PHYSICAL SCIENCES

TEXTUAL QUESTION AND ANSWERS

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ENGLISH MEDIUM

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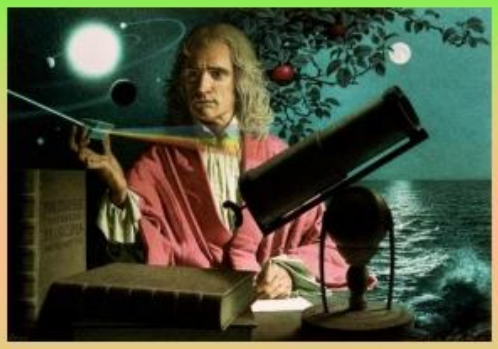


Chemical Equations and Chemical Reactions

Question – 1:

1. Why should a magnesium ribbon be cleaned before burning in air?

A. Because Mg is an active metal, it is easily oxidized in air to form a coating of MgO, the surface must be cleaned to remove the coating of MgO to burn effectively.

2. Write the balanced equation for the following chemical reactions.

(i) Hydrogen + Chlorine →Hydrogen chloride

A. H_2 (g) + Cl_2 (g) → 2HCl(g).

(ii)Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

A. $3BaCl_2$ (aq) + $Al_2(SO_4)_3$ (aq)→ $3BaSO_4$ (s)+ $2AlCl_3$ (aq)

(iii) Sodium + Water → Sodium hydroxide + Hydrogen

A. 2Na(s) + $2H_2O$ (l) → 2 NaOH (aq) + H_2 (g)

3. Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

A. $BaCl_2$ (aq) + Na_2SO_4 (aq) → $BaSO_4$ (s) + 2NaCl (aq)

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

A. NaOH (aq) + HCl (aq) → NaCl (aq) + H_2O (l)

Question - 2:

1. A solution of a substance 'X' is used for white washing.

(i) Name the substance 'X' and write its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water.

A. (i) The name of the substance used for whitewashing is calcium oxide and its formula is CaO.

(ii) It's reaction with water is - CaO + H_2O ⟶ Ca $(OH)_2$ + heat

2. Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

A. In activity 1.7 When electricity is passed through water , it is Decomposes into hydrogen and oxygen gases.

(ii) It is electrolytic decomposition reaction.

(iii) Balanced equation of this reaction is 2 H_2O → 2 H_2 + O_2

(iv) According to the above equation two molecules of water - dissociates into two molecules of hydrogen and one molecule of oxygen.

(v) Hence, H_2 produced in electrolysis is twice as much as O_2.

(vi) Therefore, the amount of H 2 produced in the chemical reaction is double the amount of O_2 produced.

(vii)The name of the gas produced in double amounts is Hydrogen gas (H_2).

Question - 3:

1. Why does the color of copper sulphate solution change when an iron nail is dipped in it?

A. The iron nail becomes brownish in color and the blue color of copper sulphate solution fades. The following chemical reaction takes place: Fe(s) + $CuSO_4$ (aq) → $FeSO_4$ (aq) + Cu(s)

In this reaction, iron has displaced or removed another element, copper, from copper sulphate solution. This reaction is known as displacement reaction.

2. Give an example of a double displacement reaction other than the one given in Activity 1.10.

A. (i) Sodium hydroxide reacts with hydrochloric acid to form sodium chloride and water.

$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(aq)$

(ii)) Sodium chloride spontaneously combines with silver nitrate in solution giving silver chloride precipitate and Sodium nitrate.

$NaCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

3. Identify the substances that are oxidised and the substances that are reduced in the following reactions.

(i) $4Na(s)+O_2(g) \rightarrow 2Na_2O(s)$

(ii) $CuO(s)+H_2(g) \rightarrow Cu(s)+H_2O(l)$

A. Addition of Oxygen to a Substance or removal of Hydrogen from a substance is called Oxidation.

Removal of Oxygen from a substance or addition of Hydrogen to a substance is called Reduction.

(i) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$

Oxygen is added to Na, and it gets oxidized to Na_2O Therefore, Na gets oxidized. One atom of Oxygen is removed from O_2, and it gets reduced to Na_2O.

Therefore, O_2 gets reduced.

(ii) $CuO(s)+H_2(g) \rightarrow Cu(s)+H_2O(l)$

Oxygen is added to H_2, and it gets oxidized to H_2O. Therefore, H_2 gets oxidized. Oxygen is removed from CuO, and it gets reduced to Cu. Therefore, CuO gets reduced.

Exercises:

1. Which of the statements about the reaction below are incorrect?

$2PbO(s) + C(s) \rightarrow 2Pb(s) + CO2(g)$

(a)Lead is getting reduced. **(b)Carbon dioxide is getting oxidised.**

(c)Carbon is getting oxidised. **(d)Lead oxide is getting reduced.**

(i)(a) and (b) **(ii)(a) and (c)** **(iii) (a), (b) and (c)** **(iv) all**

A. The statements about the reaction following are incorrect (i)(a) and (b)

(a)Lead is getting reduced and (b)Carbon dioxide is getting oxidized.

2. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$ The above reaction is an example of a

(a) Combination reaction. (b) Double displacement reaction. (c) Decomposition reaction.

(d) Displacement reaction.

A. (d) displacement reaction.

3. What happens when dilute hydrochloric acid is added to iron fillings? Tick the correct answer.

(a)Hydrogen gas and iron chloride are produced. **(b)Chlorine gas and iron hydroxide are produced.**

(c) No reaction takes place. **(d)Iron salt and water are produced.**

A. (a) Hydrogen gas and iron chloride are produced.

4. What is a balanced chemical equation? Why should chemical equations be balanced?

A. (i) When the total number of atoms of each element is same on both sides in a chemical equation, then the chemical equation is said to be a balanced chemical equation. Ex: $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

(ii) Chemical equation must follow the law of conservation of mass.

