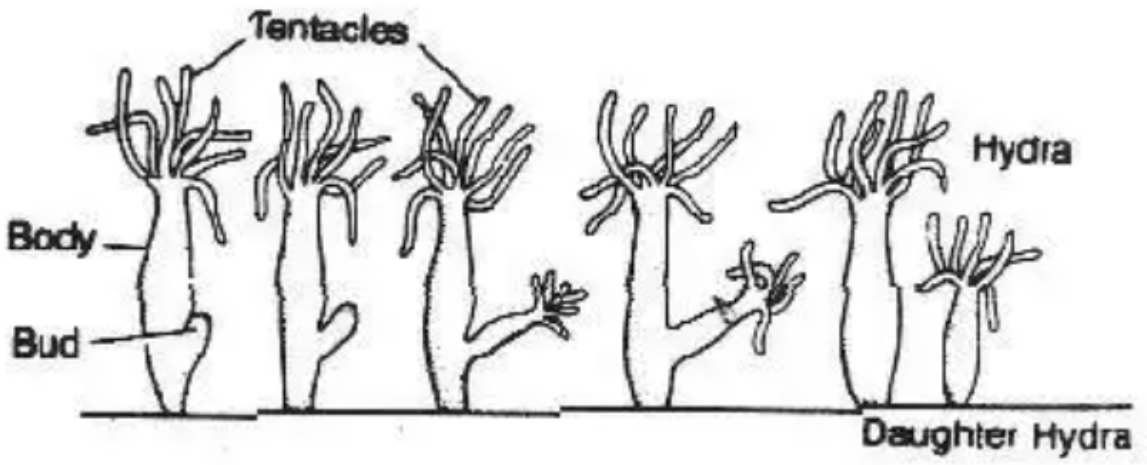
3. Papaya
4. 1
5. If the egg is not fertilised, the lining of the uterus wall breaks and is released in the form of blood and mucus through the vagina. This process is called menstruation.

Analysing & Evaluating Questions

6. The female gametes would also have twenty four chromosomes. Inn zygote there would be forty eight chromosomes.
7. While making a cutting care should be taken to see that there are some buds on it.

F. Short Answer Questions (Type I)

1. DNA copying creates variations which are useful for ensuring the survivals of the species. It ensures that same blueprint of the body design is maintained.
2. Organisms such as hydra use regenerative cells for reproduction in the process of budding. In hydra, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and, when fully mature, detach from the parent body and become new independent individuals.



3. Two advantages of using mechanical barriers are:
   - It prevents STD's.
   - It provides protection against unwanted pregnancy.
4. In budding, a small part protects the body of the parent organism grows out as a bud which then detaches to become a new organism, while in spore formation, the parent plant produces hundreds of microscopic reproductive units called spores which germinate and produce new plants. Budding occurs in hydra, yeast, etc., while spore formation takes place in Rhizopus, Peniillium, etc.

Analysing & Evaluating Questions

5. The reason is that many multicellular organisms are not simply a random collection of cells. Specialised cells are organised as tissues, and tissues into organs, which are placed at definite positions in the body. In such careful situation, cell by cell division is not possible.

G. Short Answer Questions (Type II):

1. Placenta is a special tissue and life support system to the baby during pregnancy. It gives nutrition and oxygen to the embryo from mother's blood. The developing embryo also generates waste substances which can be removed by transferring them into the mother's blood through the placenta.
2. (a) A barrier between the female sex cells and male sex cells is put up in this method that helps in blocking the sperms from reaching the eggs/ova present. Therefore, barrier methods help to avoid fertilisation of ova and the sperm and prevent conception. For example, condoms.

(b) This birth control method interferes with a woman's hormonal balance in the body. Interference of hormonal balance may result in prevention of ovulation, fertilisation or implantation of fertilised egg. For example, contraceptive pills.

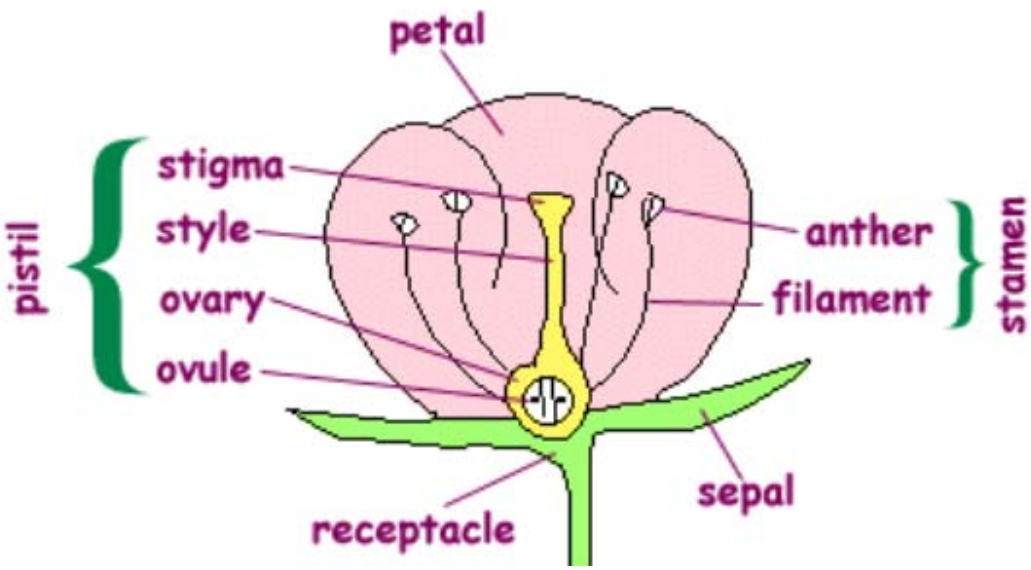
(c) Surgical operation is one of the accurate methods to avoid pregnancy because this method renders both men and women (whoever is undergoing the procedure) infertile. In case of women, the surgical procedure refers to as tubectomy or tubal ligation, while in case of men, the process is known as vasectomy

3. (a) Grafting is the process of joining the parts of plants together to grow as one.

(b) A rooted stem into which a scion or a bud is grafted is called a stock. On the other hand, a piece of young stem or bud which is inserted into a root stock is called scion.

(c) Cherry and apply trees.

4. (a)



(i) Ovary contains ovules.

(ii) Pollen grains are produced in anther.

(iii) Petals attract insects for pollination

(iv) Stigma is the part of flower on which pollen lands and germinates.

(b) The ovary contains ovules and each ovule has an egg cell. The male germ-cell produced by pollen grain fuses with the female gamete present in the ovule. This fusion of the germ-cells is called fertilisation which produces a zygote. It is capable of growing into a new plant. Thus, the pollen needs to be transferred from the stamen to the stigma. After the pollen lands on a suitable stigma, it has to reach the female germ-cells which are in the ovary. For this, a tube grows out of the pollen grain and travels through the style to reach the ovary.

Analysing & Evaluating Question

5. When the stamen or the male part of the flower is removed, it will have no effect on flower-producing capability of the plant because the pistil or the female reproductive part is intact. So, by the process of cross fertilization, the stamen from other plant might fertilize the pistil of this flower, thereby producing a fruit.

H. Long Answer Questions:

1. The sperms travel upwards and reach the oviduct where one of the sperms fuses with the egg and forms the zygote. This process is called fertilisation. The zygote then gets implanted in the lining of the uterus, and starts dividing. The lining thickens and is richly supplied with blood to nourish the growing embryo. The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. It passes glucose and oxygen from the mother to the embryo. The developing embryo also generates waste substances which can be removed by transferring them into the mother's blood through the placenta. The development of the child inside the mother's body takes approximately nine months.

Analysing & Evaluating Question

2. (a) Follicles

(b) B is ovulation and D is menstruation

(c) Pregnancy

(d) X is 28 days, Y is approximately 9 months

(e) Hormones

I. Assertion- Reason Questions:

1. (c)
2. (b)
3. (c)

J. Case-Based Question:

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

CHAPTER – 8

Heredity and Evolution

WORKSHEET – 1

Variation and Laws of Inheritance

A. Multiple Choice Questions:

1. (c)

2. (c)

3. (d)

4. (b)

5. (d)

B. Give one word for the following:

1. Phenotype

2. Gregor Johann Mendal

3. Heredity

4. Allele

5. Chromosomes

C. Differentiate between the following:

1.

Dominant	Recessive
A dominant trait express itself in the F_1 generation.	A recessive trait does not express itself in the F_1 generation.
Block letters are used to signify the dominant allele.	Small letters are used to signify recessive characteristics.
The existence of the identical character in the other gene is not required for the dominant trait to exist.	To be inherited, the recessive characteristic requires the existence of the identical trait in the other gene.

2.

Gene	Allele
Gene is defined as a section of DNA that encodes for a certain trait.	An allele is defined as a variant form of a gene.
It determines an organism's genotype.	It determines an organism's phenotype.
The role of genes is to determine individual traits.	The role of alleles is to contribute the diversity in phenotype expression.

3.

Monohybrid	Dihybrid
Mono refers to single and hybrid means mixed breed	Di refers to two or double and hybrid means breed

Monohybrid cross is used to study the inheritance of a single pair of alleles	Dihybrid cross is used to study the inheritance of 2 different alleles

D. Fill in the blanks using the suitable words given in the brackets:

1. DNA

2. Dominant

3. Homozygous

4. Heredity

5. Dihybrid

E. Very short Answer Questions:

1. First Filial generation

2. Genetics

3. Mendel's Second Law also called the "Law of Independent Assortment," states that each gene or unit factor will be independent of other genes during sexual reproduction.

4. Genotypic ratio is 1:2:1

Phenotypic ratio is 3:1

5. Form of seed and position of flower

F. Short Answer Questions (Type I):

1. Gregor Mendel chose the pea plants for his experiments because the garden pea is an ideal subject in the study of genetics for the following reasons:

- Presence of observable traits with contrasting forms.
- It produces many offspring in one cross.
- Short life cycle.
- Ease in manipulating pollination (cross pollination).

2. (a) tt

(b) TT

3. (a) Genes

(b) Chromosomes

G. Short Answer Questions (Type II):

1. (a) In pea plant, when pure tall pea plant (TT) is crossed with pure short (tt) plant,

F1 generation will be all Tt (tall plant).

(Pure Tall) **TT** x **tt** (Pure short)

F1 generation **Tt** (All tall plant)

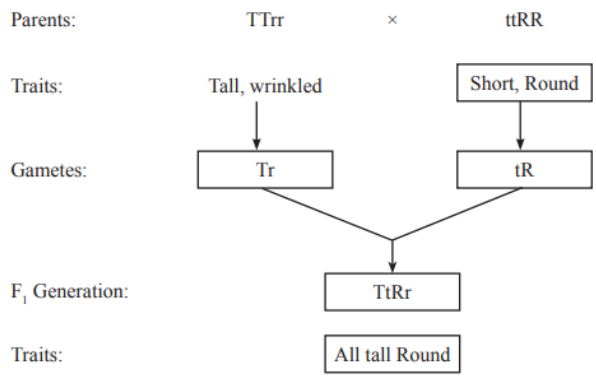
Self-pollination **Tt** x **Tt**

F2 generation **TT** **Tt** **Tt** **tt**

(b) This cross is an example of a monohybrid cross as it involved only one characteristic, the height of the plant into consideration.

2. In the F2 generation of a cross, 3:1 it is a monohybrid cross. Breeding a tall and a short pea plant is the example of such cross.

3.



H. Long Answer Questions:

1. Mendel conducted the experiments using pea plant. He selected homozygous tall (TT) and dwarf (tt) pea plants. He crossed the tall pea plant with the dwarf pea plant. It was observed that the F_1 generation are all tall plants. Thus, it was concluded that the gene causing tallness is dominant while the gene causing dwarfness is recessive. The trait expressing itself in the hybrid is the dominant one. This experiment proves Mendel's first law of inheritance which states that when a pair of contrasting factors is brought in a

hybrid, one factor inhibits the appearance of the other, one which inhibits is the dominant one and which is inhibited is recessive

2. (a) Variation occurs when one gene in the organism is mutated. If it allows the organism to survive longer than the others in the population without the mutation, it gives the mutated organism a higher chance to pass on its genes. When these genes are passed on, their kids may have the mutation but they will carry the mutated gene. As long as this helps the organism survive it will continue to be passed on to the next generation. After many generations, the mutated trait becomes common which means they have evolved.

(b) The importance of variations are:

- Variation acts as a source of raw material for evolution of species.
- Variation leads to genetic diversity, which is a key for the evolution of species. Animals are able to adapt themselves to the changing environment by inheriting some of the beneficial variations. Organisms are better suited to face the struggle for existence due to the presence of variations.
- Variations give the species an individuality of their own. In the absence of variation, there would be no science of heredity as all individuals of a race, would be identical to one another in all aspects.

WORKSHEET – 2

Heredity of Traits and Sex Determination:

A. Multiple Choice Questions:

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

B. State whether the following statements are true or false:

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

C. Complete the following table:

Information	Boy	Girl
Genotype	XY	XX
Chromosome from father	Y	X
Chromosome from mother	X	X

D. Define the following terms:

1. The transmission of characters or traits from parents to their offspring (children) is termed as heredity.
2. Homozygous refers to a cell that has two identical alleles for a single trait form both the father and mother cell.
3. Heterozygous is the state in which an organism has inherited different forms of a particular gene from each one of the biological parents.
4. Gametes are the sex cells or also known as reproductive cells that are meant to unite during the process of sexual reproduction.
5. The Y chromosome is one of the two sex chromosome present in the mammals including humans.

E. Very short Answer Questions:

1. Female
2. O
3. The pea plant progeny will be tall.
4. Turtles
5. (a) sperm cell will have 23 chromosomes.
(b) Zygote will have 46 chromosomes.

F. Short Answer Questions (Type I):

1. B or O
2. Temperature-dependent sex determination (TSD) is a type of environmental sex determination in which the temperatures experienced during embryonic/larval development determine the sex of the offspring. It is only observed in reptiles and teleost fish.
3. Snail, it indicates that sex is not genetically determined in them.

G. Short Answer Questions (Type II):

1. Sex chromosomes are a pair of chromosomes that decide the sex of an individual in humans. There are 2 sex chromosomes in humans namely X and Y. Y chromosome is found only in males. X chromosome is found in both males and females.

2. No, the sex of baby is determined by the genetic combination of father. A mother has XX chromosomes whereas the father carries XY chromosomes. Hence in either case the mother would provide X chromosome, it's the father who gives X or Y chromosomes which decides the sex of the baby.

3.

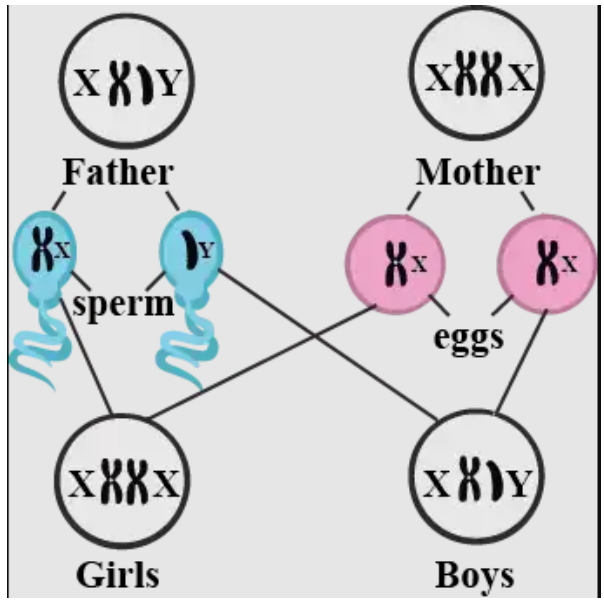
Inherited Traits	Acquired Traits
It is present by birth.	It developed during its lifetime.
It is inheritable.	It is not inheritable.
Change in DNA causes many changes	Change in DNA does not cause any changes.

H. Long Answer Questions:

1. (a) Genes are the units of heredity that transfer characteristics/traits from parent to offspring. They are found on chromosomes in our body and chromosomes are found in nucleus of the cell.

(b) Cellular DNA (genes) is the information source which regulates metabolism and makes protein in the cell. It also controls the characters of the progeny. During sexual reproduction, both the parents contribute equally to the DNA of the progeny. Thus all the cells have two copies of chromosomes, one from male and the other from female. When the two germ cells combine they maintain the total number of chromosomes and ensure the stability of DNA of the species. Thus the progeny inherits the traits of the parents.
For example, two blue eyed parents will always give birth to a blue eyed baby.

2. Sex is determined by genetic inheritance in human beings. Genes inherited from parents determine whether the offspring will be girl or boy. There are two sex chromosomes in human beings X and Y chromosome, the male contributes XY chromosomes and females contribute XY chromosome. If a sperm with X chromosome fertilises with an ovum having X chromosome then it will be a girl. If a sperm carrying Y chromosome fertilises with an ovum having X chromosome then it will be a boy.



WORKSHEET – 3

Evolution and Speciation

A. Multiple Choice Questions:

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

B. State whether the following statements are true or false:

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

C. Give one word for the following:

1. Speciation
2. Geographical Isolation
3. Evolutionary Biology
4. Darwin
5. Harold Urey and Stanley Miller

D. Give the reason for the following statements:

1. Geographic isolation is not at all a major factor in speciation of self-pollinating plant species as self pollination occurs between the reproductive organs of the same flower or another flower of the same plant, and its distance from other plants hardly affects its reproduction

2. The small numbers of surviving tigers is a cause of worry because it can result in the loss of genetic variability. This sudden extinction of the tigers and their genes will affect the diversity of nature. The decrease in the tiger population results in a decrease in the genetic pool of the tigers. This might even lead to extinction.

3. The reproductive isolation is the separation of two populations of the same species, preventing interbreeding and production of a fertile offspring. The two populations can be reproductively isolated due to geographical isolation also.

4. The acquired traits cannot be passed on in the successive generation because the changes take place do not reflect in the DNA of the germ cells. Generally, these changes affect the somatic cells but only the germ cells are passed to the next generation.

5. Genetic drift can facilitate speciation (creation of a new species) by allowing the accumulation of non-adaptive mutations that can facilitate population subdivision.

E. Very Short Answer Questions:

1. J.B.S Haldane suggested in 1929 that life must have developed from the simple inorganic molecules which were present on earth soon after it was formed. He speculated that the conditions on earth at that time, which were far from the conditions we see today, could have given rise to more complex organic molecules that were necessary for life. The first primitive organisms would arise from further chemical synthesis.

2. Microevolution is a change in the allele/trait within the species of the population. It is usually for short period due to either of mutation, genetic drift or gene flow.

3. Gene flow can take place between two populations of the same species through migration.

4. Variation due to sexual reproduction are favoured by natural selection.

5. Darwin's theory of biological evolution was developed by the English naturalist Charles Darwin and others. It states that all species of organisms arise and develop through natural selection of small, inherited variations that increase the individuals' ability to compete, survive and reproduce.

F. Short Answer Questions (Type I):

1. Geographic isolation is not at all a major factor in speciation of self-pollinating plant species as self-pollination occurs between the reproductive organs of the same flower or another flower of the same plant, and its distance from other plants hardly affects its reproduction.

2. No. This statement is mostly true, but not always. Variations that are advantageous to an organisms will help the organism to survive better in the environment. So, these will survive in the

population. Sometimes, variations that do not confer any advantage or disadvantage to an organism may also survive in the population.

3. Species is a group of same kind of organisms which can interbreed to produce fertile offspring.
Examples: Plants — Tulsi, Neem; Animals — Tiger, Dog.

G. Short Answer Questions (Type II):

1. Yes, geographical isolation of individuals of a species leads to the formation of new species. Due to geographical isolation of individuals of a species, gene flow is restricted and does not take place between the separated individuals.

2. The evidence for the origin of life from inanimate matter was provided through an experiment, conducted in 1953, by Stanley L. Miller and Harold C. Urey. In experiment, they assembled an atmosphere containing molecules like ammonia, methane and hydrogen sulphide, but no oxygen, over water.

3. Variation takes place when one gene in the organism is mutated. It gives the organism a higher chance to pass on its genes. When these genes are passed on, their offspring will carry the mutated gene. As long as this helps the organism survive, it will continue to be passed on to the next generation. After many generations, the mutated trait becomes common which means they have evolved. For example, a population of birds with long beaks inhabiting a particular area may develop short beaks if the food can be consumed properly with short beaks. So, in the new area, they will survive better and reproduce more which will lead to the evolution of new species.

H. Long Answer Questions:

1.
(a) In case I, there is a group of twelve red beetles and 3 crows which eat these beetles. They live, in some bushes with green leaves. The population of beetles will grow by sexual reproduction, and therefore, can generate variations. Now, a colour variation arises during reproduction, so that there is one beetle that is green in colour instead of red. This beetle, moreover, can pass the colour on to its progeny, so that all its progeny beetles are green. Crows cannot see green-coloured beetles on the green leaves of the bushes, and therefore cannot eat them. The progeny of green beetles is not eaten, while the progeny of red beetles continues to be eaten. As a result, there are more and more green beetles than red ones in the beetle population.
This is due to natural selection.

(b) A colour variation arises during reproduction, but now it results in a beetle that is blue in colour instead of red. This beetle can also pass the colour on to its progeny, so that all its progeny beetles are blue. Crows can see blue-coloured beetles in the green leaves of the bushes as well as they can see red ones, and therefore can eat them. In the population, as it expands, there are a few blue beetles, but most are red. But at this point, an elephant comes by, and stamps on the bushes where

the beetles live. This kills most of the beetles. By chance, the few beetles that have survived are mostly blue. The beetle population slowly expands again, but now, the beetles in the population are mostly blue.
This is due to genetic drift.

(c) In this case, as the beetle population begins to expand, the bushes start suffering from a plant disease. The amount of leaf material for the beetles is reduced. The beetles are poorly nourished as a result. The average weight of adult beetles decreases from what it used to be when leaves were plentiful, but there is no genetic change occurring. After a few years and a few beetle generations of such scarcity, the plant disease is eliminated. There is a lot of leaf food.
Low weight due to food shortage is shown in this case and it's a reversible process.

2. Speciation refers to the process of how a new kind of animal or plant species is formed. It is an evolutionary process that leads to the formation of a new and distinct species that is reproductively isolated from another species.
The factors responsible for speciation are:

- Genetic Drift: The process describing random fluctuations in the frequencies of allele frequencies in populations is known as genetic drift. Genetic drift eventually leads to the formation of new species by causing a population of organisms to be genetically distinct from the original population.
- Natural Selection: The selection by which organisms are more likely to survive and reproduce is known as natural selection. Natural selection eventually leads to speciation.
- Geographic isolation: The mechanism of speciation in which populations of species are divided by geographic barriers. These geographic barriers may include rivers, water bodies and mountains.
- Mutation: Over a long period of time, the accumulation of many small genetic changes in a population occur, these changes are known as mutations.
- Reproductive isolation: The inability of a species to breed with related species due to barriers or differences such as genetic, geographical, physiological, and behavioural.

WORKSHEET- 4

Tracing Evolutionary Relationships

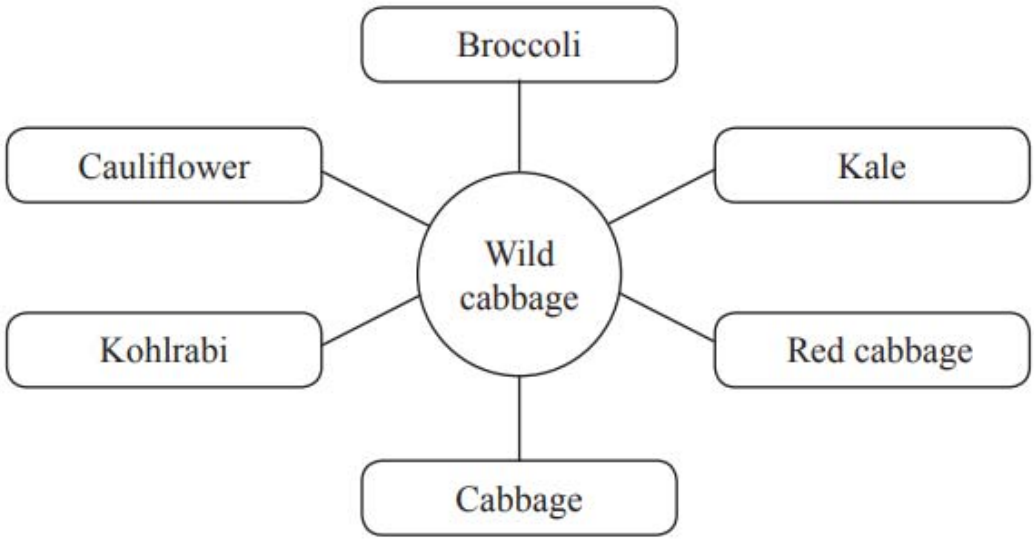
A. Multiple Choice Questions:

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

B. State whether the following statements are true or false.

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

C. Complete the given flowchart with the evolutionary variants of wild cabbage:



D. Define the following terms:

1. The organs which have the anatomically same structure but are different in functions are called homologous organs.
2. Analogous organs are the organs that are different anatomically in structure but perform the same function.
3. Fossils are the preserved remains, or traces of remains, of ancient organisms.
4. Phylogeny is a branch of biology that studies the evolutionary relationships of different organisms.
5. Artificial selection is the identification by humans of desirable traits in plants and animals, and the steps taken to enhance and perpetuate those traits in future generations.