(iii) So the chemical equation should be balanced.

(iv) Then only they can follow the law of conservation of mass.

5. Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

A. (a) Skeletal equation:

$H_2(g) + N_2(g) \rightarrow NH_3(g)$

Balanced equation:

$3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$

(b) Hydrogen sulphide gas burns in air to give water and sulpur dioxide.

A. (b) Skeletal equation:

$H_2S(g) + O_2(g) \rightarrow H_2O(l) + SO_2(g)$

Balanced equation:

$2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(l) + 2SO_2(g)$

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

A. (c) Skeletal equation: $BaCl_2(aq) + Al_2SO_4(aq) \rightarrow AlCl_3(aq) + BaSO_4(s)$

Balanced equation:

$3BaCl_2(aq) + Al_2(SO_4)_3(aq) \rightarrow 2AlCl_3(aq) + 3BaSO_4(s)$

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

A. (d) Skeletal equation:

$K(s) + H_2O(l) \rightarrow KOH(aq) + H_2(g)$

Balanced equation:

$2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$

7. Write the balanced chemical equations for the following reactions.

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

A. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

A. $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

A. $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

A. $BaCl2_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

8. Write the balanced chemical equation for the following and identify the type of reaction in each case.

(a) Potassium bromide(aq) + Barium iodide(aq) → Potassium iodide(aq) + Barium bromide(s)

A. $2KBr(aq) + BaI_2(aq) \rightarrow 2KI(aq) + BaBr_2(s)$

In this reaction, both the reactants exchange constituents to form two new products. Hence, it is a double displacement reaction

(b) Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g)

A. $ZnCO_3$ (s)→ZnO(s)+ CO_2 (g)

In this reaction, a single substance decompose into two different products. Hence, it is a decomposition reaction.

(c) Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)

A. H_2 (g) + Cl_2(g)→2HCl(g)

In this reaction, two different reactants react with each other to form a single product. Hence, it is called a combination reaction.

(d) Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen(g)

A. Mg(s)+2HCl(aq)→$MgCl_2$(aq)+H_2(g)

In this reaction, more reactive Mg is replacing less reactive H. Hence, it is displacement reaction.

9. What does one mean by exothermic and endothermic reactions? Give examples.

A. In chemical reactions that release heat energy are called exothermic reactions.

Ex: C(g)+O_2(g)→CO_2(g) + Heat Energy(Q).

In chemical reactions ithat heat energy is absorbed are called endothermic reactions.

Ex: $CaCO_3$ + Heat (Q)→CaO + CO_2.

10. Why is respiration considered an exothermic reaction? Explain.

A. (i) In respiration oxidation of glucose takes place which produce a large amount of heat energy.

(ii) This is known as exothermic reaction.

(iii) So respiration is considered as an exothermic reaction.

(iv) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + Q (Energy)

11. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

A.

Combination Reaction	Decomposition Reaction
(i)Two or more substances react to form a single product in a Combination Reaction	(i)A single reactant breaks down into more than one product in a Decomposition Reaction.
(ii)Usually, heat or energy is produced in such reactions.	(ii)Usually, heat or energy is absorbed in such reactions.
(iii)General equation : A + B → C	(iii)General equation : A → B+ C
(iv)Ex : CaO(s) + H_2O(l) → $Ca(OH)_2$ (aq)	(iv)Ex : $CaCO_3$ (s) + CaO(s) + CO_2 (g)

Hence decomposition reactions are referred to as the opposites of combination reactions.

12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

A. (i)The decomposition reaction where energy is supplied in the form of Heat is :

$$CaCO_3 \xrightarrow{\text{Heat}} CaO + CO_2$$

(ii)The decomposition reaction where energy is supplied in the form of light is

$$2AgBr \xrightarrow{\text{Sunlight}} 2\,Ag + Br_2$$

(iii)The decomposition reaction where energy is supplied in the form of electricity is

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

13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

A. A displacement reaction occurs when a more reactive ingredient displaces a less reactive element out of its compound. The displacement reaction involves both metals and non-metals.
Ex : $CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$
Here, Zinc being more reactive than Copper displaces it to form Zinc sulphate.
When both the reactants exchange constituents to form two new products this is known as a double displacement reaction. It usually takes place in watery solutions.
Ex : $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
In the reaction above, Sodium and Barium displace each other to give different products.

14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

A. (i) Refining of silver: Copper metal reacts with silver nitrate aqueous solution and form copper
nitrate aqueous solution and silver metal.
(ii) In this reaction copper occupies the place of silver by displace it from silver nitrate.
(iii) So this is a chemical displacement reaction.
(iv) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

15. What do you mean by a precipitation reaction? Explain by giving examples.

A. (i) If a precipitate is formed in a chemical reaction, it is called precipitate reaction.
Ex: $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$
(ii) Precipitates are indicated with downward arrow mark in the reactions.
$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4(l) + 2NaCl$

16.Explain the following in terms of gain or loss of oxygen with two examples each.
(a)Oxidation (b)Reduction

A.(a) Oxidation: The addition of oxygen to a substance is called oxidation.
Ex : (i) $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$
Here, Mg has gained oxygen to form MgO. Hence, Mg has been oxidised to MgO.
(ii) $2Cu(s) + O_2(g) \rightarrow 2CuO(s)$
In this reaction, Cu has gained oxygen to form CuO. Thus, Cu is oxidised to copper oxide (CuO).
(b) Reduction: The removal of oxygen from a substance is called reduction.
Ex : $CuO + H_2 \rightarrow Cu + H_2O$
In this reaction, copper oxide is losing oxygen. So, it is being reduced to copper.
(ii) $ZnO + C \rightarrow Zn + CO$
In this reaction, Zinc oxide (ZnO) is reduced to zinc by the loss of oxygen.

17. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

A. (i) Brown coloured element 'X' is copper.
(ii) The black coloured substance is copper oxide.
(iii) When brown colour copper (Cu) is heated it reacts with oxygen and forms black colour copper oxide (CuO).
(iv) $2Cu + O_2 \rightarrow 2CuO$

18. Why do we apply paint on iron articles?

A. (i) Iron articles when exposed to moist air, corrosion will takes place.

(ii) To prevent iron from corrosion, it is better to apply paint on them.
(iii) The painting helps to slow down the oxidation process.

19. Oil and fat containing food items are flushed with nitrogen. Why?

A. (i) The main reason for flushing of nitrogen to feedstuffs containing oil and fat products is to prevent rancidity,
(ii) Oil and fat, when mixed with oxygen, give bad smell and taste.
(iii) Flushing of nitrogen acts as an antioxidant to reduce oxidation and prevent rancidity.

20. Explain the following terms with one example each.(a)Corrosion (b) Rancidity

A. <u>(a)Corrosion:</u>

(i) When some metals are exposed to moisture, acids, etc., they tarnish due to the formation of respective metal oxide on their surface.
(ii) This process is called corrosion.
Ex : The black coating on silver ; $4Ag + 2H_2SO_4 \rightarrow 2AgS + 2H_2O$
Green coating on copper ; $2Cu + O_2 \rightarrow 2CuO$

<u>(b) Rancidity</u>

(i) Rancidity is an oxidation reaction.
(ii) When fats and oils are not used for a long time, they get oxidized and their smell and taste changes.
(iii) This process is called Rancidity.
Ex : Oil becomes rancid due to the decomposition (oxidation)of fats it contains.
Butter changes its smell and taste when it is kept in an open place for a longer duration.

<u>Extra Question & Answers:</u>

1. Which of the following are chemical changes?
(A)Melting of wax (B) Burning of wood (C) Boiling of water (D) Tearing of paper (E) Rusting of iron.
(F) Cooling of water (G) Melting of ice.

A. (B) Burning of wood and (E) Rusting of iron.

2. Define the following terms
(a) Reactants (b) Products (c) Antioxidants

A. <u>(a) Reactants:</u> The substances which undergo chemical change in the reaction are called reactants
<u>(b) Products:</u> The new substances formed are called products.
<u>c) Antioxidants:</u> Substances which prevent oxidation are called Antioxidants.

3. Explain step by step how to write a chemical equation.

A. (i) A chemical reaction should be written in the form of a word equation.
(ii) Write the chemical reaction in the form of chemical equation using formulas.
(iii) Balance the constituent atoms of reactants and the products formed, involved in the reaction.

4. How many types of chemical reactions are there? Explain with example.

A. There are four types of chemical reactions. They are:
(i) Combination reaction (ii) Decomposition reaction. (iii) Displacement reaction.(iv) Double displacement reaction.

(i) Combination reaction: Two or more substances react to form a single product in a Reaction is called Combination reaction.

Ex : $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$

(ii) Decomposition. reaction : A single reactant breaks down into more than one product in a Reaction is called Decomposition Reaction.

Ex : $CaCO_3(s) + CaO(s) + CO_2(g)$

(iii) Displacement reaction : More reactive element displaces a less reactive element from its compound is called Displacement reaction

Ex : $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

(iv) Double displacement reaction: When both the reactants exchange constituents to form two new products this is known as a double displacement reaction.

Ex : $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

5. Explain electrolytic composition with neat diagram.

A. (i) Take a plastic mug. Drill two holes at its base and fit rubber stoppers in these holes. Insert carbon electrodes in these rubber stoppers.

(ii) Connect these electrodes to a 6 volt battery.

(iii) Fill the mug with water such that the electrodes are immersed. Add a few drops of dilute sulphuric acid to the water.

(iv)Take two test tubes filled with water and invert them over the two carbon electrodes.

(v) Switch on the current and leave the apparatus undisturbed for some time.

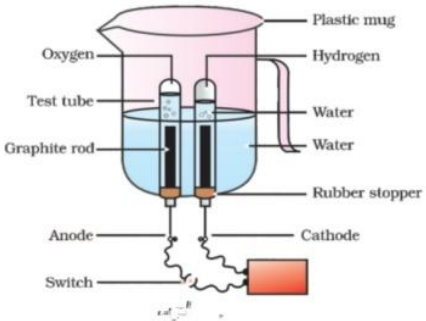
(vi)We will observe the formation of bubbles at both the electrodes. These bubbles displace water in the test tubes.

(vii) Once the test tubes are filled with the respective gases, remove them carefully.

(viii)Test these gases one by one by bringing a burning candle close to the mouth of the test tubes.

(ix)In this activity on passing the electricity water dissociates to hydrogen and oxygen. This is called electrolytic composition reaction.

$2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$



Electrolysis of water

6. What do you mean by precipitate reaction?

A. (i) If a precipitate is formed in a chemical reaction, it is called precipitate reaction.

(ii) Precipitates are indicated with downward arrow mark in the reactions.

Ex: $Pb(NO_3)_2 + 2KI \rightarrow PbI_2(l) + 2KNO_3$; $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4(l) + 2NaCl$

7. Sodium chloride spontaneously combines with silver nitrate in solution giving silver chloride precipitate and Sodium nitrate.

(i) Write the word equation for the above reaction? (ii) Which type of this chemical reaction?

(iii) What is the name of the precipitate formed in this reaction?
(iv) Write the balanced equation for this reaction?
A.(i) Silver Nitrate + Sodium Chloride →Silver Chloride + Sodium Nitrate.
(ii) Double displacement reaction.
(iii) Precipitation of silver chloride
(iv) $NaCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

Bits – MCQ:

1. In the method of balancing chemical equations, trials are made to balance the equation by using the smallest whole number coefficient, the method is known as..... ( )
(a)hit and trial method **(b)oxidation-reduction method**
(c) Valence electrons method **(d)ionic method**
A. (a) Hit and trial method

2. What is the name of ash in burning of magnesium ribbon reaction ( )
(a) Magnesium carbonate. **(b) Magnesium Oxide.**
(c) Magnesium sulphate **(d) Magnesium**
A. (b) Magnesium Oxide.

3. What is the colour of precipitate in the reaction of potassium iodide and lead nitrate ( )
(a) Pink **(b) yellow.** **(c) Orange** **(d) red**
A.(b) yellow.

4. Which gas is liberated in the reaction of Hydrochloric Acid and zinc granules? ( )
(a) Hydrogen **(b) CO_2** **(c) Oxygen** **(d) SO_2**
A. (a) Hydrogen

5. What is mean by quick lime? ( )
(a) $CaCO_3$ **(b) CaO** **(c) Ca** **(d) $CaOH_2$**
A.CaO

6. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2 Fe$ ( )
The above reaction is an example of:
a) Combination reaction **b) Decomposition reaction**
c) Displacement reaction **d) Double decomposition reaction**
A. Displacement Reaction

7. What happens when dil. hydrochloric acid is added to iron filings? Choose the correct answer ( )
a) Hydrogen gas and iron chloride are produced. **b) Chlorine gas,iron hydroxide are produced.**
c) No reaction takes place. **d) Iron salt and water are produced.**
A. a) Hydrogen gas and iron chloride are produced.

8. The chemical equation ( )
$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$ represents following type of chemical reaction.
a) Displacement **b) combination**
c) Decomposition **d) double-displacement**
A. d) double-displacement

9. Which of the following gases can be used for storage ( )
(a) Carbon dioxide or Oxygen **(b) Nitrogen or Oxygen**
(c) Carbon dioxide or Helium **(d) Helium or Nitrogen**

A. (d) Helium or Nitrogen

10. Which of the following are exothermic processes? ( )

(i) Reaction of water with quick lime (ii) Dilution of an acid

(iii) Evaporation of water (iv) Sublimation of camphor (crystals)

(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iv) (d) (ii) and (iv)

A. (a) (i) and (ii)

Fill in The Blanks:

1. The decomposition of vegetable into compost is an example of _____ reaction.

A. Decomposition

2. The chemical reactions in which energy is absorbed to form a new compound is called

A. Endothermic reaction

3. The reaction $2N_2O \rightarrow 2N_2 + O_2$ is an example for _____ reaction.

A. Combination

4. The reaction $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$ is an example for _____ reaction.

A. Displacement

5. The substances that are present on left side of a chemical equation are called _____.

A. Reactants

6. The arrow mark between the products and reactants of a chemical equation shows _____ of the reaction.

A. Direction

7. The digestion of food in the body is an example of.....reaction.

A. Decomposition reaction

8. Unbalanced reactions are also known as

A. Skeletal

9. In a chemical reaction always form ..... products.

A. New

10. Redox reaction is a combination of both ..... and .....in a reaction.

A. Oxidation, Reduction

Acids, Bases, and Salts

Question: 1

1. You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?

A. (i) Solution: The test tube containing distilled water does not affect the red litmus paper.
(ii) The test tube containing acidic solution does not change the red litmus paper.
(iii) But the test tube containing basic solution turns red litmus paper blue.

Question: 2

1. Why should curd and sour substances not be kept in brass and copper vessels?

A. (i) Sour taste is characteristic of acid.
(ii) Curd and sour substances contain acid.
(iii) Acids react with metals. Keeping curds and sour substances in brass and copper vessels causes them to react with these metals.
(iv) That is why curds and sour substances should not be kept in brass and copper vessels.

2. Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

A. Usually Hydrogen gas is liberated when an acid reacts with a metal.
For example: When zinc metal reacts with dil.HCl , hydrogen is evolved and salt , zinc chloride is formed
$Zn(s) + 2HCl\ (aq) \rightarrow ZnCl_2\ (aq) + H_2\ (g)$
It can be tested by bringing a burning candle near the gas .The candle continues burning with a pop sound.

3. Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

A. (i) In the chemical reaction, the evolved gas extinguishes a burning candle which means the gas is carbon dioxide.
(ii) Carbon dioxide is formed when dilute hydrochloric acid reacts with a metal carbonate (or metal hydrogen carbonate) producing effervescence.
(iii) Since, one of the compounds formed during this reaction is calcium chloride, it means the metal compound is calcium carbonate (It cannot be calcium hydrogen carbonate because calcium hydrogen carbonate is found only in solution, it is also unstable to exist as a solid).
Hence, the compound A is calcium carbonate. The chemical reaction is written as follows
$CaCO_3\ (s) + 2HCL\ (aq) \rightarrow CaCl_2\ (aq) + CO_2\ (g) + H_2O\ (l)$

Question: 3

1. Why do HCl, HNO 3, etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

A. Solutions like HCl, HNO_3 etc. get ionised in aqueous solutions and due to the presence of H^+ ions they show acidic characters. While solutions of compounds like alcohol and glucose do not dissociate to form H^+ ions. So they do not show acidic characters.

2. Why does an aqueous solution of acid conduct electricity?

A. An aqueous solution of an acid conducts electricity because:

(i) Acids dissociate into ions: In water, acids break down into hydrogen ions (H^+) and anions (negative ions).
(ii) Ions carry charge: These ions can move freely in the solution, carrying an electric charge.
(iii) Conductivity: The movement of these charged ions allows the solution to conduct electricity.
In an aqueous solution: Hydrogen ions (H^+) move towards the cathode (negative electrode). Anions move towards the anode (positive electrode).This movement of ions allows the solution to conduct electricity.