E. Very Short Answer Questions:

1. Planeria
2. Wild Cabbage
3. No, evolution cannot be compared with progress because there is no real progress in the idea of evolution. The only progressive trend in evolution seems to be that more and more complex body designs have emerged over time. However, it does not mean that the older designs are inefficient. So

many older and simpler designs still survive. Even bacteria inhabit the most inhospitable habitats like hot springs, deep-sea thermal vents and the ice in Antarctica.
4. Homo sapiens
5. Relative dating method.

F. Short Answer Questions:

1. The wings of bat and butterfly are analogous organs as they have same origin and basic structure.
2. (a) Ammonite
(b) Knightia
(c) Rajasaurus
(d) Trilobite
3. Evolution cannot always be equated with progress or better body designs. Evolution simply creates more complex body designs. However this does not mean that the simple designs are inefficient. Infact bacteria having a simple body design are the most cosmopolitan organisms on earth. They survive in severe hot and cold conditions.

G. Short Answer Questions (Type II):

1. Homologous organs have different functions but they are believed to have originated from a common ancestor because of their basic structure of bones. If the homologous organs are present in different organisms, it can be inferred that they have same ancestors which provides evidence for evolution.
Analogous organs give evidence of evolution coming from two directions. Some biological characteristics are analogous which means that they serve the same function in different species but they evolved independently rather than from the same embryological material or from the same structure in a common ancestor.
2. Evolution of eyes is an example of evolution by stages because the process of evolution of eyes had taken place over a long period of time. The complex organs are created bit by bit over generations. The eye was present in the earliest organisms in the form of a simple patch of photosensitive cells called an eyespot.
3. On the basis of presence of feathers in both birds and reptiles, both are said to be closely related. Initially feathers performed the function of protection from cold as in case of reptiles but later on in birds they adapted to help them in flight.

H. Long Answer Questions:

1. (a) Fossils are the remains or traces of ancient life that have been preserved by natural processes.
(b) Three different types of fossils are as follows:

- Petrified fossils: Fossils often form when an organism's remains become petrified, or "turned into stone." In this process, mineral-rich water soaks into the small cavities and pores of the original organism. The minerals precipitate from the water and fill the spaces.
- Mold fossils: A fossil mold is created when a shell or other structure is buried in sediment and then dissolved by underground water. The mold reflects only the shape and surface markings of the organism. It does not reveal any information about its internal structure.
- Cast fossils: Cast fossils are created if the hollow spaces of a mold are later filled with mineral matter.

(c) When dug into the earth, the fossils closer to the surface are more recent as compared to the fossils in deeper layers. The fossils can be dated by detecting the ratios of different isotopes of the same element in the fossil material.

2. There are a few tools used for tracing evolutionary relationship to study human evolution. Studying the structure of homologous and analogous organs can help us know the relationship between species. Fossils help us study extinct animals and their resemblance with current living organisms. Vestigial organs and comparing the DNA structure of different organisms also help us for tracing it.

WORKSHEET – 5

Based on Complete Chapter

A. Multiple Choice Questions:
1. (b)
2. (c)
3. (a)
4. (b)
5. (a)

Analyzing & Evaluating Questions

6. (b)
7. (d)

B. Match the following

	Column A	Column B
1.	Fossil	(c) Petrified remains of life
2.	Theory of Evaluation	(b) Survival of fittest
3.	Probable ancestor of birds	(e) Archaeopteryx
4.	Charles Darwin	(a) A famous evolutionist
5.	Gregor Mendal	(d) Father of genetics

C. Fill in the blanks using the suitable words given in the brackets:
1. Stages
2. Dominant

3. Both
4. Natural selection
5. Amino Acids

D. Define the following terms

1. Evolution refers to the gradual change which occurs in an organism over a long duration of time. It is a slow going process which results in the development of the organism.
2. Speciation is an evolutionary process of the formation of new and distinct species.
3. Natural selection is the process by which organisms having variations, which are better suited to the environment, are more likely to survive and reproduce more efficiently.
4. Genetic drift is the change in the frequency of an existing gene variant in a population due to random sampling of organisms. The alleles in the offspring are a sample of those in the parents, and chance has a role in determining whether a given individual survives and reproduces
5. An acquired trait is the character developed in an individual as a result of environmental influence. These traits are not coded by the DNA of a living organism and therefore cannot be passed on to future generations.

E. Very Short Answers Questions:

1. Migration, natural selection, gene flow, new species.
2. This is an example of artificial selection since humans have generated these vegetables from cabbage by selective breeding for specific characteristics.
3. The statement is correct as the fossils found closer to the surface of earth are more recent and those found in deeper layers are older ones.
4. Variation in the genetic material in certain bacteria enables them to survive in a heat wave.
5. Variation is beneficial for the existence of the species because they play an important role in the adaption to survive in the changing conditions. Variation is not essential for an individual because it does not help in the evolution of the individual.

Analysing & Evaluating Questions

6. Variation simply refers to differences. This difference could be in terms of cells, tissues, organs, or even organisms. A variation could be attributed to both genetic factors as well as some environmental factors. Variation is usually the result of an organism's life experiences. These experiences trigger a change in the genetic makeup of an organism that ensures better adaptability and survival in its environment.
These variations are aimed at increasing the survival value of an organism.
7. In sexually reproducing organisms, the gametes undergo meiosis, and hence, each gamete contains only half a set of chromosomes. When two gametes fuse, the zygote formed contains the full set of chromosomes. Hence, the formation of gametes by meiosis helps to maintain the number of chromosomes in the progeny.

F. Short Answer Questions (Type I):

1. The following are the four ways in which individuals with a particular trait may increase in population:

- Natural Selection**:** Selection of variations brought through the course of time,
- Mutation**:** Slight changes in the genetic information of the offspring during fertilisation.
- Geographic Isolation**:** Where a population of species gets separated by their respective group due to physical/natural barriers.
- Genetic Drift and Isolation**:** An accident in small population of a species may also result in survival of species having a particular trait.

2.Wings of bats and the wings of birds are analogous organs because analogous characteristics are set of characteristics that perform similar functions but are structurally different. The design of the wings of bats and the wings of birds look similar because they have a common purpose – flying. But these two structures do not have a common ancestral origin.

3. Acquired traits are not capable of directing evolution because:

- Acquired traits mostly are concerned with somatic cells.
- These traits cannot be carried forward to the next generation as there is no change in the genetic material of the reproductive cells.

4. Sexually reproducing animals will have more variations because two individuals of different genetic characteristics are involved in this type of reproduction.

Analysing & Evaluating Question

5. (a) All plants appear tall in height and have purple flowers
b.) This is Dihybrid cross.
c.) Phenotypic ratio observed is 9:3:3:1 where phenotype observed is (Purple & tall: purple & dwarf: white & tall: white & dwarf)

G. Short Answer Questions (Type II):

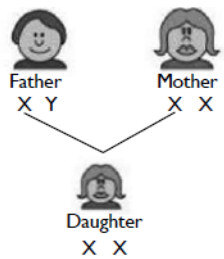
1. Two examples of homologous structures in vertebrates are limbs of birds, mammals, amphibians and reptiles; and similar pelvises in human beings, dogs, and cats. They are so called since they have similar basic structural plan, but appear different externally and perform different functions. However, they have evolved from a common ancestor. Such a homologous characteristic helps to identify an evolutionary relationship between apparently different species.
2. Human evolution: Human evolution is the evolutionary process by which human beings developed on earth. The evolution step involves a sequence of changes in genetic material and adapting to its surrounding. They evolved to live their lives to the best of their abilities.
Stages in human evolution: The various stages in the evolution of man:

- Dryopethicus- The earlier known ancestor of man. Found in some parts of Africa, Asia, and Europe.

- Australopithecus- Inhabited in the mainland of Asia. Have large jaws and human-like teeth.
- Homo habilis- Make use of stone tools. They are able to communicate with each other.
- Homo erectus- More-evolved human beings with large brain sizes. Invented fire and were carnivorous (eat meat)
- Homo sapiens- These are modern men with 1350cc brain capacity. Develop the power of thinking, using tools, and being omnivorous.

4. (a) XY in human male and XX in human female.

(b)



4. This happens during gamete formation and reproduction. When a sperm combines with an egg during fertilisation, a diploid zygote is formed. In zygote, the normal number of chromosomes is restored. Through mitosis, zygote forms all cells of the progeny. Thus, all progeny cells have the normal diploid condition with normal number of chromosomes, ensuring the stability of the DNA of the species.

Analyzing & Evaluating Question:

5. (a) Dihybrid cross
(b) Yellow and Round
(c) 9:3:3:1

H. Long Answer Questions:

1. (a) It means separation of species by physical barriers like water forms oceans, mountains etc. As there are less chance for variations to occur, new species are not formed in sexually reproducing individuals undergoing geographic isolation.

(b) Formation of a species where individuals are very different from each other and are incapable of reproducing among themselves, is called sympatric speciation. It occurs when individuals of a species share the same habitat but become reproductively isolated from each other. As for example, the orca and whales are undergoing speciation. There are clear morphological and genetic differences between types, and though they could theoretically interbreed, they generally do not do it. If that trend continues, the Pacific killer whale could split into three separate species.

Analysing & Evaluating Question

2. (a) It is a process of evolution as green beetle can pass the green color to the off springs.
(b) The green color of the beetle is an inherited trait, which can be passed on to the next generations.
(c) It helps in survival of green beetle as it can mix with green bushes, and can help in hiding from predators.
(d) The production of green color has been brought about by a change in the DNA of the reproductive cells.

I. Assertion- Reason Questions:
1. (a) **2.** (a) **3.** (c)

J. Case-based Question:
1. (c)
2. (d)
3. (b)
4. (b)
5. (a)

CHAPTER -9

Light-Reflection and Refraction

WORKSHEET 1

Introduction and Reflection of Light by Plane Mirror

A. Multiple Choice Questions:

1. (b)

2. (d)

3. (c)

4. (b)

5. (d)

B. State whether the following statements are true or false:

1. False

2. True

3. True

4. False

5. True

C. Fill in the blanks using the suitable words given in the brackets:

1. 35°
2. 4 m
3. Plane
4. Laterally

5. 40°

D. Define the following terms:

1. Reflection of light is the process of sending back the light rays which fall on the surface of an object.
2. The angle of incidence is the angle between a ray incident on a surface and the line perpendicular to the surface at the point of incidence, called the normal.
3. Lateral inversion is the apparent reversal of the image's left and right in a mirror when compared with the object.
4. Angle of reflection is the angle between a reflected ray and the normal drawn at the point of incidence to a reflecting surface.
5. It is a polished or smooth surface that forms image by reflection.

E. Very Short Answer Questions:

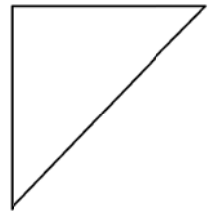
1. Two used of Plane mirrors are:

- Plane mirrors are used as looking glass.
- Plane mirrors are used in solar cookers.

2. According to Quantum theory, light consists of minute particles having properties of wave associated with them.

3. Multiple reflection is the reflection of light back and forth. Several times between reflecting surface.

4.



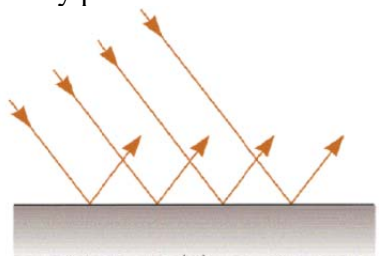
5. The Image will form at a distance of 2 m from the mirror. The width of hand will be 8 cm.

F. Short Answer Questions (Type I):

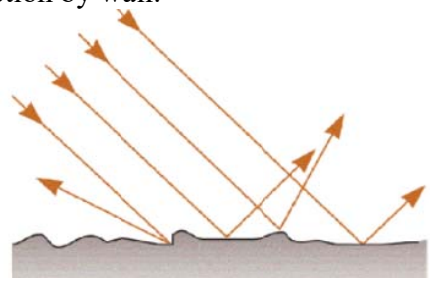
1. (a) The image will look like ' F'.
(b) The phenomenon involved is lateral inversion.

2. The important difference between looking at a photograph of our face and looking at ourselves in a plane mirror is that the image of our face in a plane mirror is laterally inverted, so right is left and left is right.
However, in a photograph of our face this does not happen. In photo, we see our past image but in plane mirror, we see our present image.
3. Diffraction is the bending of light around edges of small obstacles.
This is related to the property that light bends as it passes around the edge of the object.

G. Short Answer Questions (Type II):
1. A wall has a rough surface while a mirror has a smooth, polished and shiny surface. Hence, diffuse reflection occurs in case of wall and regular reflection occurs in case of a mirror.
The diagram represent the reflection by plane mirror.



The diagram represent the reflection by wall.

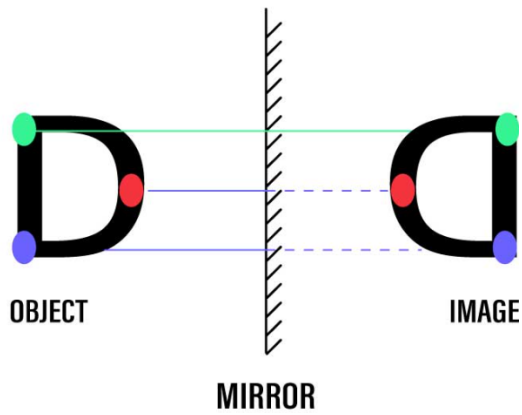


2.

Real Image	Virtual Image
The real image is the image, which forms when the light rays meet at a particular point after reflection from the mirror.	The image, which forms when the light rays appear to meet at a definite point, after reflection from the mirror, is termed as a virtual image.
Rays actually converge.	Rays perceived to converge.
The image formed is inverted.	The image formed is upright or erect.
Example of Real Image: Image developed on the photographic film of a camera	Example of Virtual Image: Image developed by a plane mirror

3. Interchange of sides between the object and its image is called lateral inversion.

For example: The letter D, when placed in front of plane mirror would undergo lateral inversion.



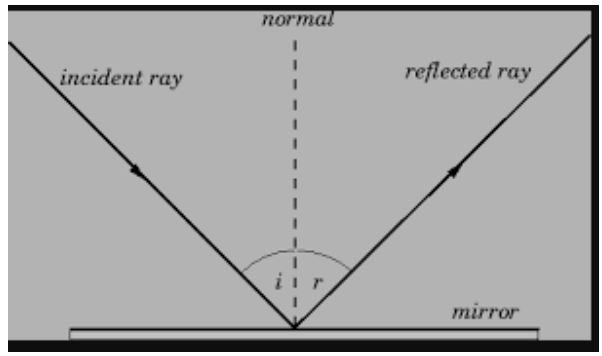
H. Long Answer Questions:

1. (a) Plane mirror produces images with a number of distinguishable characteristics. Images formed by plane mirrors are:

Virtual
Upright
Left-right reversed
The same distance from the mirror as the object's distance and the same size of the object.

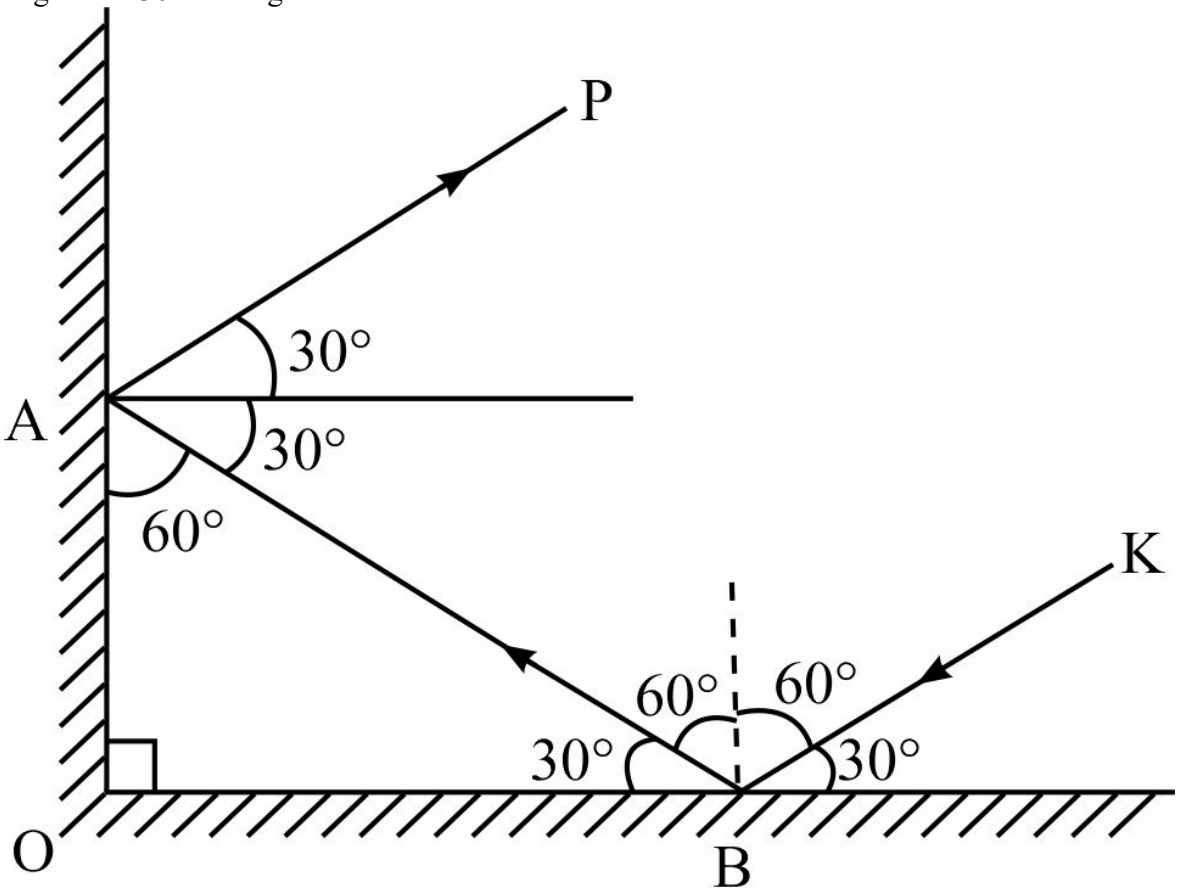
(b) The speed of the image is 1 m/s. But his image is approaching him with the speed of (1 + 1) = 2 m/s.
His own speed + the image speed = 2 m/s. This is because he already is moving with the speed of 1 m/s, so it adds to the image speed.

2. (a) The law of reflection states that the incident ray, the reflected ray, and the ray normal to the surface of the mirror all lie in the same plane. Furthermore the angle of reflection is equal to the angle of incidence.



(b) Let KB be the incident ray making an angle of 30 degrees with the horizontal mirror and 60 degree with normal. The reflected ray BA would also make the same angle with the horizontal mirror and the normal.

Further In triangle AOB, ∠A becomes 60° by the angle sum property. Hence AP would form an angle 30 degree with the normal to the vertical mirror.



WORKSHEET – 2

Reflection of Light by Spherical Mirrors:

A. Multiple Choice Questions:

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

B. Give one word for the following:

1. Principal axis
2. Centre of curvature
3. Focal length
4. Pole
5. Concave mirror

C. Match the following:

Column A	Column B
1. Shaving Mirror	(b) Concave Mirror
2. Rear View Mirror	(c) Convex Mirror
3. Principal Focus	(d) Denoted by 'F'
4. Focal Length	(e) Denoted by 'f'
5. Point-sized image	(a) Form at focus

D. Complete the table for concave mirror given below:

Position of object	Position of image	Image size	Nature of image
Infinity	At "F"	Diminished	Real and Inverted
Beyond "C"	Between "F" and "C"	Diminished	Real and Inverted
At "C"	At "C"	Same size	Real and Inverted
Between Pole and Focus	Behind the mirror	Magnified	Virtual, erect

E. Very Short Answer Questions:

1. Since the image is real, thus Magnification (m) = -3, object distance (u) = –30 cm, image distance (v) =?
We know that m = – v/u.
-3 = –v/–30
–3 = v/30
v = -3 × 30
v = -90 cm
Thus the image is 90 cm away from the concave mirror.

2. (a) In head lights of a car type of mirror used is concave as the light of the lamp undergoes divergence from reflector surface and covers a larger area and in the front.
(b) Concave mirrors are used in solar furnaces, because concave mirrors are the only type of mirror that reflects light toward a single focal point. A flat mirror does not have a focal point.

3. The principle focus is the point on the principal axis where the light rays travelling parallel to the principal axis after reflection appear to meet. The principal focus is behind the convex mirror. We know that for spherical mirror of small apertures, the radius of curvature is twice the focal length i.e., R = 2F.
Given here, the radius curvature is 32 cm.
F = R / 2
=32 / 2
F = 16 cm
Focal length of mirror is 16 cm.

4. Magnification= -v/u

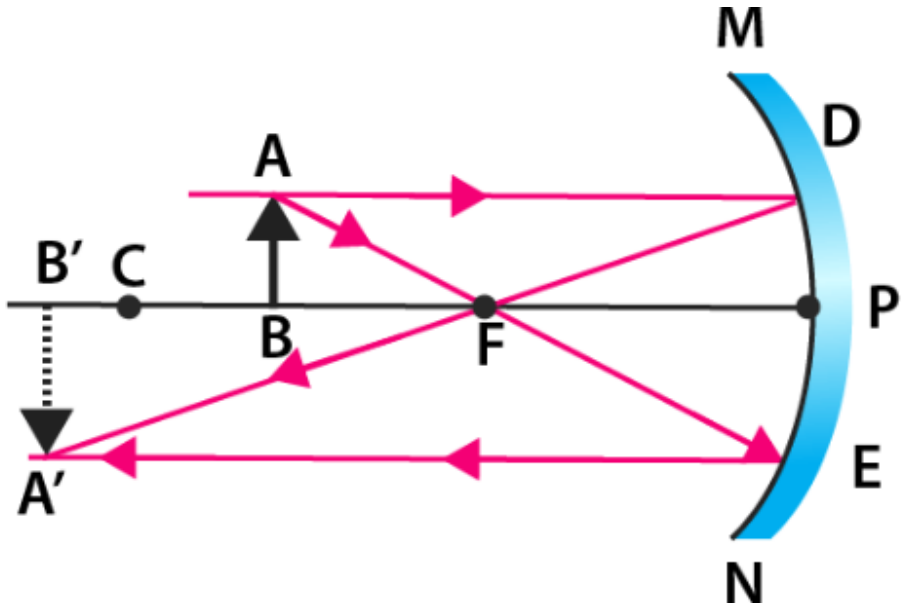
5. Given that magnification (m) of the body is 2.
m = height of image / height of object
2=height of image / 1 m
Hence, height of image =2 m.

F. Short Answer Questions (Type I):

1. Since it is 2 times magnified,
m = –2
So –v/u = –2
Also, 1/v + 1/u = 1/f
So, 1/v + 1/u = 1/ (–20)
–v/v + –v/u = –v/-20 [multiply throughout by v]
–1–2 = v/20
–3 = v/20
v = –60 cm
Further
–2 = – v/u
–2 = 60/u,
u = –30 cm.

2. The sign conventions for spherical mirrors are:
(a) Distances are to be measured from the pole (vertex) of the mirror.
(b) Distances measured along the direction of the incident ray are positive.
(c) The distance measured opposite the direction of the incident ray are negative.
(d) Distances measured above the principal axis are positive. Distances measured below the principal axis are negative.

3.



G. Short Answer Questions (Type II):

1. (a) Concave mirror

(b) Given that,
Image height = - 4 cm
Object height = 1 cm
Object distance (u) = -20 cm
Image distance (v) = ?
m = image height / object height = -v/u
-4 / 1 = - v / (-20)
v = -80 cm

(c) 1/v + 1/u = 1/f
(-1/80) + (-1/20) = (1/f)
f = -16 cm

2. (a) f = -10 cm
v = -20 cm
Using mirror formula:
1/u + 1/v = 1/f
1/u + 1/(-20) = 1/(-10)
u = -20 cm
Object must be placed 20 cm infront of mirror.

(b)) f = -10 cm
v = 20 cm
Using mirror formula:

$1/u + 1/v = 1/f$
$1/u + 1/(20) = 1/(-10)$
$u = -20/3$ cm
Object must be placed 6.67 cm infront of mirror.

3. (a) The linear magnification produced by a spherical mirror is defined as the ratio of the height of the image (h_1) to the height of the object (h_2). It is a pure ratio and has no units. It is denoted by the letter 'm'. The linear magnification 'm' is also related to object distance (u) and image distance (v).

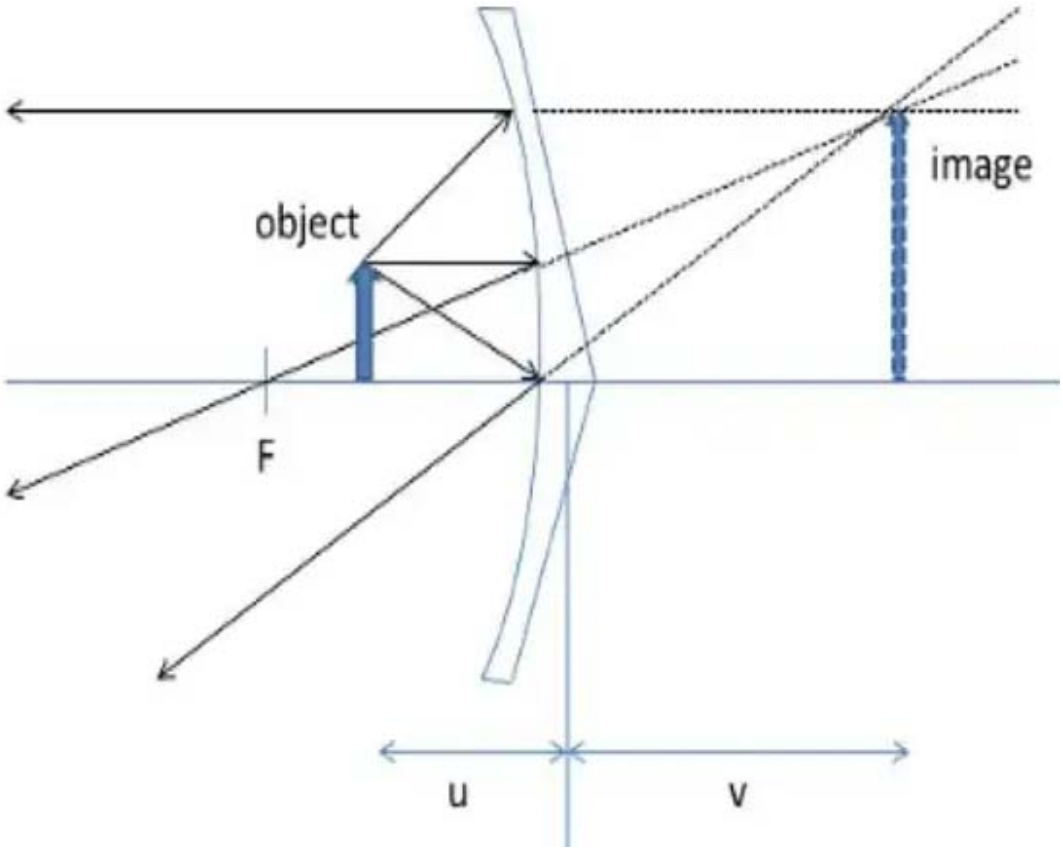
(b) If the size of image is less than object then it can be referred to as negative magnification.

H. Long Answer Questions:

1. (a) Focal length of concave mirror, f = -20 cm
Distance of object from the mirror, u = -10 cm
Use formula, $1/v + 1/u = 1/f$
or, $1/v = 1/f - 1/u$
$1/v = 1/-20 - 1/-10$
$1/v = -1/20 + 1/10 = 1/20$
$v = +20$cm

(b) The image is straight and bigger than the object.

(c)



2. (a) (a) Concave mirror
(b) Distance between object and image,
v – u = 30 cm
Magnification, m = +2 = −v/u
v = −2u
Also, v − u = 30 .....(1)
v =−2u .....(2)
From equation (1) and (2):
−2u−u = 30
⟹−3u=30 cm
u =−10 cm
Mirror is situated at a distance of 10cm from object.
(c) u=−10 cm
v= −2(−10)
= 20 cm
From mirror formula,
1/f =1/v+1/u
1/f =1/20+1/(−10)
f = −20 cm
And radius of curvature will be double of focal length of mirror,
R=2f
R=2×(−20)

=−40 cm
Radius of curvature = - 40 cm

WORKSHEET – 3

Refraction of Light

A. Multiple Choice Questions:

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

B. State whether the following statements are true or false:

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

C. Give reason for the following statements:

1. When light travels through one medium and enters another, as when it passes through water and then air, its path bends. That phenomenon is known as refraction, which creates the illusion that the bottom of the pool is not where you know it is.
2. The ray of light bends when it passes from glass to water as it travels from a denser medium to a rarer medium, it speeds up and bends away from the normal.
3. The refractive index of a medium is the ratio of the sine of the angle of incidence to the sine of the angle of refraction when light travels from a vacuum into that medium. The bigger the refractive index of a medium the greater the amount by which the medium bends the light for a given angle of incidence.
4. The speed of light changes in different mediums as more dense the material, the more energy must go through as it transfers from molecule to molecule.
5. A pencil immersed partly in water appears to be broken is because of refraction.

D. Fill in the blanks using suitable words given in the brackets.

1. Refraction
2. Rarer, Rarer
3. Directly
4. Parallel
5. Refraction

E. Very Short Answer Questions:

1. Refractive index = (speed of light in air or vaccum) / (speed of light in that medium)
Refractive index of rock salt with respect to ice = (speed of light in ice) / (speed of light in rock salt)
Speed of light in ice = c / (1.31) and, speed of light in rock salt = c/(1.54)
Required refractive index = 1.54/1.31 = 1.175

2. ∠i will be greater than the ∠r because the light rays bend towards the normal when they enter from rarer to denser medium.

3. When a ray of light travels from air into water obliquely, it bends towards the normal. This is because water is optically denser than air. On entering water, speed of light decreases and the light bends towards normal.

4. Refractive index of a medium is defined as the ratio of speed of light in the vacuum to the speed of light in the medium. From the definition it is clear that refractive index is inversely related to the speed of light in the medium

5. There would be no refraction if the refractive index of the two medium is same as the speed of light would not change in both the medium.

F. Short Answer Questions (Type I):

1. Refraction is the bending of a wave when it enters a medium where its speed is different. Refraction is caused by light passing from one medium to another**.**

2. We know that refractive index of an object can be expressed as sin i / sin r.
This will be true for all values of i and r. Therefore, we can equate the two angles.
$\sin 30° / \sin r_1 = \sin 45° / \sin r_2$(write 2 in subscript of r)
$= \sin r_1 / \sin r_2 = \sin 30° / \sin 45°$
$= \sin r_1 / \sin r_2 = 1/2 \div 1/\sqrt{2}$
$= r_1/r_2 = 1/\sqrt{2}$
Or $\sqrt{2} r_1 = r_2$

3. Laws of refraction state that the incident ray, reflected ray and the normal, to the interface of any two given mediums; all lie in the same plane. The ratio of the sine of the angle of incidence and sine of the angle of refraction is constant.

G. Short Answer Questions (Type II):

1. Refractive index = 1.33.
We know that
The refractive index is given by c/v
Where, n = refractive index, c = Speed of light in air, v = speed of light in medium
Put the value of n in equation v = c/n

$v = 3\times10^8/1.33 \Rightarrow v = 2.26\times10^8$ m/s

2. (a) Absolute refractive index of a medium: It is defined as the ratio of the velocity of light in vacuum to the velocity of light in the medium. If c is the velocity of light in vacuum and v in the medium, then
$\mu = c/v$.
(b) Relative refractive index of a medium**:** It is a ratio of the speed of light in one medium to the speed of light in another medium.
Refractive index of a medium depends upon the refractive index of the surroundings (when you consider the light ray passing from the surrounding into the medium), optical density, wavelength of the light and temperature.

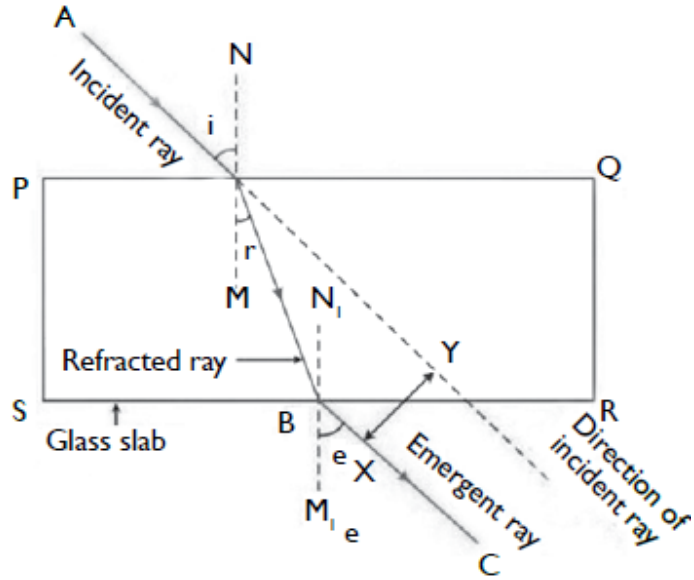
3. This is because when light falls perpendicular to the interface between the 2 mediums, the normal at the point of incidence and the incident ray are the same ray, i.e., angle of incidence = 0 and as you know angle of incidence = angle of refraction so angle of refraction also = 0 which means that the light continues along the same path and does not deviate.

H. Long Answer Questions:

1. (a)
(i) Light travels faster in water because water has the lowest refractive index.
(ii) Water, kerosene, rock salt, diamond.
(iii) As the refractive index increases, the optical density also increases. Water has a optical density = 1.33 and air has the lowest optical density = 1.0003.

(b) Let μ_1 and μ_2 be the absolute refractive indices of media 1 and 2, and v_1, v_2 be the speeds of light in the two media.
Then,
$\mu_1 = c/v_1$ and $\mu_2 = c/v_2$.
$\mu_{21} =. \mu_2 / \mu_1$
$= v_1 / v_2$
Similarly, $\mu_{12} =. \mu_1 / \mu_2$
Also, $(\mu_{21})(\mu_{12}) = 1$
And hence, $\mu_{21} = 1 / \mu_{12}$

2. Emergent ray is parallel to the incident ray, after the refraction of incident ray through a glass slab because the angle of incidence is equal to the angle of emergence and they are also the alternate interior angles. The emergent ray is laterally displaced from the path of incident ray. The perpendicular distance between the path of emergent ray and the direction of incident ray is called lateral displacement. The lateral displacement depends upon the angle of incidence along with the thickness of the medium.



WORKSHEET - 4

Refraction of light by Spherical Lenses

A. Multiple Choice Questions:

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

B. State whether the following statements are true or false:

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

C. Give one word for the following:

1. Prism
2. Optical Centre
3. Power
4. Magnification
5. Convex lens

D. Differentiate between the following:

1.

Reflection	Refraction
This phenomenon usually occurs in mirrors.	This phenomenon usually occurs in Lenses.
Reflection can simply be defined as the reflection of light when it strikes the medium on a plane.	Refraction can be defined as the process of the shift of light when it passes through a medium leading to the bending of light.
The light entering the medium returns to the same direction.	The light entering the medium travels from one medium to another.

2.

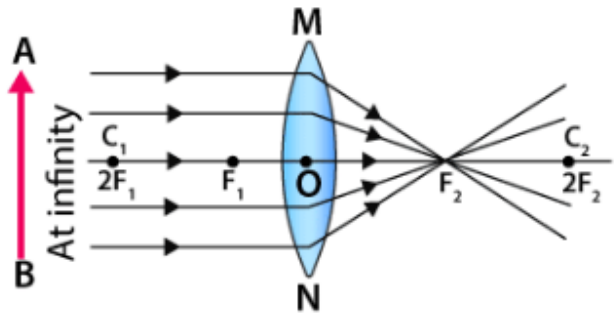
Concave Lens	Convex lens
It diverges the rays passing through it, hence it is called diverging lens.	It converges the rays passing through it, hence it is called converging lens.
It is thicker at the edges and thinner at the centre.	It is thicker at the centre and thinner at the edges.
It is used to correct short sightedness.	It is used to correct long sightedness.

3.

Lens	Mirror
The lens is a transparent substance that produces images by refraction in any surface of the two surfaces.	The mirror is glass with one side silvery backing produces an image by reflection on only one surface.
Always curved at one or two surfaces.	It can be plane or curved.
It has 2 focal points for each type of lens.	Plane mirror has no focal point.

E. Very Short Answer Questions:

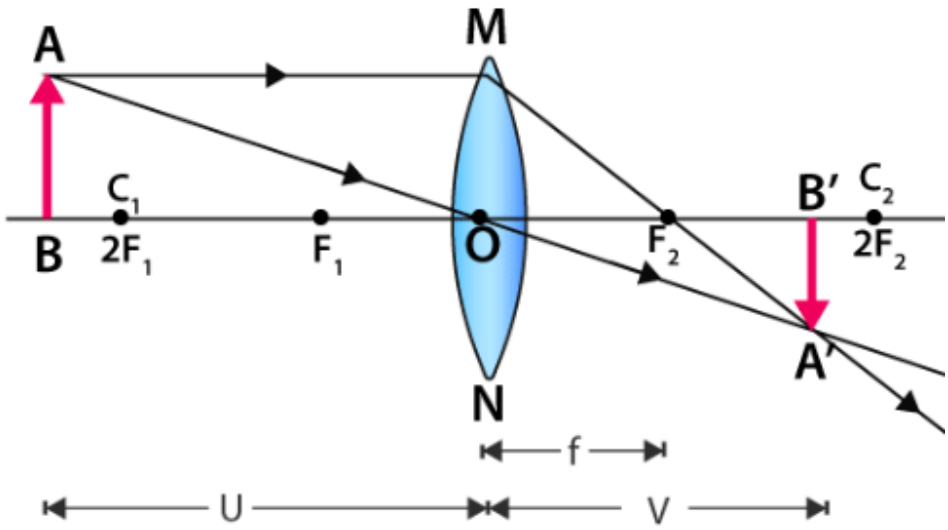
1. Focal length for a convex lens is taken positive and the same for concave lens is taken negative.
2. Two uses of convex lens are:
Convex lens is used in microscopes and magnifying glasses to subject all the light to a specific point.
3. (a) Beyond the center of curvature.
(b) Placed between focus and optical center.
4. Focal length of a lens depends on the refractive index of the glass from which it is made, and on the curvature of its two surfaces.
5.



F. Short Answer Questions (Type 1):

1. 1/v –1/u = 1/f. Where, v = Distance of image from optical centre of lens, u = Distance of object from optical centre of lens and f = Focal length of lens.

2.



3. To determine the focal length of a convex lens, we put the convex lens in a holder and keep it in front of a distant object like a window or tree, so that the rays coming from the window pass

through it. A cardboard screen is put behind the lens. We change the distance of the screen. At a particular distance of screen from less, all ray concentrate at a particular point on the screen. Measure the distance of the screen from the lens with a scale. The distance will be the focal length of convex lens.

G. Short Answer Questions (Type II):

1. Given, Power of lens = -4D

$$f = \frac{100}{P}$$
$$f = \frac{100}{4}$$
$$f = 25\ cm$$

Now,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$
$$\frac{1}{v} - \frac{1}{(-10)} = \frac{1}{25}$$
$$\frac{1}{v} = \frac{-3}{50}$$
$$v = \frac{-50}{3}\ cm$$

The image formed is virtual, erect and larger than object.

2. Given, focal length of lens = -20 cm

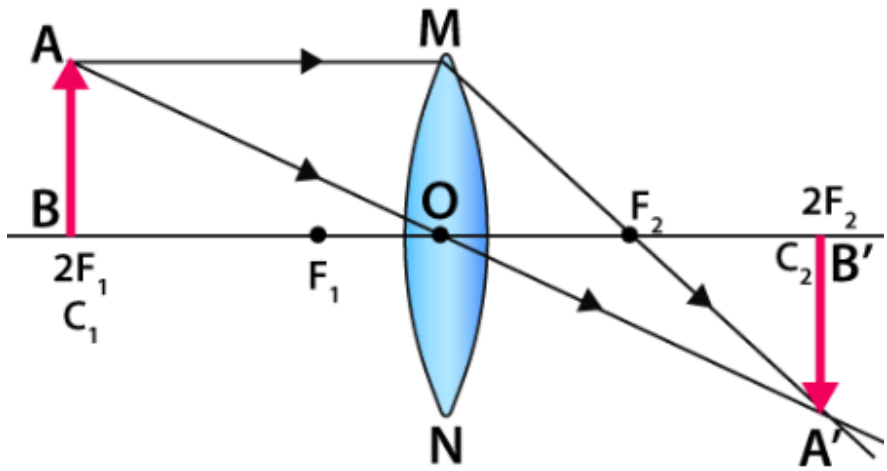
$$f = \frac{100}{P}$$
$$f = \frac{100}{4}$$
$$f = 25\ cm$$

Now,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$
$$\frac{1}{v} - \frac{1}{(-10)} = \frac{1}{25}$$
$$\frac{1}{v} = \frac{-3}{50}$$
$$v = \frac{-50}{3}\ cm$$

The image formed is virtual, erect and larger than object.

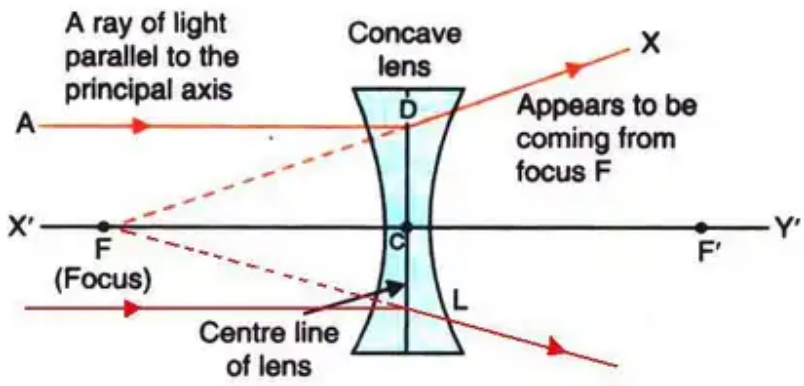
3.



(a) Image is real
(b) Image is inverted.

H. Long Answer Questions:

1. (a) In a convex lens, the parallel rays of light passing through the lens actually meet at the focus in front of the lens. This is why it is called real focus. But in a concave lens, the rays of light passing through the lens diverge and when these diverging rays are produced backward, they appear to meet at a point behind the lens. This point is the focus of the lens. Because the light rays do not actually meet at the focus, it is called virtual or imaginary focus.
(b) Magnification (m) = v/u
-4 = 60/u
So, u = 60/-4
= -15cm
Further,
1/f = 1/v - 1/u
= 1/60+1/15 = 5/60
Thus, f = 60/5 = 12 cm = 0.12 m
P = 1/f = 1/0.12 = 8.33 D
(c) When a beam of light rays parallel to one another and also to the principal axis of the concave lens falls on the lens, the incident rays pass through the lens and get refracted according to the laws of refraction. All the rays spread after passing through the lens. These diverging rays when produced backward appear to meet at a point F (focus) on the left side of the lens.



2. Focal length of the convex lens, $f_1 = +25$ cm
Focal length of the concave lens, $f_2 = -20$ cm
Let the focal length of the combination is F and the power of this combination is P

$$\frac{1}{F} = \frac{1}{-20} + \frac{1}{25}$$

$$\frac{1}{F} = \frac{1}{-100}$$

Therefore, F = –100 cm = –1 m.
Further,

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

$$P = \frac{1}{F} = \frac{1}{-100} = -1\ D$$

The negative sign of P and F indicates that the combination of two given lenses behaves as a concave lens.

WORKSHEET 5
BASED ON COMPLETE CHAPTER

A. Multiple Choice Questions:
1. (d)
2. (b)
3. (b)
4. (a)
5. (c)

Analysing and Evaluating Questions
6. (a)
7. (c)

B. Give reasons for the following:

1. When we say that a real and inverted image is formed, the height of the image formed is below the principal axis. Thus, according to the sign conventions it is taken as negative.

2. When the ray passes through optical centre, the perpendicular distance between extended incident.ray and extended emergent ray is negligible. So we can say that light ray passes through optical centre without deviation.

3. Because magnification produced by cancave lens is always less than 1 and image is formed at focus or between focus and optical centre**.**

4. When a ray of light travels from a denser medium to a rarer medium, it bends away from the normal.

5. A lens of short focal length has a great power because power is inversely proportional to focal length.

Power = 1/focal length.

C. Complete the table for the convex lens given below:

Position of Object	Position of Image	Image size	Nature of Image
At infinity	At focus F_2	Point sized	Real and inverted
Beyond $2F_1$	Between F_2 and $2F_2$	Diminshed	Real and Inverted
Between F_1 and O	On the same side of lens	Enlarged	Virtual and erect
At $2F_1$	At $2F_2$	Same Size	Real and inverted

D. State whether the following statements are true or false:

1. False

2. True

3. False

4. False

5. True

E. Very Short Answer Questions:

1. Refractive Index of B with respect to A = (sin i)/(sin r)

= (sin 60)/(sin45)

= (√3 /2)/(1/ √2)

= √6/2

=1.225

2. (a) Mirrors reflect most of the light falling on them.

(b) Optical glasses (concave, convex or irregular) refract most of the light falling on them.

3. (a) Pencil appears to be magnified and image is virtual.
(b) In convex mirror, pencil will appear smaller in size.

4. Image formed is real and inverted

∴ Magnifications (m) = -1

Since the image is real, image distance is a positive value.

Image distance (v) = 50 cm

Let the object distance be u

Magnification in a lens (m) = v/u

-1 = 50/u

u = -50 cm

The needle is placed 50 cm in front of the convex lens.

Need to find the focal length (f)

According to the lens formula,

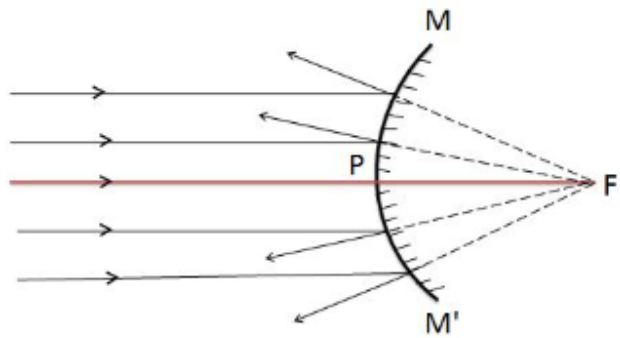
1/f = 1/v – 1/u

1/f = 2/50

1/f = 1/25

f = 25cm

5.



<u>Analysing & Evaluating Questions</u>

6. According to the problem,

For a lens, $1/f = 1/v - 1/u$

And, magnification, $m = v/u$

or, $v = mu$

So, $1/f = 1/mu - 1/u$

or, $1/f = (1/u)(1/m - 1)$

or, $1/f = (1/u)(1 - m)/m$

or, $f = mu/(1 - m)$

7. Focal length of any lens is the point where light converges. So, if focal length is more then the lens has converged the light to a larger distance that is it has converged less. Whereas, if the focal length is less then the light is converged at a smaller distance that is converged more. So, we can affirm that lens of 20 cm should be used to converge light to a larger extent**.**

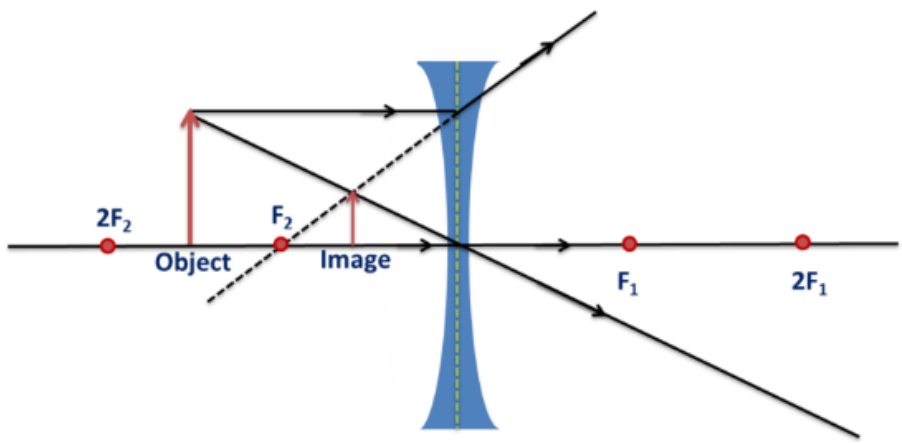
F. Short Answer Type Questions (Type I):

1. Due to the refraction of the light, the light will move away from the normal and consequently, the fish will see a longer image of the fisherman.

2. (a) Image formed is real and inverted.

(b) If the object is placed at focus F_1 then the image so formed will be enlarged.

3.



4.

(a). *Both A and B are convex lenses, because both are giving a real image.*

(b). Given that u_a = -15 cm, $v_a = \infty$

Use the lens formula to determine the focal length of mirror A

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{\infty} - \left(-\frac{1}{15}\right)$$

$$f = 15\ cm$$

For mirror B, as the height of object and image is same hence the magnification is -1. Also the distance of object and image are also equal that is u_b = *-15 cm,* v_b = *15 cm.*

Use the lens formula to determine the focal length of mirror B.

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{15} - \left(-\frac{1}{15}\right)$$

$$f = 7.5\ cm$$

Analysing and Evaluating Questions

5. Case I: i<r, hence the medium A is denser and medium B is rarer.

Case II: i>r, hence the medium A is rarer and medium B is denser.

G. Short Answer Questions (Type II):

1. (a) The given lens is convex lens as only convex lens produces magnifies erect images.

(b) Magnification, m = H_i / H_o

= 6 cm / 3 cm

m = 2

We know that,

m = H_i / H_o = v / u

$H_i / H_o = v / u$

$v = H_i \times u / H_o$

$= 6 \times (-20) / 3$

v = - 40 cm (left side of the lens)

Also,

$1/f = 1/v - 1/u$

$= 1/(-40) - 1/(-20)$

$= -20 + 40 / 800$

$= 1 / 40$

f = 40 cm

Power, P = 1 / focal length

$P = (1 / 40) \times 100$ m

P = 2.5 D

(c) Such lenses are used in microscope and magnifying glasses.

2. (a) Focal length = 0.20 m
(i) Object distance = 0.50 m
Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Image distance, v = + 0.33 m. The image is formed 0.33 m behind the lens; m = - 0.66; Real and inverted.
(ii) Object distance = 0.25 m
Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Image distance, v = + 1.00 m. The image is formed 1.00 m behind the lens; m = - 4.0; Real and inverted.
(iii) Object distance = 0.15 m
Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Image distance, v = - 0.60 m. The image is formed 0.60 m in front of the lens; m = + 4.0; Virtual and erect.

(b) The case that represent in a film projector (ii), in a camera (i) and in a magnifying glass is (iii)

3. We can distinguish between a plane mirror, a concave mirror, and a convex mirror by bringing our face close to each mirror, turn by turn.

If the image is of the same size as our face, it is a plane mirror. In-plane mirror image is of the same size as the object and also erect as compared to the object.

If the image is magnified, it is a concave mirror. In the case of the concave mirror also the image is of the same size as an object but here it will be inverted with respect to the object.