3. Why does dry HCl gas not change the color of the dry litmus paper?

A. Dry HCl gas (Hydrogen chloride) is not an acid. So it does not turn blue litmus to red. Because The HCl gas dissociates in presence of water to produce hydrogen ions. In the absence of water dissociation of HCl molecules do not occur.

4. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

A . The process of dissolving an acid or base in water is an exothermic reaction. That means it releases heat. If water is added to concentrated acid, the heat generated may cause the mixture to spell out, noxious fumes may be released, and excessive heat may destroy the vessel. Therefore it is advised to mix the acid slowly and continuously.

5. How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?

A. When an acid is diluted, then the concentration of hydronium ions decreases. This is because on dilution the overall volume of solution increases and so the number of hydronium ions per unit volume decreases (or) The concentration of hydronium ions per formula unit becomes less when an acid is diluted.

6. How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?

A. (i) Hydroxide ions (OH^-) formed by dissociation of the base.
(ii) As the amount of base increases, dissociation of ions increase and more hydroxide ions (OH^-) are produced.
(iii) Hence, the concentration of hydroxide ions (OH^-) increases and the basicity of a solution increases as well.

Question: 4

1. You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of this is acidic and which one is basic?

A. (pH 7 is neutral, below 7 is acidic, and above 7 is basic.)
Solution A (pH 6) has more hydrogen ion concentration than Solution B (pH 8).
Solution A (pH 6) is acidic.
Solution B (pH 8) is basic.

2. What effect does the concentration of H^+ (aq) ions have on the nature of the solution?

A. i) The nature of the solution has an effect on the concentration of H^+ (H^+) ions.
(ii) If the concentration of H^+ (H^+) ions increases, the pH of the solution decreases and the nature of the solution become acidic.
(iii) If the concentration of H^+ ions decreases, the pH of the solution increases and the nature of the solution become alkaline.

(iv) That is, the concentration of H^+ (H^+) ions determines the acidity or alkalinity of a solution. This is known as the acid-base theory.

3. Do basic solutions also have H^+ (aq) ions? If yes, then why are these basic?

A. Yes, basic solutions also have H^+ (aq) ions, but in very low concentration. They are basic because the concentration of OH^- (aq) ions is higher than H^+ (aq) ions.

4. Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

A. A farmer would typically treat the soil with:

Quick lime (calcium oxide) or slaked lime (calcium hydroxide) if the soil is too acidic (low pH), as these substances raise the pH and make the soil more alkaline.

Chalk (calcium carbonate) if the soil is slightly acidic to neutral (pH around 6-7), as it gently raises the pH without over-correcting.

These liming materials help neutralize soil acidity, improve soil structure, and increase nutrient availability, making the soil more suitable for plant growth.

Question: 5

1. What is the common name of the compound $CaOCl_2$?

A. Bleaching powder.

2. Name the substance which on treatment with chlorine yields bleaching powder.

A. Slake Lime [$Ca(OH)_2$].

3. Name the sodium compound which is used for softening hard water.

A. Washing Soda or Sodium Carbonate (Na_2CO_3).

4. What will happen if a solution of sodium hydro carbonate is heated? Give the equation of the reaction involved.

A. When a solution of sodium hydro carbonate ($NaHCO_3$) is heated, it decomposes to form sodium carbonate (Na_2CO_3), water (H_2O), and carbon dioxide (CO_2) gas.

The equation of the reaction is:

$$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

5. Write an equation to show the reaction between Plaster of Paris and water.

A. The equation for the reaction between Plaster of Paris (calcium sulphate hemihydrate) and water is: $CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O$

In this reaction, Plaster of Paris reacts with water to form gypsum (calcium sulphate dihydrate).

Exercises:

1. A solution turns red litmus blue, its pH is likely to be

(a) 1 **(b) 4** **(c) 5** **(d) 10**

A. (d) 10

2. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains

(a) NaCl **(b) HCl** **(c) LiCl** **(d) KCl**

A. (b) HCl

3. 10 ml of a solution of NaOH is found to be completely neutralised by 8 ml of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount HCl solution (the same solution as before) required to neutralise it will be

(a) 4 ml (b) 8 ml (c) 12 ml (d) 16 ml

A. (d) 16 mL

4. Which one of the following types of medicines is used for treating indigestion?

(a) Antibiotic (b) Analgesic (c) Antacid (d) Antiseptic

A. (c) Antacid

5. Write word equations and then balanced equations for the reaction taking place when –

(a) Dilute sulphuric acid reacts with zinc granules.

(b) Dilute hydrochloric acid reacts with magnesium ribbon.

(c) Dilute sulphuric acid reacts with aluminium powder.

(d) Dilute hydrochloric acid reacts with iron filings.

A. Here are the word equations and balanced equations for each reaction:

(a) Dilute sulphuric acid + Zinc granules → Zinc sulphate + Hydrogen gas

Balanced equation: $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$

(b) Dilute hydrochloric acid + Magnesium ribbon → Magnesium chloride + Hydrogen gas

Balanced equation: $2HCl + Mg \rightarrow MgCl_2 + H_2$

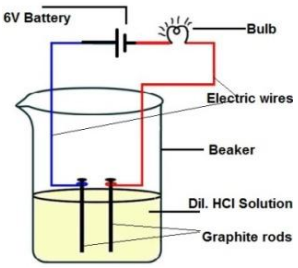
(c) Dilute sulphuric acid + Aluminium powder → Aluminium sulphate + Hydrogen gas

Balanced equation: $H_2SO_4 + 2Al \rightarrow Al_2(SO_4)_3 + 3H_2$

(d) Dilute hydrochloric acid + Iron filings → Iron(II) chloride + Hydrogen gas

Balanced equation: $2HCl + Fe \rightarrow FeCl_2 + H_2$

6. Compounds such as alcohols and glucose also contain hydrogen but are not categorised as acids. Describe an Activity to prove it.