If the image is diminished, it is a convex mirror.

4. Given: f = 200 cm, u = 100 cm, v = ?
Mirror formula:

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

By sign conventions:

$$\frac{1}{200} = \frac{1}{v} + \frac{1}{-100}$$

v = 66.6 cm
Therefore, the image is formed at 66.6 cm behind the mirror and it is virtual image.

$$m = -\frac{v}{u} = \frac{-66.6}{-100} = 0.66$$

The image is erect and smaller in size by a factor of 0.66.

Analysing and Evaluating Question

5. f = –20 cm

v = –15 cm

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{-20} = \frac{1}{-15} - \frac{1}{u}$$

$$u = -60\ cm$$

Further,

$$m = \frac{v}{u} = \frac{height\ of\ image}{height\ of\ object}$$

$$m = \frac{-15}{-60} = \frac{height\ of\ image}{5\ cm}$$

$$height\ of\ image = 1.25\ cm$$

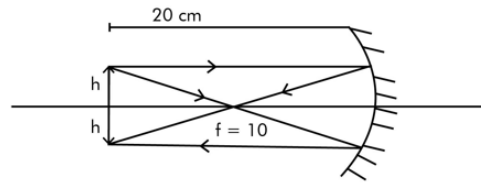
H. Long Answer Questions:

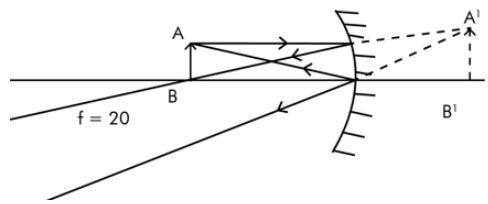
1. (a) C will form image having same size as object since the object is placed at the centre of curvature in mirror C and we know that image formed at C will have the same size as the object.

(b) The radius of curvature of Mirror A is twice the focal length that is 40 cm. Thus the object is placed between C and F. From the ray diagram it is clear that when object lies between C and F of concave mirror the image formed is real and inverted. Hence it is not suitable in the make-up room. Similarly for mirror C the object is placed at C and hence the image formed will be real and inverted.

For the mirror B the object lies between P and F and thus the image formed is virtual and erect hence mirror B is most suitable to be used as make up mirror.

(c)





Analysing and Evaluating Question

2. (a)

(i) The size of image depends upon the position of object hence the size of the image would remain the same.

(ii)The intensity of the image would reduce.

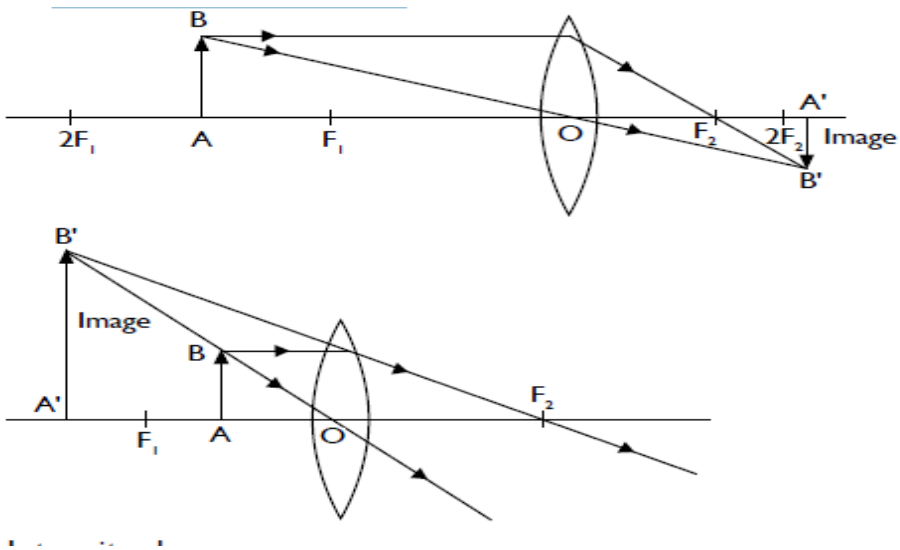
(b) The focal length would remain the same.

(c)

(i) Between F and 2F of a lens.

(ii) Within the focal length.

(d)



I. Assertion- Reason Questions:

1. (a)

2. (c)

3. (d)

J. Case-based Question:

1. (a)

2. (b)

3. (a)

4. (b)

5. (a)

CHAPTER -10

The Human Eye and the Colourful World

WORKSHEET- 1

The Human Eye

A. Multiple Choice Questions:

1. (c)

2. (a)

3. (c)

4. (b)

5. (b)

B. Fill in the blanks using the suitable words given in the brackets:

1. Dilates

2. Pupil

3. Iris

4. Cornea

5. Lens

C. Define the following terms:

1. The light enters the eye through a thin membrane called the cornea. Most of the refraction for the light rays entering the eye occurs at the outer surface of cornea.
2. Iris is a dark muscular diaphragm behind the cornea that controls the size of the pupil.
3. The pupil is a hole located in the centre of iris of the eye that regulates and controls the amount of light entering the eye.
4. Rods are responsible for vision of low light levels. They do not mediate colour vision, and have a low spatial acuity.
5. Cones are photoreceptor cells in the retina of human eye. They respond differently to light of different wavelengths and thus are responsible for colour vision and function best in relatively bright light.

D. Give one word for the following:
1. Cornea
2. Brain
3. Blind spot
4. Retina
5. Ciliary muscles

E. Very Short Answer Questions:

1. (a) Cones detect the colour.
(b) Rods work in dim light.
2. The ability of the eye lens to adjust its focal length is called accommodation of eye lens.
3. The least distance of distinct vision for a normal human eye is 25 cm.
4. The coloured part of the eye which helps regulate the amount of light entering the eye. When there is bright light, the iris closes the pupil to let in less light. And when there is low light, the iris opens up the pupil to let in more light.
5. The vitreous humour is present in between the lens and the retina.

F. Short Answer Questions (Type I):
1. The advantages of having two eyes are:
(a) It gives binocular summation which the ability to detect faint object is enhanced.
(b) It gives a creature a spare eye in case one is damaged.

2. The brain translates the information it receives from the eye into something that we can understand. In fact, the brain receives just three 'images' every second, which are sorted and combined with earlier information to create the reality that you experience.

3. The lens is located in the eye. By changing its shape, the lens changes the focal distance of the eye. In other words, it focuses on the light rays that pass through it (and onto the retina) in order to create clear images of objects that are positioned at various distances.

G. Short Answer Questions (Type II):

1. The amount of light entering the eye is controlling by the iris. It automatically adjusts the size of the pupil according to the intensity of light received by the eye. If the amount of light received by the eye is large, then the iris contacts the pupil and reduces the amount of light entering the eye. If the amount of light received by the eye is small, then the iris expands the pupil so that more light may enter the eye.

2.

(a) They are found in retina.

(b) They are called rod cells and cone cells.

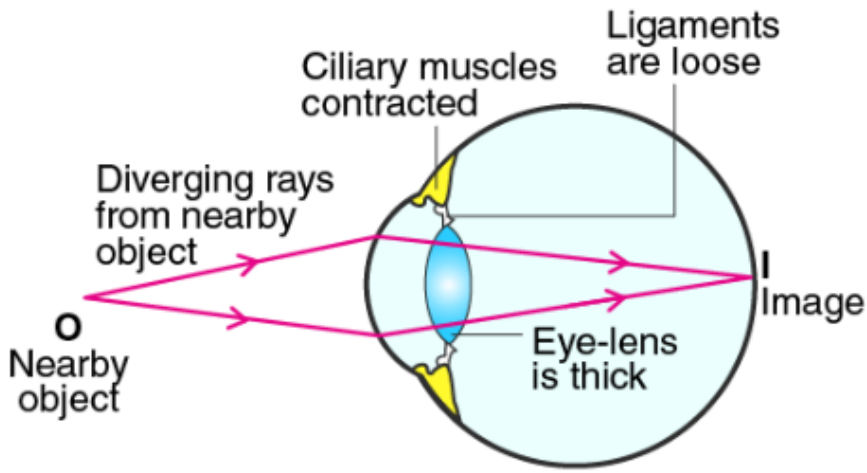
(c) Rod cells are sensitive to low light levels while cone cells are sensitive to bright light.

3. As convex eye lens is made up of fibrous flexible jelly-like transparent material, it can change the focal length of the eye by relaxing and contracting. It allows us to see things three-dimensionally. Since, a normal convex lens is made up of glass, it cannot change its shape, as it is a solid. It allows us to see things two-dimensionally

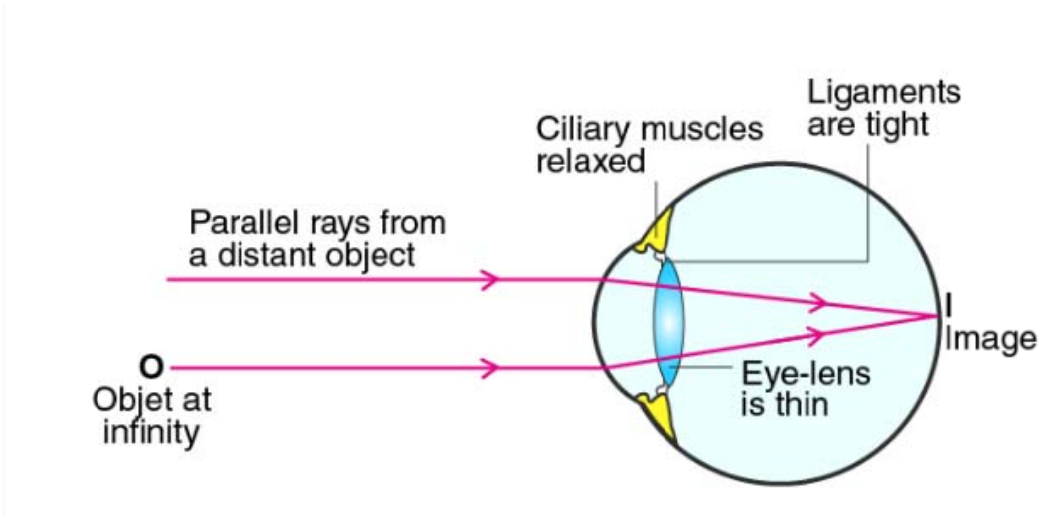
H. Long Answer Questions:

1.

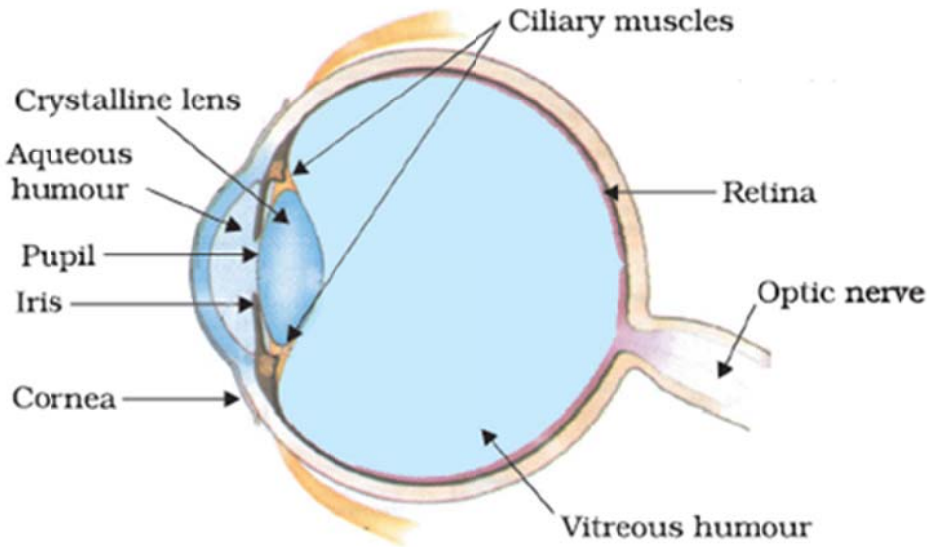
(a) When the eye is focused on a near object, the eye-lens becomes thicker.



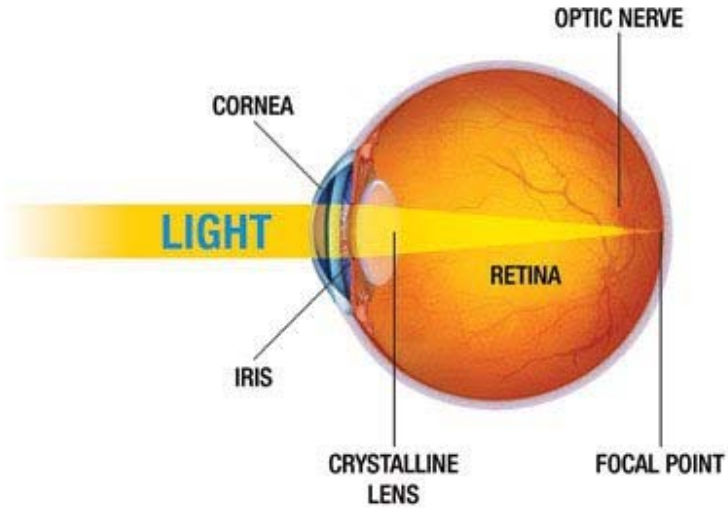
b) When the eye is focused on a distant object, the eye-lens becomes thinner.



2. (a)



(b) CORNEA→ PUPIL→ EYE LENS→ RETINA→ OPTIC NERVE



1) The first thing light encounters when it enters the eye is the cornea, a protective clear covering over the pupil and iris.

2) Light passes from the cornea to the pupil, the dark circle in the center of the iris, which is the colored portion of the eye.

3) The lens focuses light and images on the retina, a layer of light-sensitive cells at the back of the eye.

4) Once the retina senses the image, it sends impulses to the optic nerve at the back of the eye.

WORKSHEET-2

Defects of Vision and their Correction

A. Multiple Choice Questions:

1. (a)

2. (c)

3. (a)

4. (c)

5. (b)

B. Give reasons for the following:

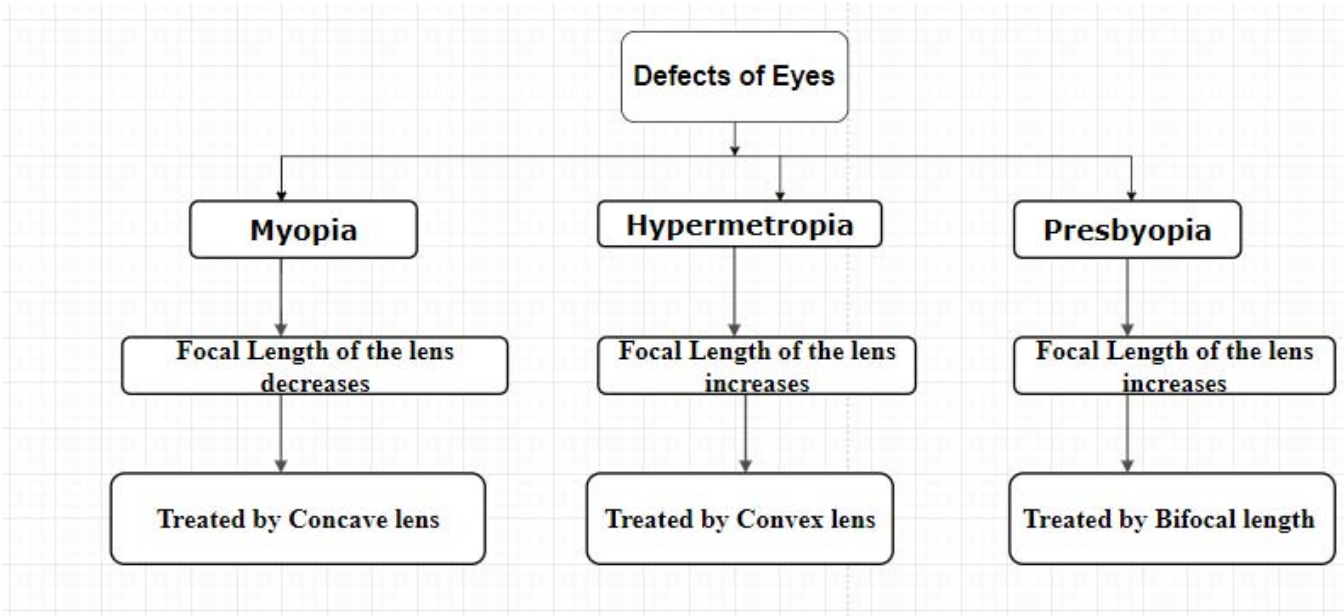
1. Because these defects are the problems in the refraction of the light by the cornea.

2. Hypermetropia is also known as farsightedness in which a person cannot see nearby objects distinctively. This is because the light rays from a nearby object are focused at a point behind the retina.
3. Because the eyeball becomes too long and prevents incoming light from focusing directly on the retina. It may also be caused by an abnormal shape of the cornea or lens.
4. The power of accommodation of the eye usually decreases with ageing. It arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens.
5. A concave lens of suitable power will bring the image back on to the retina and thus the defect is corrected.

C. Match the following:

Column A	Column B
1. Vision	(c) Ability to see
2. Myopia	(e) Near Sightedness
3. Hypermetropia	(a) Far sightedness
4. Presbyopia	(b) Loss of power of accommodation
5. Cataract	(d) Blurred Vision

D. Complete the flowchart given below:



E. Very Short Answer Questions:

1.

(a) Myopia

(b) Hypermetropia

2. This defect of vision arises due to the weakness of ciliary muscle in old age person. Due to loss of elasticity to change the focal length of a lens it causes decreasing the flexibility of eye lens.

3. People who are infected with or died from AIDS, Hepatitis B or C, rabies, tetanus, cholera, Leukemia and such diseases cannot donate eyes.

4. Eye banks are the institutions responsible for collecting (harvesting) and processing donor corneas, and for distributing them to trained corneal graft surgeons.

5. Near Point is 25 cm and far point is infinity.

F. Short Answer Questions (Type I):

1. (a) The two causes of myopia are:

- The eye lens becomes too convex or curved.
- Depth of the eyeball is too much i.e. eyeball lengthened from front to back. When the length of the eyeball is too long as compared to the focusing power of the lens of the eye and cornea.

(b). The two causes of hypermetropia are:

- The eyeball becomes too small along its axis so that the distance between the eye lens and the retina is reduced.
- The focal length of the eye lens becomes too large resulting in the low converging power of the eye lens.

2. Bifocal lenses are the lenses with lines separating two different prescriptions. There is a presence of a distance lens at the top and the lower part has a lens that can be used to view the objects placed nearby.

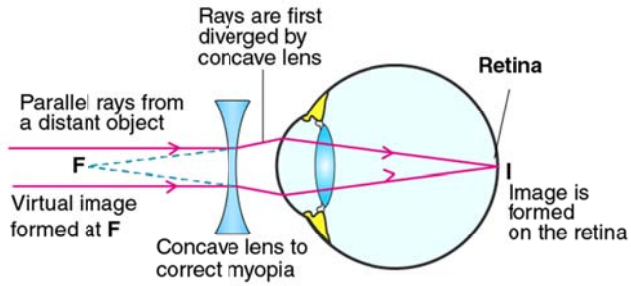
3. (a) The person is suffering from Myopia.

(b) This defect can be cured by using concave lens.

G. Short Answer Questions (Type II):

1. (a) Myopia is also known as short-sightedness in which the person finds difficulty in seeing objects that are placed nearby. This defect is corrected by using a concave lens.

b) Correction of myopia is done with the help of a concave lens.



2. Cataract is the clouding of the lens of human eye that lies behind the iris and pupil. It leaves to a blurred vision or decrease in vision. The lens that has becomes cloudy is replaced by an artificial lens to restore the normal and clear vision.

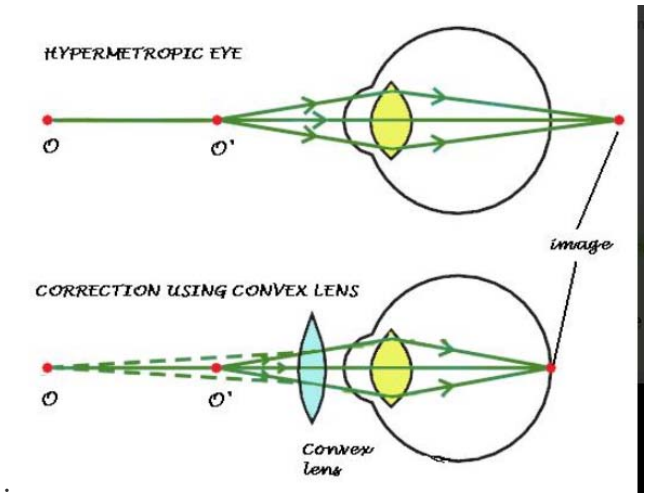
3. (a) Presbyopia is the vision defect in which an person finds difficulty in seeing the nearby objects due to loss of power of accommodation of the eye.

(b) This happens because of weakening of the ciliary muscles and the diminishing flexibility of the eyes.

(c) This is corrected by using convex lens.

H. Long Answer Questions:

1. Hypermetropia is corrected by converging lens



2.

Myopia	Hypermetropia
A defect of vision in which a person cannot see distant objects clearly.	A defect of vision in which a person cannot see distant objects clearly.
Far point of myopic eyes is close than infinity.	The near point of hypermetropic eyes is more than 25 cm.
Myopia occurs because the eye lens have high converging power.	Hypermetropia occurs because the eye lens have low converging power.

Bifocal lens are used by the person suffering from myopia as well as hypermetropia. The upper part corrects myopia and the lower part corrects hypermetropia.

WORKSHEET-3

Refraction and Dispersion of Light through Glass Prism

A. Multiple Choice Questions:

1. (b)

2. (b)

3. (c)

4. (a)

5. (b)

B. State whether the following statements are true or false:

1. False

2. True

3. True

4. True

5. True

C. Fill in the blanks using the suitable words given in the brackets:

1. Spectrum

2. White

3. Rainbow

4. Red

5. Issac Newton

D. Differentiate the following:

1.

Dispersion	Spectrum
Dispersion is the phenomenon in which white light is split into its constituent colors.	Scattering is the phenomenon due to which the light rays deviate from its original path in a different direction.
Dispersion occurs in all mediums but the separation between the split constituents light is affected by the medium.	Scattering is not affected by the medium in which scattering is taking place.
Dispersion of light is the reason for the formation of the rainbow during and after rain. Here the sunlight is dispersed due to the fine raindrops.	The scattering of light is the reason for the blue color of the sky. The blue color is predominately scattered by the fine particles (dust and other particles) and thus the sky appears blue.

2.

Glass slab	Glass Prism
A glass slab is a rectangular, transparent medium, bounded by four surfaces. The two parallel, horizontal surfaces act as the refracting surface.	A glass prism is a homogenous, transparent medium bounded by two plane surfaces, inclined to each other at an angle.
When monochromatic light passes through a glass slab, it suffers refraction at the first surface, whereas at the second surface, it suffers both reflection and refraction, and the reflected ray again suffers refraction at the first surface emerging out in the air.	When monochromatic light passes through a glass prism, the light suffers double refraction, one at refracting surface at which it is incident at and the second at the opposite the refracting surface through which it emerges out in the air.
When white light passes through a glass slab, it suffers refraction at the first surface, and splits into its component colored rays. At the second surface these colored rays suffer reflection and are reversed back to the first surface, undoing the effect of the first surface. At the surface the light again suffers refraction and emerges out as white light.	When white light falls on a glass prism, it splits into the rays of its constituent colors. The reason for 'dispersion' of light is that in glass the light rays of different colors travel with different speed, although in vacuum rays if all colors travel with the same speed. The emergent rays are of different colors. The ray of red light bends minimum towards the base of the prism, while violet light bends maximum.

3.

Angle of Emergence	Angle of Deviation
The angle of emergence is the angle of the light ray coming out of a medium with the perpendicular to the surface at the point of emergence.	The angle of deviation is defined as the angle which is obtained from the difference between the angle of incidence and the angle of refraction created by the ray of light travelling from one medium to another that has a different refractive index.
For any triangular prism angle of emergence is equal to angle of incident.	The Angle of Deviation is the angle equal to the difference between the angle of incidence and the angle of refraction of a ray of light passing through the surface between one medium and another of different refractive index.

E. Very Short Answer Questions:

1. Rainbow

2. Violet

3. Red

4. Isaac Newton

5. Angle of deviation

F. Short Answer Questions (Type I):

1. This information reminds us about the phenomenon of dispersion of light. The rain drops act like miniature prisms refracting or breaking sunlight into various colours as well as reflecting it to produce the spectrum.
2. The acronym VIBGYOR is meant to remember the sequence of colours – violet, indigo, blue, green, yellow, orange and red. The band of coloured components of a light beam is called its spectrum. It is connected with dispersion of light.
3. Isaac Newton was the first to use a glass prism to obtain the spectrum of light. This observation gave Newton the idea that the sunlight is made up of seven colours. Any light that gives as spectrum similar to that of sunlight is often referred to as white light.