A. (i) Prepare solutions of glucose, alcohol, hydrochloric acid and sulphuric acid etc.,

(ii) Connect two different colored electrical wires to graphite rods separately in a 100beaker (iii) Connect free ends of the wire to 6 volts battery through a bulb & a switch. Make a circuit.

(iv) Now pour some dilute HCl in the beaker and switch on the current.

(v) Repeat activity with dilute sulphuric acid and glucose and alcohol solutions separately.

(vi)We will notice that the bulb glows only in acid solutions but not in glucose and alcohol solutions.

(vii)Glowing of bulb indicates that there is flow of electric current through the solution.

(viii) Acid solutions have ions and the moment of these ions in solution helps for flow of electric current through the solution.

(ix) Alcohol and glucose contains hydrogen but not dissociates hydrogen ion in their aqueous solutions. So they are not categorized as acids.

7. Why does distilled water not conduct electricity, whereas rain water does?

A. Distilled water is the purest form of water does not contain ions. It does not conduct electricity because there are no ions that can carry an electric current.

But in rainwater, carbon dioxide (CO_2) from the air, forming carbonic acid (H_2CO_3) releases H^+ ions, while other gases and particles in the atmosphere and minerals and salts from the earth's surface dissolve, they form the ions. These ions increase electrical conductivity.
That's why does distilled water not conduct electricity, whereas rain water does.

8. Why do acids not show acidic behavior in the absence of water?

A. Acids don't show acidic behavior without water because they need water to break into H^+ ions, which are responsible for acidic properties. Without water, acids remain neutral.
Here water acts as a medium for acid dissociation, allowing acids to show their characteristic properties.

9. Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4,1,11,7 and 9, respectively. Which solution is (a) Neutral? (b) Strongly alkaline?
(c) Strongly acidic? (d) Weakly acidic? (e) weakly alkaline?
Arrange the pH in increasing order of hydrogen-ion concentration.

A. Based on the pH values:

(a) Neutral: Solution: D (pH 7)

(b) Strongly alkaline: Solution C (pH 11)

(c) Strongly acidic: Solution: B (pH 1)

(d) Weakly acidic: Solution: A (pH 4)

(e) Weakly alkaline: Solution: E (pH 9)

Arranging the pH in increasing order of hydrogen-ion concentration (decreasing pH):

1. pH 1 (Solution B) - strongest acid
2. pH 4 (Solution A) - weak acid
3. pH 7 (Solution D) - neutral
4. pH 9 (Solution E) - weak base
5. pH 11 (Solution C) - strong base

10. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?

A. Fizzing (effervescence) occurs due to the release of hydrogen gas when an acid reacts with magnesium.
Test tube A (HCl) will show more vigorous fizzing because:
(i) HCl is a strong acid, completely dissociating into H^+ ions, which react with Mg to produce more hydrogen gas.
(ii) Acetic acid (CH_3COOH) is a weak acid, partially dissociating into H^+ ions, resulting in less hydrogen gas production.
Since the amount and concentration of both acids are the same, the stronger acid (HCl) will produce more hydrogen gas, leading to more vigorous fizzing in test tube A.

11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

A. As fresh milk turns into curd, the pH will decrease (become more acidic).

This is because:
(i) Lactic acid bacteria (e.g., Lacto coccus lactis) present in the milk ferment the lactose (milk sugar) and produce lactic acid.
(ii) The lactic acid produced lowers the pH of the milk, making it more acidic.
(iii) As the milk curdles, the casein proteins coagulate, and the acidity increases, further decreasing the pH.
So, the pH of the milk will decrease from 6 to around 4.5-5.5, becoming more acidic as it turns into curd.

12. A milk man adds a very small amount of baking soda to fresh milk.
(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?
(b) Why does this milk take a long time to set as curd?
A. (a) Baking soda neutralizes the natural acidity of milk, raising the pH value slightly to around 7-7.5.
(b) Alkaline environment inhibits the growth of lactic acid bacteria and increases the casein micelles and interferes with the coagulation of milk, so it takes a long time for milk to curdle.

13. Plaster of Paris should be stored in a moisture-proof container. Explain why?
A. (i) Plaster of Paris should be stored in moisture-proof container.
(ii) Because it turns into Gypsum after reacting with moisture present in air.
(iii) Also it sets into hard solid.
(iv) $CaSO_4 . ½H_2O + 1½H_2O \rightarrow CaSO_4 . 2 H_2O$

14. What is a neutralization reaction? Give two examples.
A. (i) The reaction between an acid and a base to produce salt and water is called neutralization reaction.
(ii) Acid + Base --> Salt + Water
(iii) Ex: (a) $HCl + NaOH \rightarrow NaCl + H_2O$
(b) $H_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + 2 H_2O$

15. Give two important uses of washing soda and baking soda.
A. <u>Uses of Washing soda (Na_2CO_3):</u>
(i) Sodium carbonate (washing soda) is used in glass, soap and paper industries.
(ii) It is used in the manufacture of sodium compounds such as borax.
(iii) Washing soda can be used as a cleaning agent for domestic purposes.
(iv) It is used for removing permanent hardness of water.

<u>Uses of Baking Soda ($NaHCO_3$):</u>
(i) Baking soda is used for making Baking powder. Baking powder is used in the preparation of bread and cake to make them soft and spongy.
(ii) Baking soda is also an ingredient in antacids. Being alkaline, it neutralizes excess acid in the stomach and provides relief.
(iii) It is also used as soda-acid in fire extinguishers.
(iv) It acts as mild antiseptic.
(v) It is used sometimes for fast cooking.

<u>Extra Question and Answers</u>

1. What are olfactory indicators? Name some olfactory indicators.

A. (i) Olfactory indicators: There are some substances whose odor changes in acidic or basic media. These are called olfactory indicators.

Examples for Olfactory indicators: (i) Onion pieces, (ii) Clove oil, (iii) Vanilla essence

2. Complete the following table:

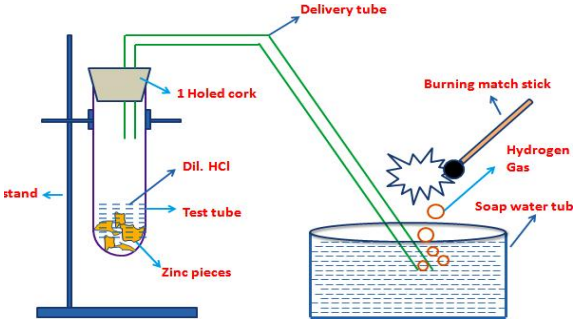
	Blue litmus	Red litmus	Methyl Orange	Phenolphthalein
Acid				
Base				

A.

	Blue litmus	Red litmus	Methyl Orange	Phenolphthalein
Acid	Red	Red	Red	No colour
Base	Blue	Blue	Yellow	Pink

3. Draw a labeled diagram that represents here action of acids on metals to liberate hydrogen gas. Write the method to identify the hydrogen gas which is liberated during the experiment.

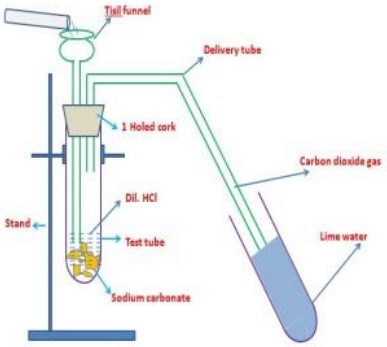
A.



(i)If we keep a burning match stick near the Hydrogen gas, it puts off with POP sound.

4. Draw a labeled diagram that represents the reaction of acids with carbonates to liberate carbon dioxide gas. Write anyone precaution to be taken while doing the experiment.

A.

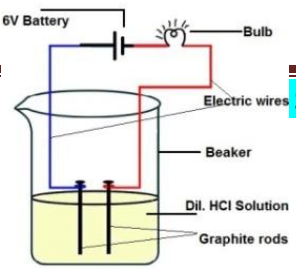


(i)Delivery tube should not touch the bottom of the test tube in which acid is taken.

5. What is pH?

A. The negative logarithm of the concentration of hydrogen ions in a solution is called pH of the solution.

6. Draw a neat diagram showing acid solution in water conducts electricity A.



7. Observe the following table.

	Lemon juice	Sea water	Blood	Distilled water	Baking soda	Coffee	Orange juice
pH value	**2.2**	**8**	**7.4**	**7**	**8.2**	**4.8**	**3.6**

Answer the following questions from the table.

(i). Which of the given substances is a neutral?

(ii). Which of the given substances is a strong acid?

(iii). Which of the given substances is a weak base?

(iv). What is pH?

A. (i)Distilled water is the neutral substance.

(ii) Lemon juice is the strong acid.

(iii) Blood is the weak base.

(iv) The number that represents the concentration of hydrogen ions in a solution is called pH.

8. Observe the following table.

	NaOH	Sea water	Blood	Distilled water	Baking soda	HCl	Vinegar
pHvalue	**13.8**	**8**	**7.4**	**7**	**8.2**	**0**	**3**

(i). Answer the following questions from the table.

(ii) Which of the given substances is a strong acid?

(iii) Which base is present in human body?

(iv) Which of the given substance can be used as antacid in emergency?

(v) What is the nature of NaOH? Acid/ base? Strong / weak?

A. (i) HCl is the strong acid in the given substances.

(ii) Base present in human body is blood.

(iii) Baking soda solution can be used as antacid in emergency.

(iv) NaOH is a strong base.

9. Observe the following table.

Substance	A	B	C	D	E	F
PH Value	**0**	**8**	**7**	**14**	**5**	**1**

Answer the following questions:

(i) What is the nature of the substances A and F?

(ii) Which of the above is a weak base?

A. (i) A and F are acids.

(ii)B is a weak base.

10. What is Chloro – alkali process? Explain.

A. (i) The process of preparing Sodium hydroxide by sending electricity through aqueous Sodium chloride solution is called Chloro-alkali process.

$$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$$

In this process, Chlorine gas is released at anode.
Hydrogen gas is released at cathode. Sodium hydroxide solution is formed at cathode.

11. Write the uses of Plaster of Paris.

A. Uses of Plaster of Paris:

(i) It is used as plaster for supporting fractures bones.
(ii) It is used for making toys.
(iii) It is used for making decoration articles.
(iv) It is used for making surfaces smooth.
(v) It is used for inner ceiling of houses.
(vi) It is used in the process to preserve the prints like handprints and leg prints.

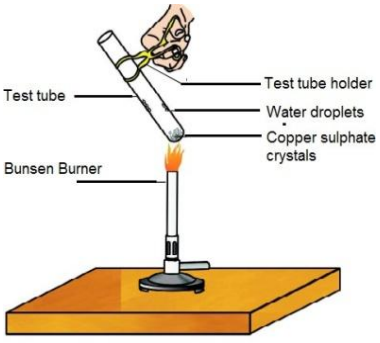
12. What is baking powder? How does it make the cake soft and spongy?