G. Short Answer Questions (Type II):

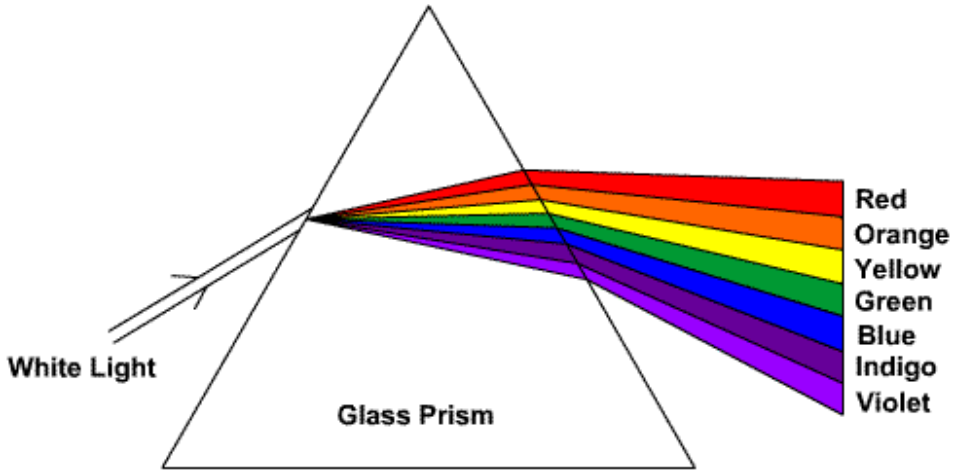
1. Rainbows are formed when light from the sun is scattered by water droplets (e.g. raindrops or fog) through a process called refraction. Refraction occurs when the light from the sun changes direction when passing through a medium denser than air, such as a raindrop. Once the refracted light enters the raindrop, it is reflected off the back and then refracted again as it exits and travels to our eyes.

2.

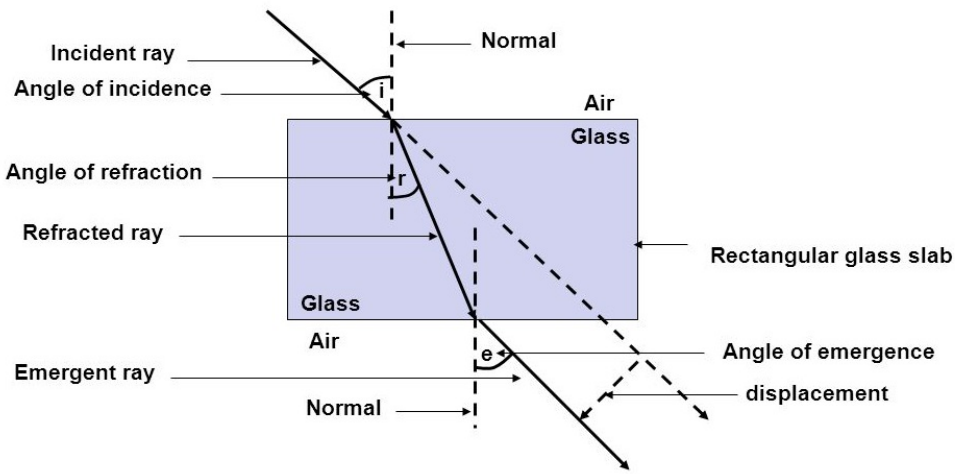
Ray/ Angle	Denoted by
Incident Ray	PE
Refracted Ray	EF
Emergent Ray	FS
Angle of Prism	□□
Angle of Incidence	□i

Angle of refraction	r
Angle of emergence	e

3. When a visible white light is passed through a glass prism it is differentiated into 7 colours this is called dispersion of light.



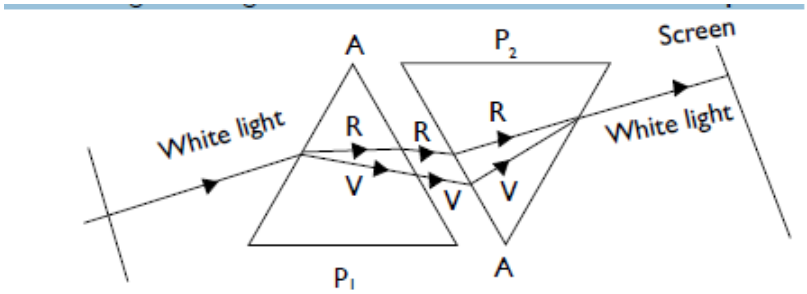
Refraction is the change in direction of a wave passing from one medium to another caused by its change in speed



H. Long Answer Questions:

1.

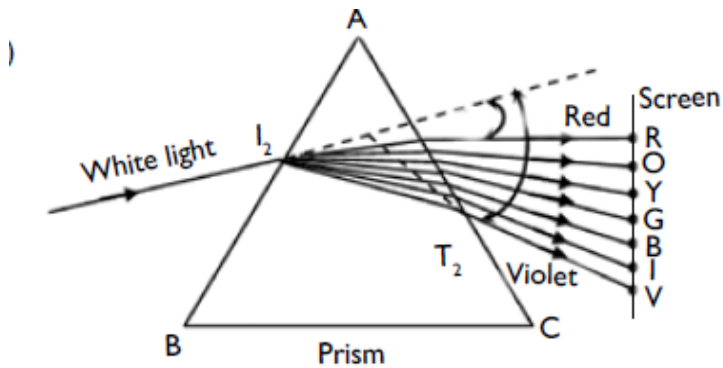
(a) Isaac Newton tried to split the colours of the spectrum of white light further by using another similar prism.
However he could not get any more colours. When a second identical prism is placed in an inverted position
with respect to the first prism this allows all the colours of the spectrum to pass through the second prism.
Thus, a beam of white light emerges from the other side of the second prism.



(b) Violet colour is seen at X as it has the least wavelength and Red colour is seen at Y as it has the highest wavelength.

2

(a)



Where, R stands for Red.

O stands for orange.

Y stands for yellow.

G stands for green.

B stands for Blue.

I stands for Indigo.

V stands for violet.

(b) Different colours have different wavelengths therefore, they deviates differently when passing through a glass prism. The amount of deviation depends on the wavelengths of the coloured light.

WORKSHEET 4

ATMOSPHERIC REFRACTION AND SCATTERING OF LIGHT

A. Multiple Choice Questions:

1. (c)

2. (b)

3. (c)

4. (a)

5. (a)

B. State whether the following statements are true or false.

1. False

2. True

3. False

4. True

5. False

C. Match the following:

Column A	Column B
1. Hotter air	(d) Less Dense
2. Cooler air	(a) More Dense
3. Sunrise	(e) Advanced
4. Sunset	(b) Delayed
5. Scattering	(c) Tyndall effect

D. Give reasons for the following statements:

1. This is due to Tyndall effect.

2. The atmosphere of the earth is made of different layers. It is affected by winds, varying temperatures, and different densities as well. When light from a distant source (a star) passes through our turbulent (moving air) atmosphere, it undergoes refraction many times. When we finally perceive this light from a star, it appears to be twinkling! This is because some light rays reach us directly, and some bends away from and toward us. It happens so fast that it gives a twinkling effect.

3. Stars seems to be higher in sky because of atmospheric refraction.

4. The blue colour is scattered more and hence the sky appears blue. The reason for more scattering of blue colour is that the wavelength of the blue light is shorter than the other light.

5. At noon because the sun is overhead, the light is scattered the least and hence appears white. When it is overhead, it has lesser air to travel through and the scattering from dust and other particles is reduced if the distance to be travelled in air is reduced.

E. Very Short Answer Questions:

1. (a) About 2 minutes.

(b) About 2 minutes.

2. The earth's atmosphere is heterogeneous as it typically consists of 21% Oxygen, 78% nitrogen, 0.93% argon and 0.03% of CO_2 with other gases making up the remaining percentage.

3. Atmospheric Refraction is the phenomenon responsible for apparent flattening of the sun's disc at sunrise and sunset.

4. Colloidal Solutions show Tyndall effect.

5. Very fine particles scatter blue colour and large particle scatter red colour.

F. Short Answer Questions (Type I):

1. Atmospheric refraction is the deviation of light or other electromagnetic wave from a straight line as it passes through the atmosphere due to the variation in air density as a function of height. This causes astronomical objects to appear higher above the horizon than they actually are.
2. Unlike stars, planets do not twinkle. Stars are so distant that they appear as pinpoints of light in the night sky, even when viewed through a telescope. Because all the light is coming from a single point, its path is highly susceptible to atmospheric interference.

3. The Tyndall effect is the scattering of light as a light beam passes through a colloid. The individual suspension particles scatter and reflect light, making the beam visible. The amount of scattering depends on the frequency of the light and density of the particles. The visible beam of headlights in fog is caused by the Tyndall effect, because fog is a colloidal substance.

G. Short Answer Questions (Type II):

1. (a) This is due to refraction. Light rays that travel straight down do not bend, while rays that enter the Earth's atmosphere at a shallower angle get refracted and bend towards the normal, roughly following the direction of the Earth's curvature. This means that celestial objects in the zenith position directly above you appear in the correct position, while objects closer to the horizon appear to be **higher up in the sky** than they actually are.

(b) When the sun is just above the horizon, the light rays coming from it, on entering the Earth's atmosphere suffer atmospheric refraction from a denser to rarer medium so, they bend towards the normal at each refraction. Due to continuous refraction of light rays at each layer, it follows a curved path and reaches the eye of the observer. As a result, we can see the sun 2 minutes after it sets below the horizon in the evening.

2. This hotter air is optically rarer but the colder air further up is optically denser, so when we see the objects by the light coming from them through hot and cold air layers having different optical densities, then refraction of light takes place randomly due to which the objects appear to be moving slightly.

3. During sunrise and sunset, the rays have to travel a larger part of the atmosphere because they are very close to the horizon. Therefore, light other than red is mostly scattered away. Most of the red light, which is the least scattered, enters our eyes. Hence, the sun and the sky appear red.

H. Long Answer Questions:

1. (a)

(i) The colour of the sunlight scattered by the dust particles in the atmosphere will be white because dust particles suspended in the atmosphere are much larger than the wavelength range of visible light.

(ii) The colour of the sunlight scattered by the dust particles in the atmosphere will be blue because blue colour has shorter wavelength.

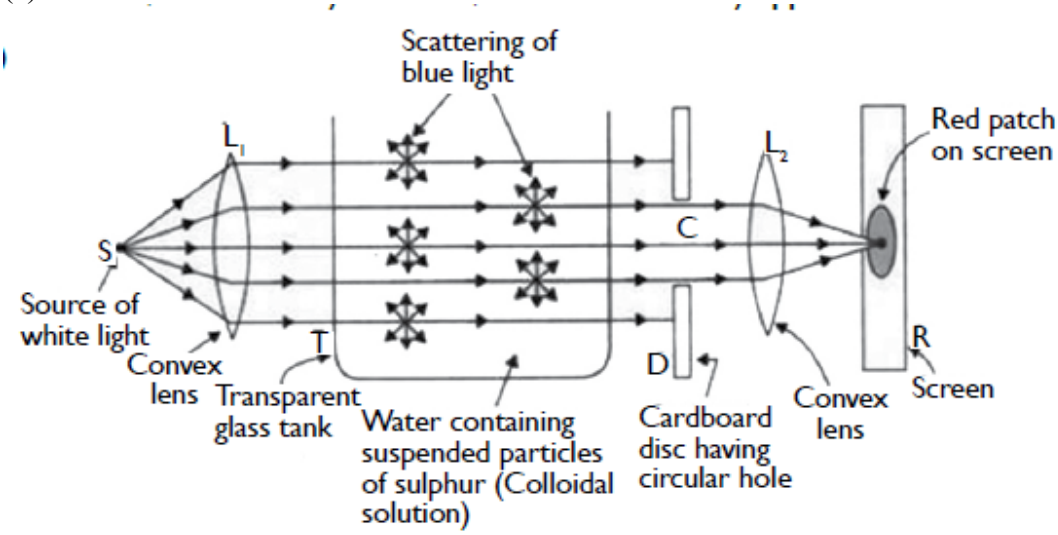
(b) Two effects produced by the scattering of light by the atmosphere are:

- Sky appears blue.
- Sun appears red at sunrise and sunset.

The blue colour have the shorter wavelength due to which it gets scattered more and hence the sky appears blue.

During sunrise and sunset, the rays have to travel a larger part of the atmosphere because they are very close to the horizon. Therefore, light other than red is mostly scattered away. Most of the red light, which is the least scattered, enters our eyes. Hence, the sun and the sky appear red.

2.
(a)



(b) The white light appears as red patch on the screen.
(c) Scattering of light
(d) Red

WORKSHEET- 5

Based on Complete Chapter

A. Multiple Choice Questions:

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

Analysing & Evaluating Questions

6. (a)

7. (b)

B. Define the following terms:

1. Nearsightedness (myopia) is a common vision condition in which you can see objects near to you clearly, but objects farther away are blurry.

2. Accommodation of the eye refers to the act of physiologically adjusting crystalline lens elements to alter the refractive power and bring objects that are closer to the eye into sharp focus.

3. When white light is passed through a glass prism it splits into its spectrum of colours (in order violet, indigo, blue, green, yellow, orange and red) and this process of white light splitting into its constituent colours is termed as dispersion.

4. When light passes from one medium to any other medium say air, a glass of water then a part of the light is absorbed by particles of the medium preceded by its subsequent radiation in a particular direction. This phenomenon is termed as a scattering of light.

5. The spectrum is the range of frequencies of electromagnetic radiation and their respective wavelengths and energies.

C. Fill in the blanks using the suitable words given in the brackets:

1. Retina

2. Seven

3. Away from the normal

4. Distinct

5. Deviation

D. State whether the following statements are true or false:

1. False

2. False

3. False

4. True

5. False

E. Very Short Answer Questions:

1. The ciliary muscles make the eye lens thicker so as to increase its converging power when the eye is focusing on a nearby object.

2. (a) Optic nerve
(b) Pupil

3. Given focal length of the lens = –70 cm, u = –∞
From the lens formula we know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{-70} = \frac{1}{v} - \frac{1}{-\infty}$$

$$v = -70\ cm$$

Hence the far point of the person will be 70 cm.

4. Milk and Starch Solution.
5. Tyndall effect and the "red hues of sunrise and sunset".

Analysing and Evaluating Questions

6. (a) Near Point is 1.2 m and far point is 10 m.

(b) Myopia:

7. The person is suffering from hypemetropia and he should use convex or converging lens in his spectacles to correct his vision.

F. Short Answer Question (Type I):

1. Ciliary muscles are involved in the accommodation reflex. Ciliary muscles help in changing shape of the lens to focus on the near object. It also controls the flow of aqueous humour into Schlemm's canal.

2. When white light comes out of the prism, light is spread in a fan shaped beam. This fan shaped beam is termed as a spectrum. The spectrum consists of violet, indigo, blue, green, yellow, orange and red.

3. For a myopic eye, the correcting lens is concave. Distance of far point, x = 80 cm, P = ?

For viewing distant objects, focal length of corrective lens,
f = -x = -80 cm
Using the relation

$$P = \frac{1}{f}$$

$$P = \frac{1}{-0.8\ m} = -1.25D$$

As the person is suffering from myopia thus he should use convex lens.

4. (a) Power, P = –5.5 D, Focal length, f = ?

$$P = \frac{1}{f}$$

$$F = \frac{1}{-5.5\ D} = -0.18\ m$$

Negative sign indicates that the lens is concave.

(b) Power, P = +1.5 D, Focal length, f = ?

$$P = \frac{1}{f}$$

$$F = \frac{1}{+1.5\ D} = +0.67\ m$$

Negative sign indicates that the lens is convex.

Analysing & Evaluating Questions

5. (a) A person having diabetes and asthma, can donate eyes as diabetes and asthma are not communicable diseases.
(b) A person suffering from communicable diseases like leukemia (cancer), meningitis and hepatitis cannot donate eyes.

G. Short Answer Question (Type II):

1. (a) Scattering occurs when light or other energy waves pass through an imperfect medium (such as air filled with particles of some sort) and are deflected from a straight path. The colours of light separate as the sun's rays pass through the atmosphere, and blue is the colour that reaches us.
(b) This happens because there is no atmosphere in the outer space that can scatter the sunlight. As sunlight is not scattered, no scattered light reaches the eyes of the astronauts and the sky appears dark to them.

2. This hypermetropic eye can see the nearby object kept at 25 cm clearly if the image is formed at its own near point, i.e., 50 cm.

Object distance, u = –25 cm, Image distance, v = –150 cm

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-150} - \frac{1}{-25}$$

$$\frac{1}{f} = \frac{1}{30}$$

$$f = 30\ cm$$

3. Near point distance for a hypermetropic eye, D = 100 cm
Near point distance for a normal eye, D = 25 cm
So, $v = -100$ cm, $u = -25$ cm
Using the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-100} - \frac{1}{-25}$$

$$\frac{1}{f} = \frac{3}{100}$$

$$f = \frac{100}{3}\ cm$$

Further,

$$P = \frac{100}{f(in\ cm)}$$

$$P = \frac{300}{100\ cm} = +3\ D$$

Positive sign indicates that the lens is concave.

4. Three points about donation of eyes.

- Eyes can be donated by contacting the nearest eye hospital/eye donation center within six hours after the death of a particular person.
- Anyone can donate eyes regardless of age, caste, sex, colour etc.
- Corneal Blind peoples are benefitted from the donated eyes.

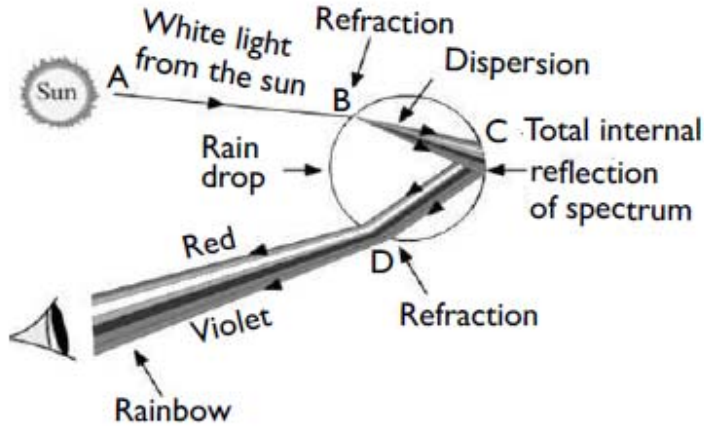
Analysing & Evaluating Question

5. This means that due to atmospheric refraction we continue to see the sun about 2 minutes after the actual sunset. No such atmospheric refraction could have been possible if the earth had no atmosphere. Hence, the day is longer due to the atmosphere of earth.

(b) Yes, this is because the amount of atmospheric refraction is a function of the temperature gradient, pressure and humidity.

H. Long Answer Questions:

1. (a) A rainbow is a natural spectrum appearing in the sky after a rain shower. It is caused by dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the sun. The water droplets act like small prisms. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop. Due to the dispersion of light and internal reflection, different colours reach the observer's eye and appear as a rainbow.



(b) Rainbow formation

(c) Conditions necessary to observe a rainbow are as follows:
• The sun should be behind us.
• It should have rained and the sun should be present.

Analysing & Evaluating Question

2. (a) The defect shown in the above diagram is myopia or near-sightedness. In myopic eye, the image of a distance object is formed in front of the retina.
(b)Two causes of this defect are:

- Excessive curvature of eye lens.
- Elongation of the eye ball.

(c) Concave lens of suitable power is used to correct this defect.

I. Assertion- Reason Questions:

1. (d)
2. (b)

3. (c)

J. Case-Based Question:

1. (a)
2. (a)
3. (d)
4. (d)
5. (d)

CHAPTER – 11

Electricity

WORKSHEET 1

Electric Circuit, Current and Potential Difference

A. Multiple Choice Questions:

1. (a)
2. (b)
3. (a)
4. (b)
5. (a)

B. State whether the following statements are true or false:

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

C. Give One Word for the following:

1. Proton
2. DC
3. Voltmeter
4. Coulomb
5. Ammeter

D. Complete the table given below:

Components	Symbol
Open switch	
Cell	
Battery	
Voltmeter	
Ammeter	
Variable resistor	
Bulb	

E. Very Short Answer Questions:

1. Electric charge (Q) = [Electric current (I)]*[Time]
2. (a) Coulomb
(b) Volt
3. (a) 1000
(b) 1000000
4. Potential Difference is defined as the work done per unit charge. Unit of Work is joule and the unit of charge is coulomb. Hence the unit of potential difference is joule per coulomb.
Let V represents the potential difference, W is the work done and Q is the charge.

$$V = \frac{W}{Q}$$

$$V = \frac{Joule}{Coulomb}$$

$$V = JC^{-1}$$

5. A circuit diagram is a simplified representation of the components of an electrical circuit using either the images of the distinct parts or standard symbols.

F. Short Answer Type Questions (Type I):

1. Potential Difference is defined as the work done per unit charge. Unit of Work is joule and the unit of charge is coulomb. Hence the unit of potential difference is joule per coulomb.

$$V = \frac{W}{Q}$$

Where W is work done and Q is the charge.

2. Electric charge is the product of current and time.

$$Electric\ Charge = Electrric\ Current\ \times Time$$

$$Charge = \ 4A \times (10\ seconds)$$

$$= 40\ Coulomb$$

3. (a) Variable resistor
(b) Closed Switch

G. Short Answer Questions (Type II):

1. When one end of a wire (for example) is made negative and the other end positive, electrons in the wire have a force placed on them. They are repelled by the negative end and attracted to the positive end, so they move in the wire, carrying electrical charge. This flow of charge is described as electric current.
2. (a) A key make (complete) or break the circuit.
(b) (i) If the key is closed the circuit would get closed and current would start flowing in the circuit.
(ii) If the key is open then circuit will be open and no current would flow in the circuit.

3. (a) Potential Difference is defined as the work done per unit charge. Unit of Work is joule and the unit of charge is coulomb. Hence the unit of potential difference is joule per coulomb.

$$V = \frac{W}{Q}$$

Where W is work done and Q is the charge.
(b). Potential difference is:

$$230V - 220V = 10V$$
$$Work\ done = (10V)(4C)$$
$$= 40\,J$$

H. Long Answer Questions:

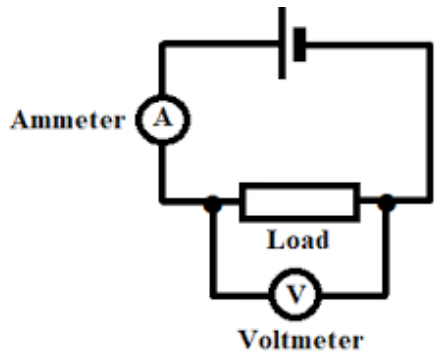
1. (a) An electric current is the rate of flow of electric charge in a direction. The tendency of attraction between the positive and negative charges makes electric current flow through a wire.
(b) Given:
Current = 1A
Time, t = 1s
Using the formula:

$$Q = i * t$$
$$Q = (1A) * (1s)$$
$$Q = 1C$$

If the charge is $1.6 \times 10^{-19}\,C$, the number of electrons is 1. So, if the charge is 1 C, the number of electrons is given by:

$$Q = ne$$
$$1C = n(1.6 \times 10^{-19}\,C)$$
$$n = \frac{1}{1.6 \times 10^{-19}\,C}$$
$$n = 6.25 \times 10^{18}\ electrons$$

2. (a) i) If the resistance of an ammeter is large, the current measured by the ammeter is quite less as compared to the actual amount of current flowing through the circuit which is ineligible.
(ii) The voltmeter should have high resistance because it draws very little current from the circuit and the voltage to be measured does not drop.
(b)



WORKSHEET- 2

Ohm's Law and Combination of Resistances

A. Multiple Choice Questions:

1. (a)
2. (b)
3. (a)
4. (a)
5. (b)

B. Fill in the blanks using the suitable words given in brackets:

1. Directly
2. Good
3. Reduces
4. Semi-conductors
5. Rheostat

C. State whether the following statements are true or false:

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

D. Match the following:

Column A	Column B
1. Resistance	(b) Ohm
2. Resistivity	(e) Ohm-metre
3. Series	(a) Current Constant
4. Parallel	(c) Potential Constant
5. Alloy	(d) Constantan

E. Very Short Answer Questions:

1. Rubber is an insulator and does not allow the passage of electric current through it, so when electricians wear rubber gloves, electric current cannot pass through them which prevents them from electric shock.
2. When the conductor is made thinner, resistance increases. This is because resistance is inversely proportional to area of cross section.
3. The net resistance is reduced in parallel combination.

4. When "n" equal resistors of resistances "R" are connected in parallel the net resistance is R/n.
5. The resistivity of a material depends on its nature and the temperature of the conductor.

F. Short Answer Questions (Type I)

1. Nichrome is used for making heating elements because of the following reasons.

- It has high melting point.
- Its resistivity is very high.

2. (a) Both the resistors are connected in series, hence the net resistance would be the algebraic sum of individual resistances.

$$500\ \Omega + 1000\ \Omega = 1500\ \Omega$$
$$= 1.5\ k\Omega$$

(b) Both the resistors are connected in parallel. Let the combined resistance is represented by R_{net}.

$$\frac{1}{\text{Rnet}} = \frac{1}{2\Omega} + \frac{1}{2\Omega}$$

$$\frac{1}{\text{Rnet}} = \frac{2}{2\Omega}$$
$$\text{Rnet} = \frac{2\Omega}{2}$$
$$\text{Rnet} = 1\Omega$$

3. In series connection the net resistance is very high than the individual resistances.
Consider the graph, for any fixed value of current on the x axis, the voltage at y axis is maximum in C and least in A. Hence, C represents the series connection of resistors.

G. Short Answer Questions (Type II):

1. (a) The resistance is directly proportional to the length of wire. Hence when length is tripled, the resistance also becomes three times.
(b)) If the diameter get tripled then its resistance becomes one ninth of the initial resistance.
2. (a) If only coil A is used then the net resistance connected in the circuit will be $24\ \Omega$.
The current can be then determined by the ohm's law.

$$i = \frac{V}{R}$$
$$i = \frac{220\ V}{24\Omega}$$
$$i = 9.17\ A$$

(b) When the coils are connected in series the net resistance will be:

$$24\ \Omega + 24\ \Omega = 48\ \Omega$$

The current can be then determined by the ohm's law.

$$i = \frac{V}{R}$$
$$i = \frac{220\ V}{48\ \Omega}$$
$$i = 4.58\ A$$

(c) When the coils are connected in parallel the net resistance would be:

$$\frac{1}{\text{Rnet}} = \frac{1}{24\ \Omega} + \frac{1}{24\ \Omega}$$

$$\frac{1}{\text{Rnet}} = \frac{2}{24\ \Omega}$$
$$\text{Rnet} = 12\ \Omega$$

The current can be then determined by the ohm's law.

$$i = \frac{V}{R}$$
$$i = \frac{220\ V}{12\ \Omega}$$
$$i = 18.33\ A$$

3. (a) The resistance depends upon temperature by the relation $R_T = R_o(1+\alpha\Delta T)$, where R_T is the unknown resistance at any temperature, R_o is the resistance at known temperature, ΔT is the temperature difference and α is the temperature coefficient.
For metal the value of temperature coefficients is positive i.e temperature increases with increase in resistance and vice versa.
Hence if the temperature is decreased then the resistance of the metal would also decrease.
(b) Presence of impurities in a metal increases the resistance.

H. Long Answer Questions:

1. Definition of Ohm's Law

According to ohm's law at constant temperature , the current(I) flowing through a conductor is directly proportional to the potential difference(V) across its ends. i.e.

$$I \propto V$$

$$I = \frac{V}{R}$$

Where, R is a constant called "Resistance" of the conductor.

Unit of Resistance:
The unit of resistance is ohm(Ω).

From Ohm's Law,

$$R = \frac{V}{I}$$

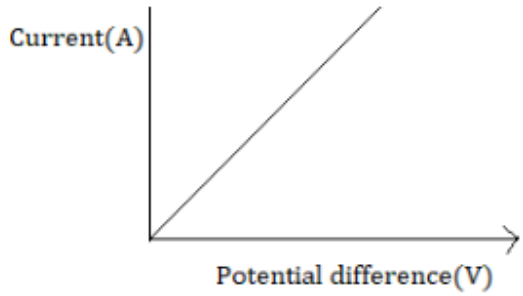
If V = 1 Volt and I =1 Ampere then,

$$R = \frac{1\ V}{1\ A}$$

$$= 1\ \Omega$$

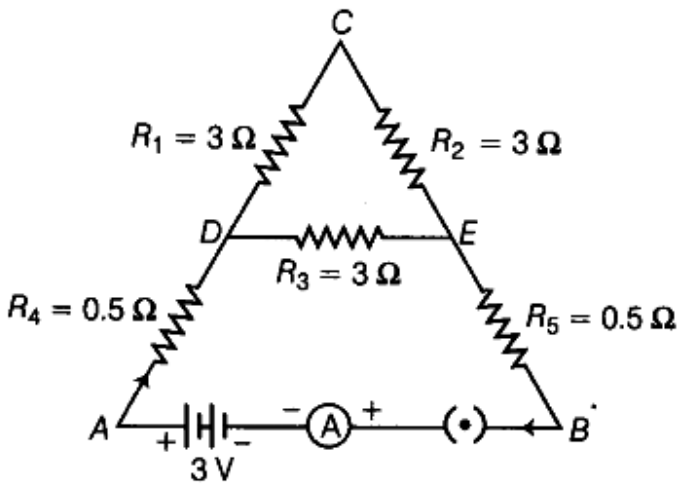
Thus, 1 Ohm is the resistance of a conductor such that when a potential difference of 1 Volt is applied to its ends and current of 1 Ampere flows through it.

Graph for ohm's law:



As the graph between V and I is a straight line passing from origin, hence it is clear that voltage and current are having a direct relationship.

2. Let the circuit is represented as:



The resistance R_1 and R_2 are connected in series. Their net resistance "R" is the algebraic sum of resistance R_1 and R_2.

$$R = 3\,\Omega + 3\,\Omega = 6\,\Omega$$

This is connected in parallel with R_3, so the combined resistance is R_s.

$$Rs = \frac{(6\,\Omega)(3\,\Omega)}{6\,\Omega + 3\,\Omega}$$
$$Rs = 2\,\Omega$$

The resistor R_s is connected in series with is R_4 and is R_5. The net resistance between D and E is represented by is R_{DE}.

$$R_{DE} = 2\ \Omega + 0.5\ \Omega + 0.5\ \Omega$$

$$= 3\ \Omega$$

The ammeter represents the net current in the circuit. The net current I is calculated by Ohm's law.

$$I = \frac{3\ V}{3\ \Omega}$$

$$I = 1\ A$$

WORKSHEET- 3

Heating Effects of Current and Electric Power.

A. Multiple Choice Questions:

1. (d)

2 .(d)

3. (d)

4. (b)

5. (b)

B. Fill in the blanks using the suitable words given in the brackets.

1. Kilowatt hour

2. Power

3. Tungsten

4. Series

5. Energy

C. Give one word for the following:

1. Watt

2. Power

3. Watt

4. Power

5. Magnetic effect

D. Complete the following table:

S. No.	Quantities	Relation
1.	P,V and I	P=VI
2.	H, I, R and t	$H=I^2Rt$
3.	P, V and R	$P=V^2/R$
4.	P, I and R	$P=I^2R$
5.	H, T, I and V	P=VIT

E. Very Short Answer Questions:

1. Kilowatt hours (kWh) is the commercial unit of energy.

2. Heating effect of current is used in glowing light bulbs and room heaters.

3. Rating of fuse = Power consumed / voltage applied

= 1 kW / 220 V

= 1000 W / 220 V

= 4.54 A

4. *Electric power* is the rate at which work is done or energy is transferred in an *electrical* circuit. SI unit of power is Watts.

5. Heating effect and magnetic effect.

F. Short Answer Questions (Type I)

1. (a) Series connection.

(b) Parallel connection

2. Watt is the unit of power. 1 Watt is the rate of consumption of energy in a circuit when the current in the circuit is 1 A and potential difference is 1 Volt.

1W= (1 Volt)(1 Ampere)

3. The symbol kWh means kilowatt hours. It is used to represent the electrical energy consumed.

G. Short Answer Questions (Type II):

1. Electric Bulbs are not filled with air because an electric bulb's filament is comprised of tungsten, which would quickly burn if it came into touch with oxygen in the air therefore it is not filled with air. Unreactive gases like argon and nitrogen are used to fill electric bulbs for this reason. Chemically, these gases are inert.

2. An electrical fuse is a safety device that operates to provide protection against the overflow of current in an electrical circuit. An important component of an electrical fuse is a metal wire or strip that melts when excess current flows through it. It helps to protect the device by stopping or interrupting the current.

Under normal conditions, the fuse wire is a part of the circuitry, contributing to a complete loop for charges to flow through it. However, when an excessive amount of current flows through the fuse wire, the heating effect of current causes the fuse wire to melt. This is because the fuse wire is chosen such that it has a low melting point. This causes the loop to break thereby stopping the flow of charges in the circuit.

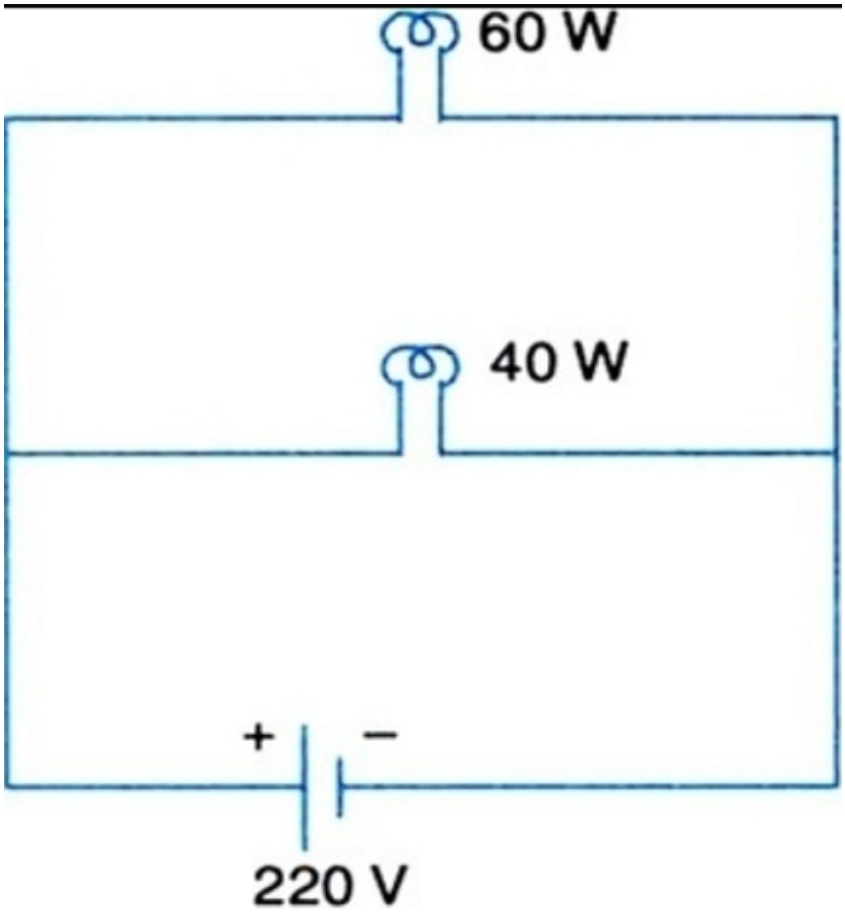
3. (a) The dimmest lamp will be in the (II) case as the total voltage is divided between the lamps.

(b) The lamps of equal brightness are in the (III) case, they have equal voltage across them.

(c) The maximum light is in the (III) case as there are two lamps with entire applied voltage.

H. Long Answer Questions:

1. (a)



(b) Both the lamps are connected in parallel hence the current drawn by each lamps would be different. The net current drawn would be the sum of current drawn by both the lamps.

Current drawn by 40 W lamp is:

$$I = \frac{V}{P}$$

$$I = \frac{60\ W}{220\ V}$$

$$I = 0.273\ A$$

Similarly, current drawn by 40 W lamp is:

$$I = \frac{40\ W}{220\ V}$$

$$I = 0.182\ A$$

The net current drawn by battery is the sum of current drawn by 60 W lamp and 40 W lamp.

$$0.273\ A + 0.182\ A = 0.455\ A$$

(c) Total energy consumed by the two lamps together when they operate for one hour = Energy consumed by 40 W lamp in 1 hour + Energy consumed by 60 W lamp in hour.

Energy consumed by 40 W lamp in 1 hour = (40 W)(1 Hour) = 40 Watt hours

Energy consumed by 60 W lamp in 1 hour = (60 W)(1 Hour) = 60 Watt hours

Net energy consumed= 40 Watt hours + 60 Watt hours = 100 Watt hours

= 0.1 kWh

2. (a) Joule's law of heating states that, when a current 'i ' passes through a conductor of resistance 'r' for time 't' then the heat developed in the conductor is equal to the product of the square of the current, the resistance and time.

Mathematical expression of the Joule's law is:

$$Q = I^2 \quad R \quad T$$

Where

Q = Amount of heat

I = Electric current

R = Amount of electric resistance in the conductor

T = Time

We know that, electric power is I^2 times the resistance, i.e.

$$P = I^2R$$

And energy is the product of power and time.

$$Q = PT$$

Substituting I^2R for P.

$$Q = I^2RT$$

Where I= current flowing through the conductor

R= resistance of the conductor

T= time for which current is flowing in the conductor.

(b). The net resistance of the circuit is the sum of resistors connected in series, i.e.

$40\ \Omega + 60\ \Omega = 100\ \Omega$

According to Joules law of heating, the heat generated is equal to I^2RT, where I is the current in ampere, R is the net resistance which is dissipating the heat and T is the time in seconds for which current is flowing.

$$H = I^2RT$$

$$H = (\frac{V}{R})^2RT$$

$$H = \frac{V^2}{R}T$$

$$H = \frac{(220\ Volt)^2}{(100\ \Omega)}(30\ seconds)$$

$$H = 14520\ Joules$$

WORKSHEET - 4

Based on Complete Chapter

A. Multiple Choice Questions:

1. (d)

2. (c)

3. (d)

4. (b)

5. (b)

Analyzing & Evaluating Questions

6. (b)

7. (d)

B. Fill in the blanks using the suitable words given in the brackets:

1. Series

2. Charges

3. Cells

4. Allow

5. 1 Joule

C. Define the following terms:

1. Power is defined as the rate of doing work in a unit time.

2. Resistance is an elements which resists the flow of current in a circuit.

3. The amount of work done in bringing a unit positive charge from infinity to that point.

4. Electric current is defined as the rate of flow of charges.

5. 1 unit of electricity is equal to 1 kilowatt hours. It is the amount of energy consumed by an appliance of rating 1000 W when used for 1 hour.

D. Differentiate between the following:

1.

Resistance	Resistivity
Resistance is the physical property of a substance because of which it opposes the flow of current i.e. electrons.	Resistivity is the physical property of a particular substance which is having particular dimensions.
Resistance is directly proportional to the length and temperature while it is inversely proportional to the cross-sectional area of the material.	Resistance is only proportional to the temperature of the conductor. It also depends on the nature of the material of the conductor.

The SI unit of resistance is ohm.	The SI unit of resistivity is ohm-metre.

2.

Conductors	Insulators
Electrical conductor is defined as materials that allow electricity to flow through them easily.	Insulators are materials that hinder the free flow of electrons from one particle of the element to another.
Electrons move freely within the conductor.	Electrons do not move freely within the insulator.
A few examples of a conductor are silver, aluminium, and iron.	A few examples of an insulator are paper, wood, and rubber.

3.

Electric Power	Electric Energy
It is the rate at which work is done or energy is transformed in an electrical circuit. In simpler words, it is a measure of how much energy is used in a span of time.	The work is done or energy supplied by the source in maintaining the flow of electric current is called electrical energy.
Electric power is equal to the rate of doing work by an energy source i.e. $P = W/T$	It is equal to the product of power and time i.e. $E = P \times t$
The SI unit of power is Watt, joule per second.	The SI unit of energy is Joule (J) or Kilowatt-hour (kWh).

E. Very Short Answer Questions:

1. According to Ohm's Law, voltage is current times the resistance i.e. V=IR

Potential difference when current of 2 Ampere is flowing through the 20 Ω resistance is

$(20\ \Omega)(2A) = 40\ V$

2. It also indicates that maximum safe current that can flow through the lamp is 3 Ampere. It also represent that the resistance of the filament of lamp is 4 **Ω**. Other than this it also indicates that the lamp will consume energy at the rate of 36 J/s.

3. Two examples of good conductors of electricity are copper and aluminium. Both of these elements have very low value of resistivity hence they are good conductors of electricity.

4. Copper and Aluminium have very low value of resistivity hence they are good conductors and are used in electricity transmission.

5. Current is defined as the rate of flow of charges. When 20 C charge is passed through the circuit in 40 seconds then the current is:

$$I = \frac{Q}{T}$$

$$I = \frac{20\ C}{40\ s}$$

$$I = 0.5\ A$$

Analysing and Evaluating Questions

6. Power dissipated varies as the square of current. If the current is increased by 100% that is current become twice its original value. The power would be 4 times the original value.

Let the percentage increase in power is represented by ΔP.

$$\Delta P = \frac{4P - P}{P} \times 100$$

$$\Delta P = \frac{3P}{P} \times 100$$

$$\Delta P = 300\%$$

Hence the power would increase by 300%.

7. The heat in an electrical circuit is calculated by the formula

$$H = \frac{V^2}{R} T$$

That is the heat generated is inversely related to the resistance of the circuit.

The net resistance in case (I) is 2 Ω, in case (II) its 4 Ω (series connection of 2 Ω and 2 Ω), and in case (III) its 1 Ω (parallel connection of 2 Ω and 2 Ω). As the resistance is lower in case (III) hence the heat generated would be maximum in case (III).

F. Short Answer Question (Type I):

1. Energy of one day =Power × Time = 400W × 8h = 3.2KWh

Energy of 30 days = 3.2 kWh × 30 = 96 kWh.

So, cost of the energy = 96 × 3 = Rs.288

2. The resistors are connected in parallel consequently the voltage across each resistor would be the same i.e. 24 V

Current through 6 Ω resistor is = 24 V / 6 Ω = 4 A

Similarly, current through 4 Ω resistor is = 24 V / 4 Ω = 6 A

3. Radius of cable is 1 mm or 10^{-3} m., length of cable is 10 km or 10^{4} m, Resistivity of aluminium (ρ) is 2.7×10^{-8} Ω m.

We know that resistance (R) is calculated as

$$R = \frac{\rho l}{a}$$

$$R = \frac{(2.7 \times 10^{-8})(10000)}{\pi(10^{-3})(10^{-3})}$$

$$R = 85.94\ \Omega$$

4. Current in electric lamp =220 V / 100 Ω = 2.2 A

Current in toaster = 220 V / 50 Ω = 4.4 A

Current in filter = 220 V / 500 Ω = 0.44 A

⇒ Total current = 2.2 A + 4.4 A + 0.44 A

= 7.04 A

Net resistance that would take same current from the circuit = 220 V / 7.04 A

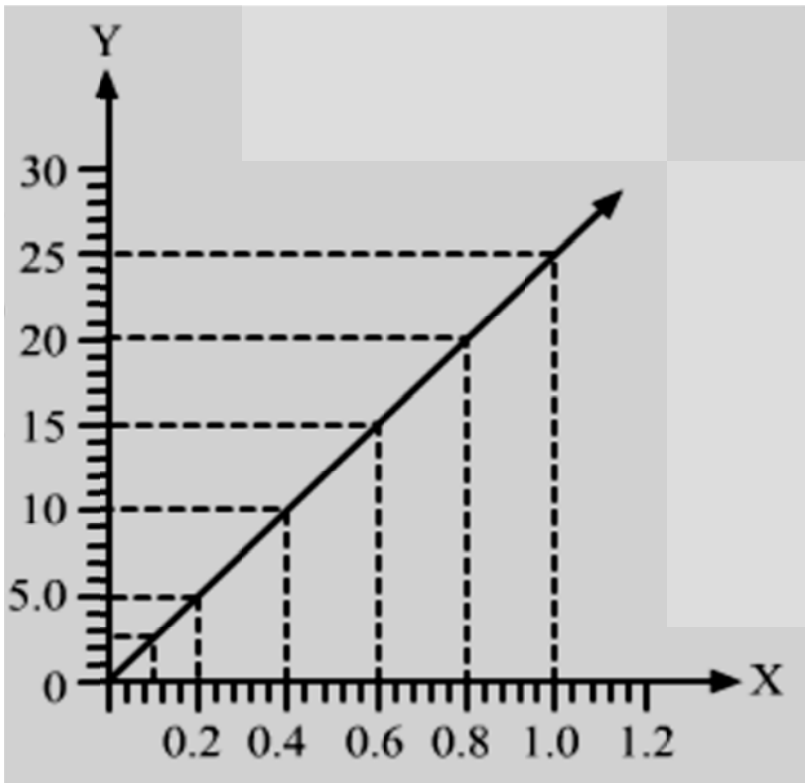
= 31.25 Ω

Analysing & Evaluating Questions

5. Filament type electric bulbs are not power efficient because most of the electric power consumed by the filament of a bulb appears as heat and only a small amount of electric power in converted into light.

G. Short Answer Questions (Type II):

1. The graph between V and I is drawn below. The abscissa represent the value of current through the resistor and the ordinate represent the value of voltage across the resistor.



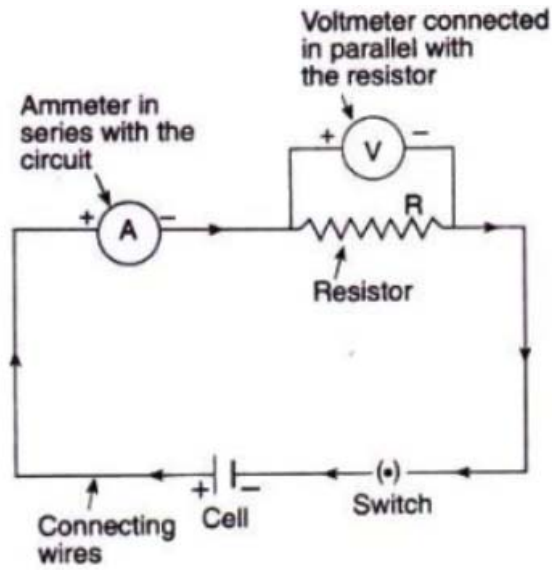
The resistor is calculated by dividing the value of voltage by the corresponding value of current.

R = 5 V / 0.2 A = 25 Ω

R = 2.5 V / 0.1 A = 25 Ω

R = 10.0 V / 0.4 A = 25 Ω

2. A diagram which indicates how different components in a circuit have been connected by using the electrical symbols for the components is called a circuit diagram.



A voltmeter measures the voltage difference between two different points, but it should not change the amount of current going through the element between those two points. So, it should have very high resistance so that it doesn't allow current to pass through it.

3.

(a) (i) Resistivity: This is due to the reason that the resistivity is the property of the material of which the wire is made. As both the wires are made of the same metal, their resistivity is the same.

(ii) Resistance: As both the wires are of different cross-sectional area, their resistances are different.

(b) (i) Let R_A is the resistance of wire A and R_B is the resistance of wire B.

$R_A = 4\ R_B$

$R_A / R_B = 4 / 1$

As resistance is inversely proportional to area, hence area of wire A that is A_A is ¼ times area of wire B i.e. A_B.

$A_A / A_B = 1 / 4$

(ii) The cross section area of wire depends upon the square of radius. Let R_A and R_B be the radius of wires A and B respectively.

$A_A / A_B = (R_A / R_B)^2$

Since, $A_A / A_B = 1 / 4$

Therefore, $(R_A / R_B)^2 = 1 / 4$

Taking square root on both sides.

$(R_A / R_B) = 1 / 2$

4. The reasons why different electrical appliances in a domestic circuit are connected in parallel are:

- All the appliances get their rated voltage so that they function efficiently.
- All the components can have their independent switch to control them.
- If one appliance gets faulty, it doesn't affect the other appliances.

Analysing & Evaluating Question

5. As the lamps are similar hence their resistances would also be equal. Let the resistance of each lamp is R Ω

When connected in series the net resistance would become 2R.

The power in series connection would be $V^2 / 2R$. Let the power is represented by P_1.

$P_1 = V^2 / 2R$

When connected in parallel the net resistance would become R / 2.

The power in parallel connection would be $V^2 / R / 2$ or $2V^2 / R$. Let the power is represented by P_2.

$P_2 / P_1 = 2V^2 / R / V^2 / 2R$

$P_2 / P_1 = 4$

$P_2 = 4 P_1$

H. Long Answer Questions:

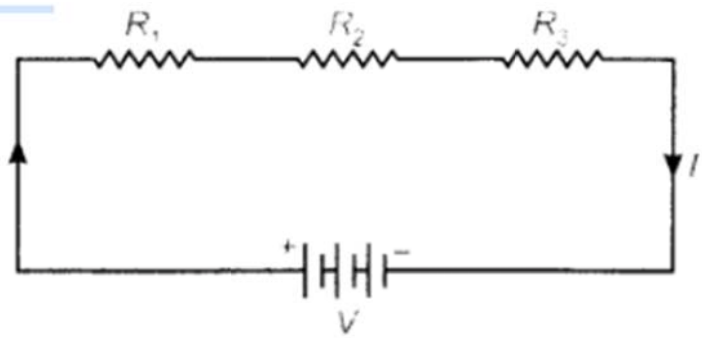
1. (a) No, the bulb in series connection would glow less as the net resistance would be more in series connection and the power is inversely proportional to the resistance.

(b). The remaining bulbs would continue to glow in case of parallel connection because in parallel connection, every bulb would get the same voltage and thus the current from each bulb would be independent from the rest of bulbs.

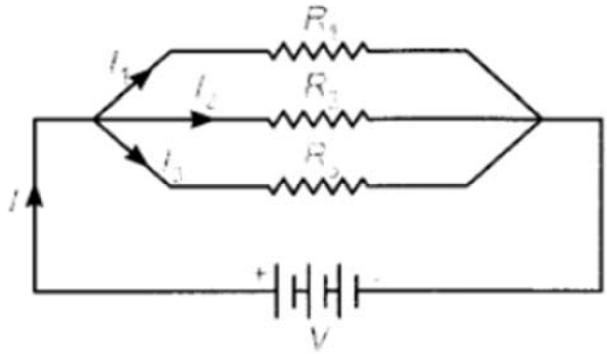
However, in series connection if one bulb get fused then no current would flow in the circuit due to which none of the bulb would glow.

(c)

For series,



For parallel,



Analysing & Evaluating Questions

2.

(a) In the circuit both the 8 Ω resistors are connected in parallel. Let R_{eq} represents the equivalent resistors of the parallel connected resistors.

$$\text{Req} = \frac{(8\ \Omega)(8\ \Omega)}{8\ \Omega + 8\ \Omega}$$

$$\text{Req} = 4\ \Omega$$

The net current in the circuit is calculated by Ohm's law

$$\text{I} = \frac{8\ V}{4\ \Omega + 4\ \Omega}$$

$$\text{I} = \frac{8\ V}{8\ \Omega}$$

$$\text{I} = 1\ A$$

The net current in the circuit is the current flowing through the 4 Ω resistor that is 1 A.

(b) The Potential difference across 4 Ω resistor is calculated by Ohm's Law

V = (4 Ω) (1 A)

= 4 V

(c) Power dissipated across the 4 Ω resistor is given by I^2R. Current through 4 Ω resistor is 1 A.

Hence, $P = (1\ A)^2\ (4\ \Omega) = 4\ W$

(d) There is no difference in the reading of ammeters, both will read the same current of 1 A.

I. Assertion- Reason Questions:

1. (a)

2. (a)

3. (d)

J. Case- Based Question:

1. (a)

2. (a)

3. (a)

4. (b)

5. (a)

CHAPTER -12

Magnetic Effects of Electric Current

WORKSHEET 1

Magnetic Field and Field lines

A. Multiple Choice Questions:

1. (b)

2. (b)

3. (b)

4. (b)

5. (c)

B. Fill in the blanks using the suitable words given in the brackets:

1. Bar Magnet

2. Compass Needle

3. Field

4. North South direction

5. North

C. Differentiate between the following:

1.

Bar Magnet	Compass
Bar magnet attracts the magnetic material.	Compass needle shows deflection when bought near bar magnet.
Opposite poles of bar magnet attract each other when they are in close proximity.	Compass needle don't attract each other. No matter how close they are.

2.

North Pole	South Pole
North poles are attracted by south poles of other magnets while they are repelled by north poles of other magnets.	South Poles are attracted by north poles of other magnets while they are repelled by south poles of other magnets.
North Poles are the sources of magnetic field lines.	South Poles are the sinks of magnetic field lines.
North pole of a magnet ends up pointing towards the "North Pole" of The Earth.	South pole of a magnet ends up pointing towards the "South Pole" of The Earth.

3.

Magnetic field	Field Lines
A magnetic field is represented by a series of lines around a magnet.	The path along which north pole moves in a magnetic field is called magnetic lines of force or magnetic

	field line.
The direction of magnetic field is taken to be the direction in which a north pole of compass needle move inside it.	Magnetic field lines emerges from North pole and enter the magnet at south pole. Inside the magnet direction of field line is from south pole to north pole.

D. Give one word for the following:

1. Magnet

2. Magnetic field

3. Compass

4. Magnetic flux lines

5. North Pole

E. Very Short Answer Questions:

1. Hans Christian Oersted

2. The magnet exerts its influence in the region surrounding it. Therefore the iron filings experience a force. The force thus exerted makes iron filings to arrange in a pattern.

3. The region surrounding a magnet, in which the force of the magnet can be detected, is said to have a magnetic field.

4. The north an the needle of the compass indicates the direction of magnetic field at the point where it is placed.

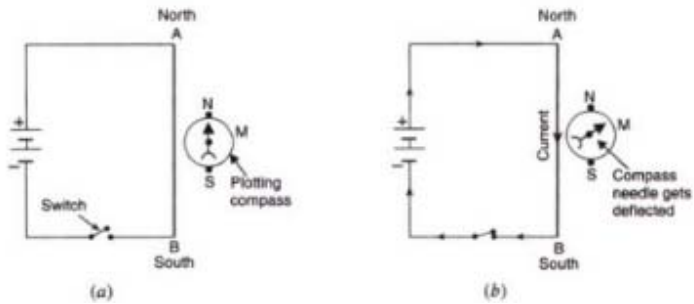
5. The strength of the field is proportional to the closeness of the field lines.

F. Short Answer Questions (Type I):

1. We can trace the pattern of magnetic field lines of magnet by a compass and by iron fillings in the compass needle method. For this, we need to let the needle rotate freely and trace it.
2. A strong magnetic strip is attached along the door frame of refrigerator's body. This is covered by a gasket which can be seen along the frame. This magnetic strip attracts the door which is made of metal. When it comes close to the door frame and pulls, it shuts the door and prevents from opening.
3. A compass needle is a small bar magnet. So when it is brought near a bar magnet, its magnetic field line interact with that of the bar magnet. Hence a compass shows a deflection when brought near a bar magnet.

G. Short Answer Questions (Type II):

1.
We take a thick insulated copper wire and fix it in such a way that the portion AB of the wire is in the north-south direction as shown in figure. A plotting compass M is placed under the wire AB. The two ends of the wire are connected to a battery through a switch. When no current is flowing in the wire AB, the compass needle is parallel to the wire AB and points in the usual north-south direction. When current is passed through wire AB by closing the switch, we find that the compass needle is deflected from its north-south position. On opening the switch, the compass needle returns to its original position. Thus, the deflection of compass needle by the current carrying wire shows that magnetic field is associated with an electric current.



2. The two magnetic field lines can never intersect each other because two tangents can be drawn from that point of intersection which will give two directions of the field from the same point, which is impossible.
3. Case A: Pole P is north-pole as magnetic field lines are emerging from this pole. Pole Q is south-pole as magnetic field lines are entering in it.

Case B: Pole P is north-pole as magnetic field lines are emerging from this pole. Pole Q is north-pole as magnetic field lines are emerging from this pole.

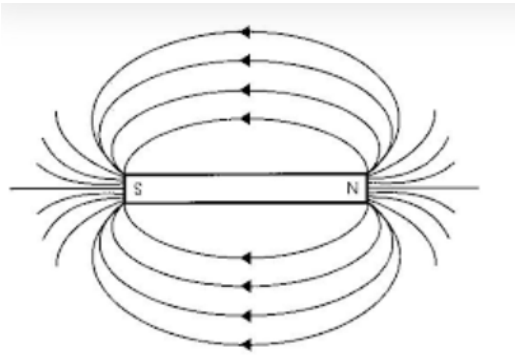
H. Long Answer Questions:

1. A magnetic field is the area around a magnet in which there is magnetic force. The direction of a magnetic field at a point is determined by placing a small compass needle. The N-pole of compass indicates the direction of magnetic field at that point.

2. Four properties of Magnetic field lines are:

- Each line is a closed and continuous curve.
- They originate from the north-pole and terminate at the south-pole.
- They will never intersect each other.
- They are crowded near the poles where the magnetic field is strong.

Magnetic field lines around bar magnet is:



WORKSHEET – 2

Magnetic field due to current carrying conductors.

A. Multiple Choice Questions:

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

B. Fill in the blanks using the suitable words given in the brackets.

1. Bar Magnet
2. Centre
3. Concentric Circles
4. Current
5. North Pole

C. Match the following:

Column A	Column B
1. Right-hand thumb rule	(e) Maxwell's cock screw rule
2. Anticlockwise Current	(d) North Pole
3. Clockwise Current	(b) South Pole
4. Centre of solenoid	(a) Parallel field Lines
5. Straight current carrying conductor	(c) Concentric Field Lines

D. State whether the following statements are true or false:

1. True

2. True

3. False

4. False

5. False

E. Very Short Answer Questions:

1. Concentric

2. When we reverse the direction of electric current flowing in the wire, the north and south poles are reversed. Direct current flows in only one direction of the wire.

3. The magnetic field strength is maximum at point A and is minimum at point C because magnetic field is strong where magnetic field lines are crowded and is weak where magnetic field lines are far apart.

4. The strength of the magnetic field produced decreases with increase in distance from the current-carrying conductor.

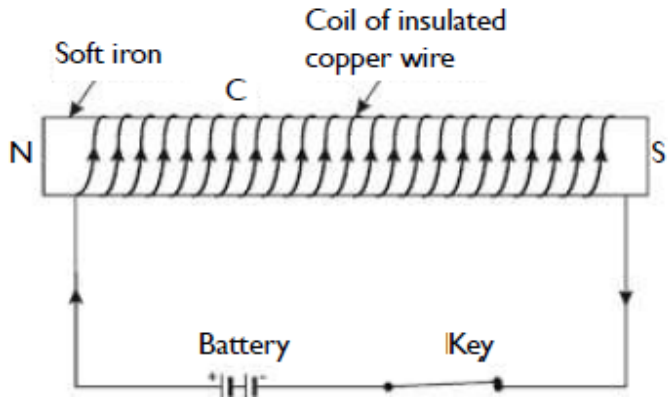
5. In electromagnet, the magnetic field is created by a wire wound coil but the magnetic field of a bar magnet cannot be changed. The strength of bar magnet depends on the material used for its creation, but the strength of electromagnet varies according to the flow of electric current into it. Bar magnet can retain magnetic properties for a longer time but an electromagnet behaves like a magnet when a battery is connected to a solenoid. Polarity of electromagnet can be changed while that of bar magnet cannot be changed.

F. Short Answer Questions (Type I):

1. As the iron core is inserted in a solenoid, the strength of the magnetic field due to the solenoid increases i.e. the magnetic field becomes strong.
2. The strength of an electromagnet can be increased by increasing the number of loops of wire around the iron core and by increasing the current or voltage.
3. If we drive a corkscrew in the direction of current then the direction of turning of its handle gives the direction of magnetic field lines. It is used to find the magnetic field in a circular loop and straight wire carrying current.

G. Short Answer Questions (Type II):

1. (a)



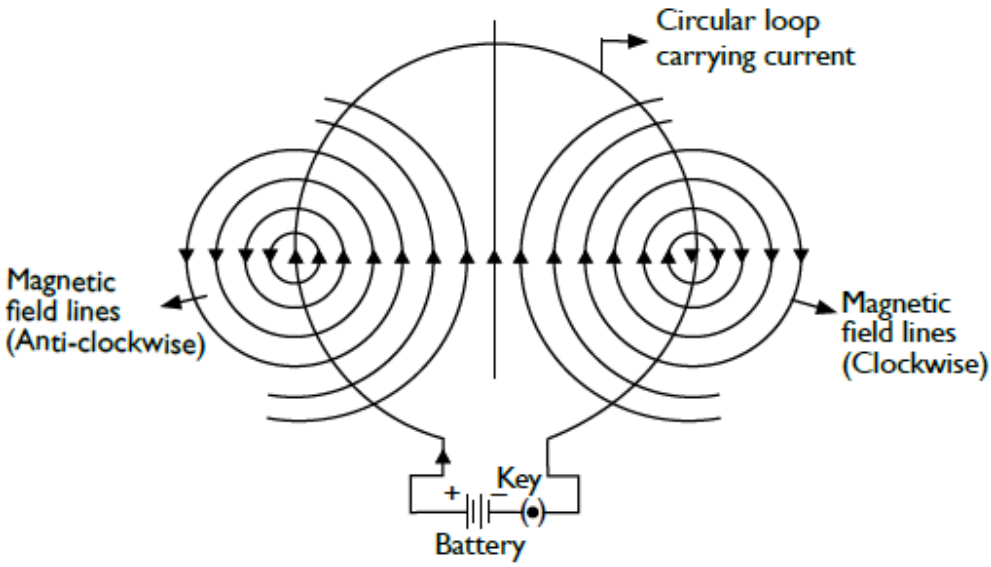
(b) An electromagnet is used to separate copper from iron scrap yard with the help of magnetic field. Current in the electromagnet is used to generate magnetic field of different intensities. This magnetic field attracts iron but not copper because iron is ferrous and is easily attracted towards magnet.

2. Suppose, we look at one face of the circular wire through which a current is passing. If the current around the face of the circular wire flows in the clockwise direction, the face of the circular wire will be south-pole and vice versa.

3. In electromagnet, the magnetic field is created by a wire wound coil but the magnetic field of a bar magnet cannot be changed. The strength of bar magnet depends on the material used for its creation, but the strength of electromagnet varies according to the flow of electric current into it. Bar magnet can retain magnetic properties for a longer time but an electromagnet behaves like a magnet when a battery is connected to a solenoid. Polarity of electromagnet can be changed while that of bar magnet cannot be changed.

H. Long Answer Questions:

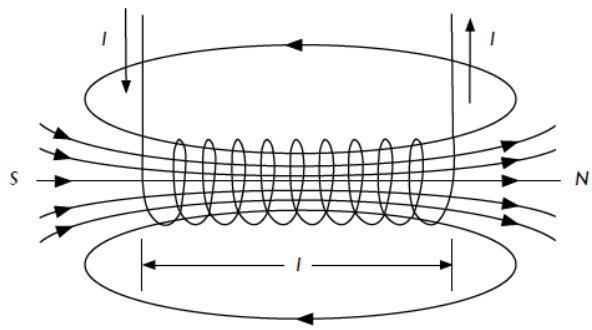
1. (a)



(b) If the number of turns are increased, magnetic field strength is increased. When we increase the value of current the magnetic field associated with it also increases. Reducing the radius of circular wire also increases strength of magnetic field.

2. (a) The direction of the magnetic field produced by a current-carrying conductor is given by Maxwell's right hand thumb rule. It states that if you are holding the current carrying conductor in your right hand such that the thumb points in direction of the current, then the direction in which the fingers encircle, gives the direction of magnetic lines.

(b)



WORKSHEET – 3

Force on current carrying conductor in Magnetic Field

A. Multiple Choice Questions:

1. (c)

2. (a)

3. (d)

4. (d)

5. (d)

B. State whether the following statements are true or false:

1. True

2. False

3. True

4. False

5. False

C. Fill in the blanks using the suitable word given in the brackets:

1. Left

2. Commutator

3. Electromagnet

4. MRI

5. Armature

D. Give one word for the following:

1. Split ring

2. MRI

3. Motor

4. Fleming Right Hand rule

5. Armature

E. Very Short Answer Questions:

1. 180 degrees

2. South

3. (a) The force is increased

(b) The force is increased

4. Electric motor works on the principle of magnetic effect of current, i.e., when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously.

5. Force

F. Short Answer Questions (Type I):

1. The split ring is used to reverse the direction of current throughout the coil.

2. Since the direction of positively charged particle is towards west, the direction of the current will also be towards the west. The direction of the magnetic force is towards the north hence the direction of magnetic field will be **upward** according to Fleming's Left hand rule.

3. (a) Carbon

(b) Soft iron

G. Short Answer Questions (Type II):

1. There are various uses of magnetism in medicine like they are used as instruments such as magnetic resonance imaging (MRI) and in developing the magnetic pulse and used to treat Parkinson's disease. There can be pain relief with help of magnetic field and produce more oxygen, treating minor pains and increasing the blood circulation etc.

2. (a) Current

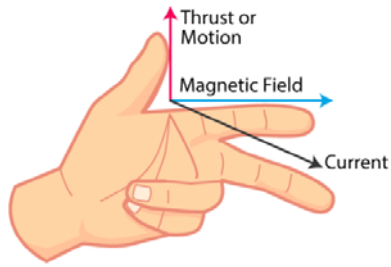
(b) Magnetic field

(c) Motion or Thrust

3. Fleming's Left Hand Rule states that if we arrange our thumb, forefinger and middle finger of the left-hand perpendicular to each other, then the thumb points towards the direction of the force

experienced by the conductor, the forefinger points towards the direction of the magnetic field and the middle finger points towards the direction of the electric current.

Fleming's left-hand rule is used to find the direction of the force acting on the current carrying conductor placed in a magnetic field.



H. Long Answer Question:

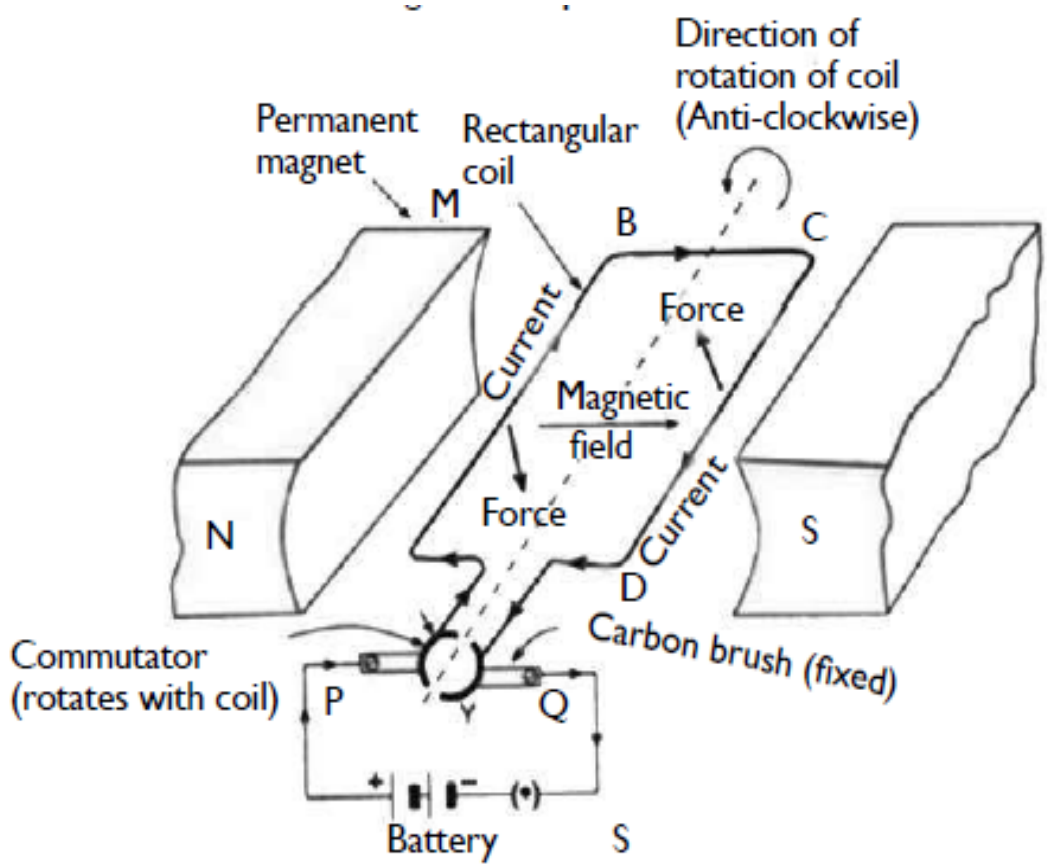
1. (a) A current carrying conductor placed in a perpendicular magnetic field experience a force which is perpendicular to the field as well as direction of current.

Fleming left hand rule **is** used to find the direction of the force.

(b) By increasing the current flowing in the conductor and by increasing the strength of magnetic field.

(c) Electric Motor

2. Electric motor works on the principle of magnetic effect of current, i.e., when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously. The diagram given here describes the working of a simple electric motor.



WORKSHEET – 4

Electromagnetic Induction and Domestic Circuits

A. Multiple Choice Questions:

1. (b)

2. (d)

3. (b)

4. (b)

5. (d)

B. State whether the following statements are true or false:

1. True

2. True

3. False

4. True

5. True

C. Complete the following table:

Property	Wire name	Insulation Colour
Positive Wire	Live Wire	Red
Negative Wire	Neutral Wire	Black
Wire at zero potential	Earth Wire	Green

D. Give one word for the following:

1. Live Wire **2.** Neutral Wire

3. Fuse **4.** Earth Wire

5. Short Circuit

E. Very Short Answer Questions:

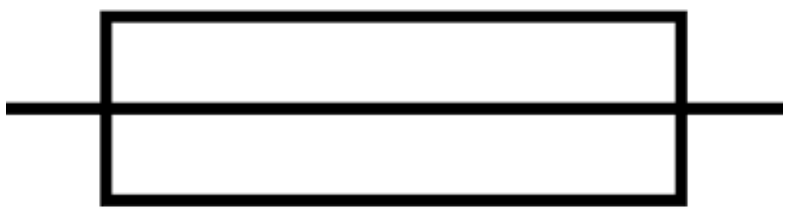
1. Electromagnetic Induction

2. Galvanometer

3. Fleming Right Hand Rule

4. Steam turbine driven generators or gas turbine power generators

5.



F. Short Answer Questions (Type I):

1. If the slip rings of an A.C. generator are replaced by a commutator, it will become a D.C. generator.

2. Earthing is used to protect us from an electric shock. It does this by providing a path (a protective conductor) for a fault current to flow to earth.

3. Fleming's right hand rule
Hold the thumb, the fore finger and the centre finger of your right-hand at right angles to one another. Adjust your hand in such a way that forefinger points in the direction of magnetic field, and thumb points in the direction of motion of conductor, then the direction in which centre finger points, gives the direction of induced current in the conductor.

G. Short Answer Questions (Type II):

1. When the current through the fuse exceeds its rating, the fuse wire melts and cut off the current.
The fuse is basically a piece of wire composed of pure tin or alloy of tin and copper which is having low melting point and high resistance. When high current flows in the circuit whatever may be the reason short circuit etc, the fuse wire melts and circuit is broken and the appliances are saved from damage.

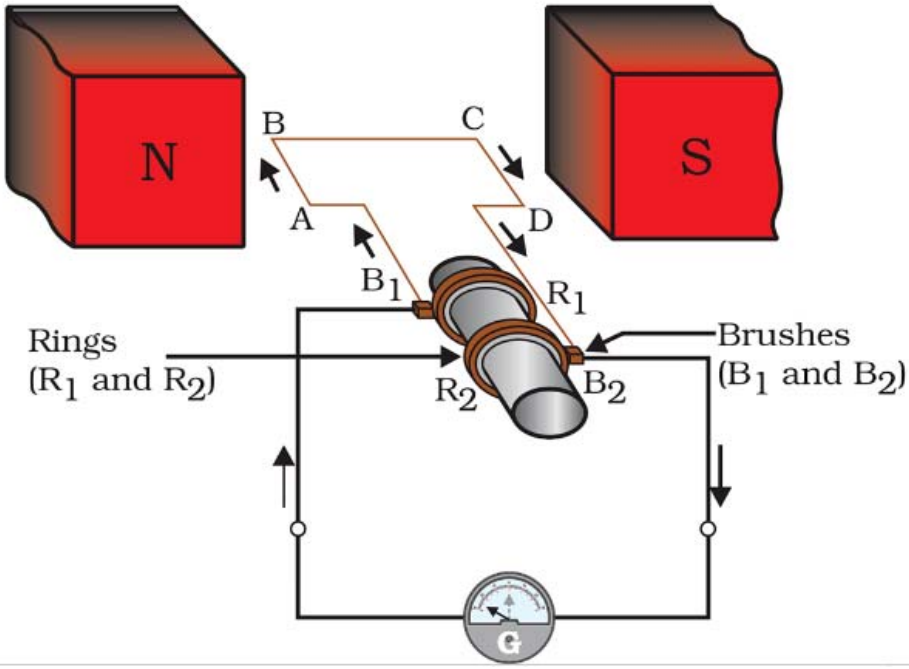
2. Let the maximum number of bulbs be Y. Power of Y bulbs, P = 60Y,
V = 220V, I = 5A.
We know that
P = VI
60Y = 220 × 5 = 1100
Y = 18.33
So, the maximum number of bulbs that can be run is 18.

3. (a) In case I the current is DC. In case II the current is AC.
(b) Battery is the source of DC current. Household supply is the source of AC current.
(c) The magnitude of AC current varies with time whereas the magnitude of DC current remains constant over the complete time period.

H. Long Answer Questions:

1. In an electric generator, mechanical energy is used to rotate a conductor in a magnetic field to produce electricity. It is working on the principle of electromagnetic induction.
Working of electrical generator:
When the axle attached to the two rings is rotated such that the arm AB moves up (and the arm CD moves down) in the magnetic field produced by the permanent magnet. Let us say the coil ABCD is rotated clockwise in the arrangement. By applying Fleming's right hand rule, the induced currents are set up in these arms along the directions AB and CD. Thus an induced current flows in the direction ABCD. If there are larger number of turns in the coil, the current generated in each turn adds up to give a large current through the coil. This means that the current in the external circuit flows from B_2 and B_1.
After half a rotation, arm CD starts moving up and AB moving down. As a result, the directions of the induced currents in both the arms changes, giving rise to the net induced current in the direction DCBA.

The current in the external circuit now flows from B_1 to B_2. Thus after every half rotation the polarity of the current in the respective arms changes.
There are two brushes and in the electric generator, one brush is at all times in contact with the arm moving up in the field, while the other is in contact with the arm moving down. Because of these Brushes unidirectional current is produced.



2. (a) As the current through coil A is constant, the magnetic field associated with it also remains constant. As the magnetic field is not changing in the coil A, hence it would not change in coil B also and thus no current is produced in coil B. Hence galvanometer shows no deflection.

2) If we change the current in the coil A by rheostat then flux linked with it also changes which induces current in B and hence galvanometer shows deflection.

3) If the current in coil A is changed at faster rate, the magnetic flux would also change rapidly. The induced current is proportional to the rate of change of flux and so greater deflection is produced.

WORKSHEET – 5

Based on Complete Chapter

A. Multiple Choice Questions:

1. (d)

2. (c)

3. (d)

4. (a)

5. (c)

Analysing & Evaluating Questions

6. (a)
7. (a)

B. Fill in the blanks using the suitable words given in the brackets:

1. Short Circuit
2. 220 V
3. Secondary
4. Micheal Faraday
5. Split ring

C. Differentiate the following:

1.

Generator	Electric Motor
An electric generator is a machine that converts mechanical energy to electrical energy	An electric motor is a machine that converts electrical energy to mechanical energy.
Electric generator follows Fleming's right-hand rule.	Electric motor follows Fleming's left-hand rule
The working principle of generator is based on electromagnetic induction.	The working principle of a motor is based on the current-carrying conductor that experiences a force when it is kept in the magnetic field.

2.

Direct Current	Alternating Current
In DC, the flow of direct current does not change periodically.	In alternating current, the electric charge flow changes its direction periodically.

DC has no frequency or zero frequency.	The frequency of AC is dependent upon the country. But, generally, the frequency is 50 Hz or 60 Hz.
Electrons only move in one direction – that is forward.	Electrons in AC keep changing their directions – backward and forward.

3.

AC Generator	DC Generator
AC generator is a mechanical device that converts mechanical energy into AC electrical power.	DC generator is a mechanical device that converts mechanical energy into DC electrical power.
In an AC generator, the electrical current reverses direction periodically.	In a DC generator, the electrical current flows only in one direction.
AC generator does not have commutators.	DC generators have commutators to make the current flow in one direction only.

D. Define the following terms:

1. A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.
2. A strong magnetic field produced inside a solenoid can be used to magnetise a piece of magnetic material, like soft iron, when placed inside the coil. The magnet so formed is called an electromagnet.
3. Magnetic resonance imaging or MRI is a non-invasive radiology scan used to diagnose diseases, diagnosis, and to monitor treatment.
4. Fuse is an electrical safety device that protects the circuit from short-circuiting, the fuse wire is made of tin alloys that have high resistance and low melting points. A switch is used before the equipment in the circuit in a series combination.
5. Short circuiting happens when live wire and neutral wires of domestic circuit come in contact accidently. As a result of short circuit, the resistance of the circuit decreases to very small value and current increases enormously. It results in heating up fuse wire and breaking up circuit.

E. Very Short Answer Questions:

1. Two ways in which current induced in the coil of generator can be increased are:
- By rotating the coil faster.
- By using a coil of larger area.

2. Maxwell Cock screw Rule
3. Commutator used to change the direction of current flowing through coil every time coil just passes the vertical position during revolution.

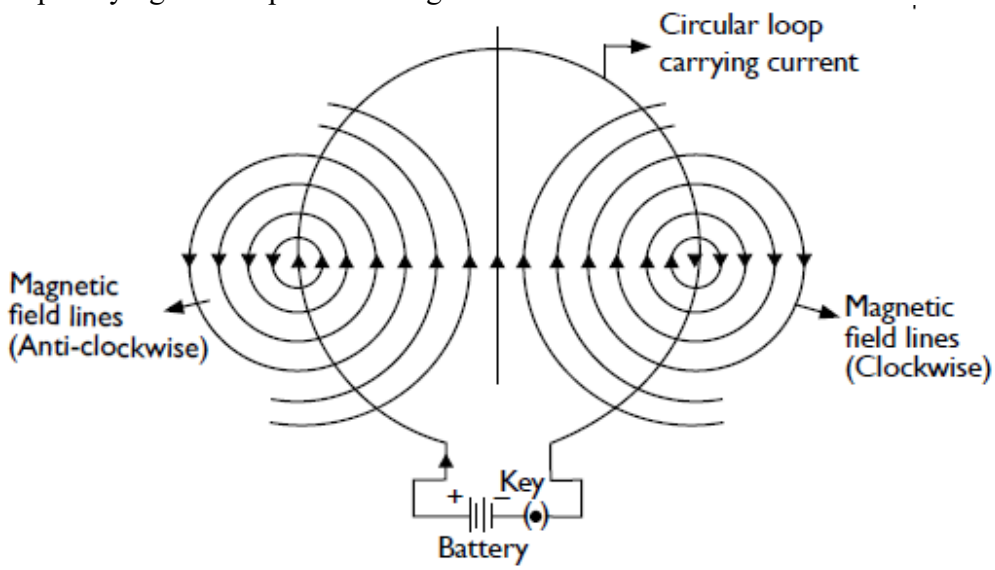
4. A motor converts electrical energy in mechanical energy.
5. Brushes are used to transfer the current from coil to load.

Analysing & Evaluating Questions

6. In parallel connection
7.
(a) Yes, Alpha particles are positively charged particles and therefore a thin beam of moving alpha particles constitutes a current in the direction of motion of the alpha particles.
(b) No, The neutrons are electrically neutral and therefore there is no current associated with the thin beam of moving neutrons.

F. Short Answer Questions (Type I):

1. The magnetic field lines are concentric circles at every point of a current carrying circular loop. At the centre of the circular loop, the magnetic field lines are straight. Each segment of circular loop carrying current produces magnetic field lines in the same direction within the loop.



2. (a) The fuse wire is made of tin-placed copper wire because of its low melting point.
(b) As copper has very high melting point due to which it won't melt in short circuit condition, hence copper wires are not used as fuse wire.
3. Fleming's Right Hand Rule states that if we arrange our thumb, forefinger and middle finger of the right-hand perpendicular to each other, then the thumb points towards the direction of the magnetic force, the forefinger points towards the direction of the magnetic field and the middle finger points towards the direction of the current.
4. An electric motor, also called a DC motor, works on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a torque. The torque produced can be used for obtaining mechanical work. The direction of rotation of the rotor is given by Fleming left hand rule.

An electric motor is used in washing machines, mixer, grinder etc.

Analysing & Evaluating Question

5. In compass needle is made up of metal that is why needle gets deflected when bar magnet or a current carrying loop is brought near it. Features of magnetic field lines of force are as follows:

- Magnetic field lines are imaginary lines used to show magnetic field.
- These are closed continuous curves.
- When magnetic field lines are closer in the region, magnetic field is strong.
- Magnetic field lines do not intersect each other.
- The direction of magnetic field lines is from north-pole to south-pole.

G. Short Answer Questions (Type II):

1. (a) P = 3kW = 3000W
V = 240V
We know that, P = V x I
I = P/V = 3000/240 = 12.5 A
(b) A 13 A fuse should be used in this geyser circuit.

2. The special features of commercial electric motors are as follows:
• The coil is wound on a soft iron core. This increases the strength of magnetic field, which makes the motor more powerful.
• The coil contains a large number of turns of insulated copper wire.
• A powerful electromagnet is used in place of permanent magnet.

3. Whenever there is an electric current, there is a magnetic field. Even the extremely weak ion currents that travel along the nerve cells in our body produce magnetic fields. When we try to touch something, our nerves carry an electric impulse to the muscles we need to use. This impulse creates a temporary magnetic field. These fields are about one billionth as weak as the Earth's field. Two main organs in the human body where the magnetic field produced is significant are heart and brain. Thus the phenomenon where magnetic fields are produced by the living things, especially by the human body is called bio-magnetism. It is a promising new window into the human body generally, and into the brain, in particular.

4. Some silent features of Magnetic lines of forces

- Closer the field lines.
- Stronger is the magnetic field and vice-versa is also true.
- Magnetic field lines are closer near the poles; which shows greater strength of magnetic field near the poles.

Analysing & Evaluating Question

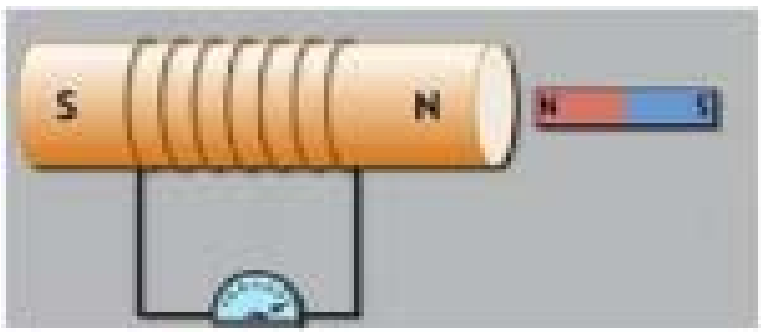
5. (a) The appropriate value of the fuse to be fitted in the circuit is 2.5A or 3A.

(b) If a 13A fuse is fitted in the circuit, it will not protect the vacuum cleaner against the very high current flowing through it. If short-circuiting or overloading occurs, it can damage the vacuum cleaner.

H. Long Answer Type Questions (5 Marks):

1. For electromagnetic induction, the coil and the magnet should be in relative motion. This can be ensured in the following ways:

- The coil should move within the magnetic field such that the flux changes.
- The magnet should be moved keeping the coil at rest.
- Both the coil and magnet should be moved.



Analysing & Evaluating Question

2. Frequency of Alternating current is equal to the number of cycles completed in one second. In India, frequency of AC is 50 Hz i.e. 50 cycles per second.
An alternating current is considered to be advantageous over direct current for long range transmission of electric energy because it can be transmitted over long distances to distant places without much loss of electric power as compared to direct current.

I. Assertion- Reason Questions:

1. (a)
2. (b)
3. (a)

J. Case Based Question:

1. (a) **2.** (a)
3. (b) **4.** (b)
5.(a)

CHAPTER-13

OUR ENVIROMENT

WORKSHEET-1

Ecosystem

Q A. Multiple Choice Questions:

1. (b) **2.** (a) **3.** (a) **4.** (c) **5.** (b)

Q B. State whether the following are true or false:

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

Q C. Define the following terms:

1. Ecosystem

All organisms such as plants, animals, microorganisms and human beings as well as the physical surroundings interact with each other and maintain a balance in nature. All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem.

2. Trophic level

Trophic level is the steps in a food chain where transfer of food in the form of energy takes place between organisms. At each step in a food chain is an organism that forms the trophic level.

3. Decomposers

The microorganisms, comprising bacteria and fungi, break-down the dead remains and waste products of organisms. These microorganisms are the decomposers as they break-down the complex organic substances into simple inorganic substances that go into the soil and are used up once more by the plants.

4. Food web

A **food web** is a tool that illustrates the feeding relationship among species within a specific habitat. It is a connection of multiple food chains to show the interaction between different organisms in an ecosystem.

5. Environment

An Environment is everything that is around us, which includes both living and nonliving things such as soil, water, animals and plants, which adapt themselves to their surroundings.

Q D. Give one word for the following:

1. Trophic level
2. Ecosystem
3. Ecological factor
4. Ecosystem
5. Consumers

Q E. Very Short Answer Questions:

1. 1%
2. Natural: River, Artificial: Aquarium
3. Plant ⟶ Rat ⟶ Snake ⟶ Hawk
4. Algae ⟶ Protozoa ⟶ Small insect ⟶ Large insect ⟶ Small fish ⟶ Large fish
5. Trophic levels

Q F. Short Answer Questions (Type I):

1. The concentration of the harmful chemicals will be maximum at the top level i.e., Bird. These harmful chemicals get accumulated progressively at each trophic level and carried to the top of that particular food chain, therefore the organism which occurs at the highest trophic level in the food chain will have the maximum concentration of harmful chemicals.

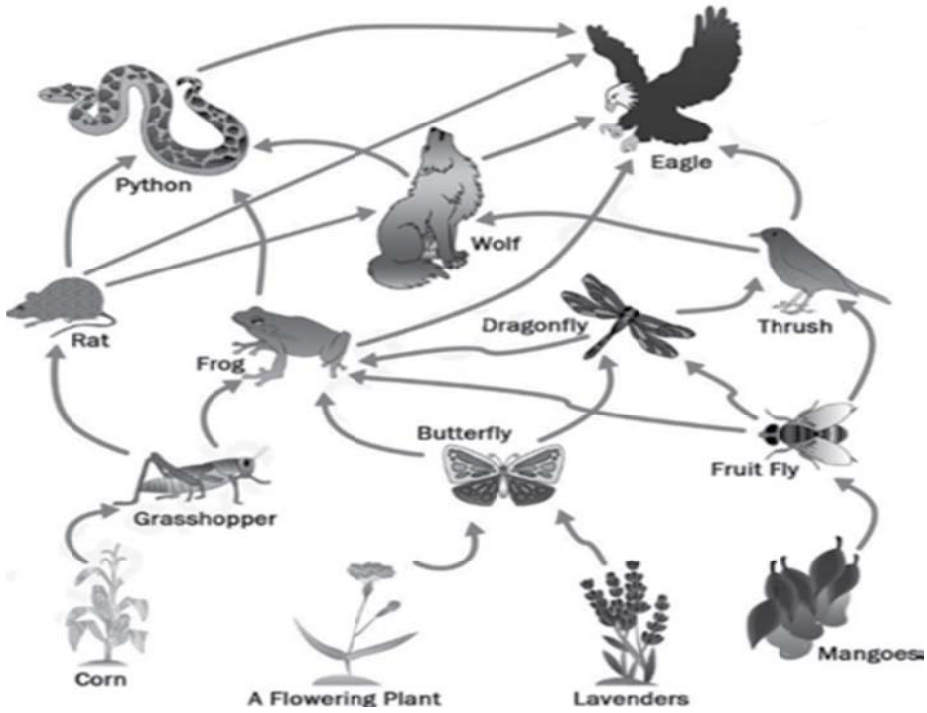
2. According to 10 percent law, 90% of the captured energy is lost as heat in the previous level and only 10% is available for transfer to the next higher trophic level. For example if 1000 Joule of sunlight energy falls on plants, They have only 10 Joule of energy because plants absorb only 1% of energy that they receive from sun and according to 10 percent law, only 10% of 10 Joule will be transferred from plants to the next higher trophic level which is 1 Joule. Now 10% of 1 Joule =0.1 Joule which will be transferred to next higher trophic level and carnivores will receive 0.1 Joule of energy if 1000 Joule of sunlight energy falls on plants.
3. Excessive and indiscriminate use of pesticides causes air, water and soil pollution and adversely affects human beings. The pesticides are either inhaled or taken through food and drinks. They accumulate in the body and may get biologically magnified with time as they pass through the food chain. Pesticides have been reported to induce cancer, growth of tumours and have mutagenic effects in man.

Q G. Short Answer Questions (Type II):

1. The organisms at first trophic level in a food chain are producers, always. They are autotrophs, they make their own food. For example- Plants are producers

The organisms at third trophic level in a food chain are consumers. They are carnivores at third trophic level. They feed on herbivorous animals. For example- frog feeds on insects.

2. A **food web** is a tool that illustrates the feeding relationship among species within a specific habitat. It is a connection of multiple food chains to show the interaction between different organisms in an ecosystem.



Food web

3. **Write down a food chain**

(a) Occurring in the sea:

Algae ⟶ Protozoa ⟶ Small insect ⟶ Large insect ⟶ Small fish ⟶ Large fish

(b) Which ends with humans:

Plants ⟶ Goats ⟶ Humans

(c) With five links in it:

Dandelions ⟶ Snail ⟶ Frog ⟶ Bird ⟶ Fox

Q H. Long Answer Questions:

1. **(a)** If all the lions from the given food chain are removed, the population of deer will increase exponentially. Thus, deer and other plant-eaters will be present in abundance which will lead to overgrazing of grass and no grass will be left. And if no grass will be left, then deer will automatically die which will eventually destroy the complete food chain.

(b) (i) Bread is obtained from plant⟶ Second trophic level.

(ii) Apple is obtained from plant⟶ Second trophic level.

(iii) Eggs come from chicken which feeds on plants. Chicken are primary consumers, and eating substance obtained from chicken will make the organism secondary consumer ⟶ Third trophic level.

2. **(a)** A – Primary consumers

   B – Tertiary consumers

(b) Energy C= 10% of 10 J

= 10 × 10/100=1 J

Energy D= 10% of 1 J

= 10 × 1/100= 0.1 J

Energy E= 10% of 0.1 J

= 10×0.1/100= 0.001 J

WORKSHEET-2

Impact of Human Activities on Environment

Q A. Multiple Choice Questions:

1. (a) **2.** (b) **3.** (c) **4.** (c) **5.** (c)

Q B. Give one word for the following:

1. Ozone
2. Biodegradable
3. Skin cancer
4. Chlorofluorocarbons (CFCs)
5. Landfill

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

1. 1980s
2. Waste
3. Non-biodegradable
4. Incineration
5. Toxic

Q D. Match the following:

	Column A	Column B
1.	Biodegradable	(d) Fruit peels
2.	Non-biodegradable	(c) Plastics
3.	Ozone	(e) O_3
4.	Ozone depletion	(b) CFCs
5.	Oxygen	(a) O_2

Q E. Very Short Answer Questions:

1. Ultraviolet(UV) radiations
2. Glass bottles and Paper
3. Jute bags are biodegradable whereas plastic bags are non-biodegradable
4. Improvements in our life-style and change in attitude
5. Freezing the of production of Chlorofluorocarbons (CFCs) at 1986 levels

Q F. Short Answer Questions (Type I):

1. The Examples of biodegradable waste materials are vegetable peels and paper, and examples of non-biodegradable waste materials are glass bottles and iron rod.
2. Garbage is a waste material that is discarded by humans, usually due to a perceived lack of utility. Garbage consists of easily decomposable and putrefying (animal and vegetable) waste from preparation, handling, storage and scale or serving of food. Garbage may consist of newspapers, appliances, clothes, bottles, products packaging etc.
3. Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials. Incineration and other high temperature waste treatment systems are described as thermal treatment. Incineration of waste materials converts the waste into ash, flue gas and heat.

Q G. Short Answer Questions (Type II):

1. Sewage is a type of waste water that is produced by a community of people. Sewage disposal is the process in which sewage is transported through cities and inhabited areas to sewage treatment plants, where it is then treated to remove contaminants to produce environmentally safe waste.

2. The solid wastes like paper, plastic and metal objects are recycled. For example, Waste paper is sent to the paper mills where it is reprocessed to form new paper once again.
3. Biodegradable wastes can be broken down into non-poisonous substances by the action of microorganisms like bacteria and earthworms, examples are spoilt food, vegetable peels, tea-leaves, wood. On the other hand, non-biodegradable wastes cannot be broken down by any biological process and they remain unchanged over a long period of time, examples are glass bottles, metal cans, polythene bags, synthetic fibres.

Q. H Long Answer Questions:

1. Following are the different methods of waste disposal:

(i) Landfill: A site that is designed to dispose of the dumping rubbish, garbage and other sort of solid wastes.

(ii) Incineration: Controlled combustion of garbage to reduce it to incombustible matter such as ash and waste gas.

(iii) Waste Compaction: The waste materials such as cans and plastic bottles are compacted into blocks and sent for recycling.

(iv) Biogas Generation: Biodegradable wastes are sent to bio-degradation plants where they are converted to biogas by degradation with the help of bacteria, fungi, or other microbes.

(v) Composting: Organic wastes are buried under layers of soil and then, left to decay under the action of microorganisms such as bacteria and fungi, which results in formation of nutrient-rich manure.

(vi) Vermicomposting: Process of using worms for the degradation of organic matter into nutrient-rich manure.

2. (a) Ozone layer is naturally found in the upper part of the atmosphere called stratosphere. It is created when ultraviolet radiation (sunlight) strikes the stratosphere, dissociating or splitting oxygen molecules (O_2) to atomic oxygen (O). The atomic oxygen quickly combines with further oxygen molecules to form ozone.

(b) The following are the harmful effects of ozone depletion:

1. It causes UV rays to reach the earth and it causes harm to living organisms.
2. It can lead to skin cancer in humans. It can lead to cataracts in humans.
3. It can lead to damage to our immune system by lowering the body's resistance to diseases.
4. It can lead to many diseases in animals and plants

WORKSHEET-3

Based on Complete Chapter

Q A. Multiple Choice Questions:

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

Q B. Differentiate between the following:

1.	Producer		Consumer
I.	Producers are the living organisms which help to produce food from sunlight, soil and air. Such as Green plants, who prepare food in their leaves.	I.	Consumers are the living organisms which depend directly and indirectly on other organisms for their food. Examples are Animals, Humans etc.
II.	Every other organism is dependent on producers for their energy needs.	II.	They are dependent on producers for their energy source.
III.	They have an autotrophic mode of nutrition	III.	They have heterotrophic mode of nutrition.

2.	Food chain		Food web
I.	A linear pathway showing the flow of energy	I.	A multitude of networks showing the flow of energy
II.	An organism of higher level trophic feeds on a specific organism of lower trophic level	II.	An organism of higher trophic level has access to more members of a lower trophic level.
III.	Has no effect on the adaptability and competitiveness of organisms.	III.	Has a role in improving the adaptability and competitiveness of an organism.

3.	Biotic components		Abiotic components
I.	Biotic components include all the living components present in an ecosystem, Examples of biotic resources include all flora and fauna	I.	Abiotic components refer to all the non-living, i.e. physical conditions and chemical factors that influence an ecosystem, Examples of abiotic factors include sunlight, water, air, humidity etc.
II.	They depend on abiotic factors for survival and reproduction	II.	They are completely independent of biotic factors
III.	They originate from the biosphere	III.	They originate from the lithosphere, hydrosphere and atmosphere

Q C. Give reasons for the following:

1. Non-biodegradable substances, like plastic, metals, and chemicals are not decomposed by living organisms. They persist in the environment for a long time and contaminate soil and water resources. Many a times they accidentally eaten by stray animals, can harm them and even cause their death.
2. When energy is passed in an ecosystem from one trophic level to the next, most of the energy is liberated as heat to the environment, used in digestion and for the growth and reproduction therefore only 10% energy is available for transfer to the next trophic level.
3. In an ecosystem, All organisms are interrelated with each other in the form of food and consumers chain. In spite of various changes in the environments, the natural balance is maintained for a long time. If the number of a particular organism increases, the number of other living beings of that ecosystem will change in such a manner that the balance of the number of other living beings is maintained.
4. The organisms that are capable of preparing their own food from simple inorganic substances like carbon dioxide and water by using sunlight energy in the presence of chlorophyll are called producers. The green plants synthesize their own food through the process of photosynthesis and thus are called the producers.
5. Herbivores don't produce their own food, they take up their food directly from plants. They are at the 2^{nd} trophic level of the food chain and are called primary consumers.

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

1. Producers, Consumers
2. Non-biodegradable, Biodegradable

3. Decomposers
4. Ecology
5. Food Chain

Q E. Very Short Answer Questions:

1. Algae → Small animals → Fish → Big fish
2. Jute bags and paper bags
3. Stratosphere
4. Reduce the use of paper on daily basis and recycle the paper waste
5. Ozone layer prevents UV radiations from reaching earth's surface
6. Ponds and lakes are natural ecosystems and they contain decomposers. Decomposers act as cleansing agents here, whereas an aquarium is an artificial ecosystem, it does not contain decomposers. Hence, an aquarium needs to be cleaned periodically.
7. Decomposers help in decomposing dead plants and animals and hence act as cleansing agents of the environment. In their absence, dead plants and animals would remain as such, and their elements would never be returned to the soil, air and water.

Q F. Short Answer Questions (Type I):

1. Grass ⟶ Grasshoppers ⟶ Frog ⟶ Snake

The secondary consumer is frog in this food chain as it eats grasshoppers which are primary consumer of grass.

2. The UNEP is United Nations Environment Programme. In 1987, in an attempt to protect the ozone layer, the UNEP forged an agreement among its member countries to freeze the production of chlorofluorocarbons (CFCs) at 1986 levels.
3. Chemical substances such as pesticides are sprayed over crop plants to protect them from pests and diseases. When herbivorous animals eat plant food, these chemicals go into their bodies. Man, being an omnivore, eats plant food as well as herbivores. Thus, the pesticides present in plant food and in the bodies of herbivores are transferred to the bodies of humans through food.
4. (a) Pond weeds → Tadpoles → Water beetles

(b) There are 3 trophic levels in this food chain.

5. (a) X could be phytoplankton.

   (b) Phytoplankton → Tadpole → Water beetle → Fish

Q G. Short Answer Questions (Type II):

1. (a) Chlorofluorocarbons and certain ozone depleting substances are responsible for depletion of ozone layer. If the ozone layer becomes thin, ultraviolet radiation will

penetrate through the layer and reach the surface of earth destroying genetic material of skin causing cancers.

(b) If the ozone layer becomes thinner, harmful ultraviolet radiations will enter the earth and may cause skin cancer and other ailments in humans and also affect plants and animals.

2. (a) Decomposers are organisms that break down the organic components of dead and decaying matter into simpler substances and feed on them. They are usually bacteria and fungi which obtain their nutrients from dead and decaying matter.

(b) Decomposers play a vital role in the ecosystem as they breakdown the organic components of dead and decaying matter into simpler substances. The organic matter is recycled in the ecosystem thus acting as a cleansing agent for the environment.

3. Ozone is a toxic gas produced from the reaction of ultraviolet radiations with oxygen. It differs from oxygen in having 3 molecules (O_3) instead of 2 (O_2). Ozone is formed when ultraviolet radiations act on oxygen molecules. Oxygen molecule O_2 are converted to O_3 when ultraviolet radiations act on them.
4. (a) Due to use of pesticides to protect the crops, they enter the food chain. These pesticides are either washed down into the soil or in water bodies. The level of accumulation of these pesticides in food chain increases at each higher trophic level and this process is termed as biological magnification.

(b) Grass → Grasshopper → Frog → Snake → Peacock

Grass is a producer, it grows by consuming harmful chemicals from the soil. Grass is eaten by grasshopper which is further eaten by frog. Frog is eaten by snake and peacocks feed on snake. Since peacock is at the highest trophic level, it will have the maximum concentration of harmful chemicals in its body according to biomagnification.

5. (a) X could be small fish as they feed on zooplanktons in aquatic food chain.

(b) Y could be carnivorous fish or man. Both carnivorous fish and humans feed on small fish.

(c) (i) Zooplankton as they feed on phytoplankton like algae.

(ii) Carnivorous fish or man as they eat small fishes, i.e., secondary consumers.

Q H. Long Answer Questions:

1. (a) Raymond Lindeman in 1942 gave the ten percent law. According to this law when energy is passed in an ecosystem from one trophic level to the next, most of the energy is liberated as heat to the environment, used in digestion and for the growth and reproduction therefore only 10% energy is available for transfer to the next trophic level.

(b) If tertiary consumer gets 0.2 J of energy from the secondary consumer, the producer would have received 20000 J of energy form the sun. This is because of the 10% energy law. Producer receives 20000 J energy from the sun and uses 1% of it to make food.

200 J → 20J → 2J → 0.2J

Analysing & Evaluating Questions

2. (a) Garbage: Every household produces a lot of garbage daily.

(b) Incineration: It is a method of destroying waste material by burning at high temperature.

(c) Incinerator: Incineration is carried out in an incinerator.

(d) D: is carbon dioxide, i.e., organic matter that is removed by burning of garbage.

E: is water left behind after burning of garbage.

F: is ash that is left behind after burning of garbage.

Q I. Assertion-Reason Questions:

1. (b) **2.** (a) **3.** (d)

Q J. Case-based Question:

1. (c) **2.** (b) **3.** (a) **4.** (b) **5.** (c)