A. (i) Baking powder is a mixture of baking soda and a mild edible acid such as tartaric acid.
(ii) When baking powder is heated or mixed in water, the following reaction takes place.
$NaHCO_3 + H^+$ $CO_2 + H_2O$ + sodium salt of acid.
(iii) Carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

13. What is meant by "water of crystallization" of a substance? Describe an activity to show the water of crystallization.

A. <u>Water crystallization:</u>

(i) The water molecules present in the formula unit of salt crystals are called water of crystallization.
(ii) The salts which contain water of crystallization are called hydrated salts. Activity:
(iii) Take a few crystals of Copper sulphate in a dry test tube.
(iv)Hold the test tube with test tube holder.
(v) Lit the spirit lamp or Bunsen burner.
(vi)Heat the test tube.
(vii)We observe the water droplets appear on the inner walls of the test tube.
(viii) This is due to evaporation of water of crystallization present in crystals.
(ix) Blue colour copper sulphate turns into white.
(x) When the crystals are added with water, the blue color reappears.



Metals – Non Metals

Question 1:

1. Give an example of a metal which
(i) is a liquid at room temperature **(ii) can be easily cut with a knife.**
(iii) is the best conductor of heat **(iv) is a poor conductor of heat.**

A. (i) Liquid at room temperature: Mercury (Hg)
(ii) Can be easily cut with a knife: Sodium (Na)
(iii) Best conductor of heat: Silver (Ag) ; (iv) Poor conductor of heat: Bismuth (Bi)

2. Explain the meanings of malleable and ductile.

A. Malleable: Malleability is a property of metals due to which they can be beaten or hammered into thin sheets without breaking. Such metals which can be beaten into sheets are called malleable. Example: Gold and Aluminium.
Ductile: Ductility is a property of metals which gives them the ability to be drawn into thin wires without breaking. Metals which can be drawn into wires are called ductile. Example: Gold

Question 2:

1. Why sodium is kept immersed in kerosene oil?

A. Sodium is kept immersed in kerosene oil because it is highly reactive and:
(i) Burns spontaneously in air ; (ii) Reacts violently with water
(iii) Can cause fires or explosions
Kerosene oil prevents sodium from coming into contact with air or water, reducing the risk of accidents. It's a safety measure to store sodium safely!

2. Write equations for the reactions of
(i) iron with steam **(ii) calcium and potassium with water**

A. Here are the equations for the reactions:
(i) Iron with steam: $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
(ii) Calcium with water: $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
Potassium with water: $2K + 2H_2O \rightarrow 2KOH + H_2$ + heat (exothermic reaction)
(The potassium reaction is highly exothermic and may even ignite the hydrogen gas produced)

3. Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows.

Metal	Iron (II) sulphate	Copper (II) sulphate	Zinc sulphate	Silver sulphate
A	No Reaction	Displacement		
B	Displacement		No Reaction	
C	No Reaction	No Reaction	No Reaction	Displacement
D	No Reaction	No Reaction	No Reaction	No Reaction

Use the Table above to answer the following questions about metals A, B, C and D.
(i) Which is the most reactive metal?
(ii) What would you observe if B is added to a solution of Copper (II) sulphate?
(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

A. (i) B is most reactive metal.
(ii) B will displace copper from copper sulphate.

(iii) Arrangement of metals in the order of decreasing reactivity B > A > C > D

4. Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H_2SO_4.

A. When dilute hydrochloric acid (HCl) is added to a reactive metal, hydrogen gas (H_2) is produced. This is because the acid donates a hydrogen ion (H+), which reduces the metal and releases hydrogen gas.

$Fe + 2HCl \rightarrow FeCl_2 + H_2$

Here's the chemical reaction when iron reacts with dilute sulphuric acid (H_2SO_4):

$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$

5. What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.

A. When zinc is added to a solution of iron (II) sulphate, you would observe:

(i) The zinc metal (a solid) will start to dissolve

(ii) The solution will change colour from pale green (due to Fe2+ ions) to colourless

(iii) Bubbles of gas will be released (hydrogen gas)

The chemical reaction that takes place is: $Zn + FeSO_4 \rightarrow ZnSO_4 + Fe + H_2$

This is an example of a single displacement reaction, where zinc (a more reactive metal) displaces iron from its solution.

Question 3:

1. (i) Write the electron-dot structures for sodium, oxygen and magnesium.

(ii) Show the formation of Na_2O and MgO by the transfer of electrons.

(iii) What are the ions present in these compounds?

A. (i) (a) The electronic configuration of Sodium (Na) is 2, 8, 1. Sodium has 1 electron in its outermost shell.

Sodium 11

The electron-dot structures for Na: **Na·**

(b) The electronic configuration of oxygen (O) is 2, 6. Oxygen has 6 electrons in its outermost shell.

Oxygen 8

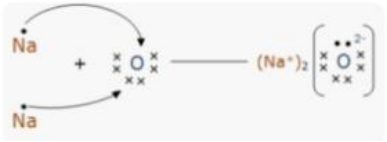
The electron-dot structures for O: ·Ö:

(c)The electronic configuration of Magnesium (Mg) is 2, 8, 2. Magnesium has 2 electrons in its outermost shell.

Magnesium 12

The electron-dot structures for Mg: Mg·

(ii)Formation of Na_2O:



$2Na$ (Sodium) $\rightarrow 2Na^+$ (Sodium ion) + $2e^-$ (electrons)

:O: (Oxygen) + $2e^- \rightarrow O^{2-}$ (Oxide ion)

Transfer of electrons

$2Na^+ + O^{2-} \rightarrow Na_2O$ (Sodium oxide)

Formation of MgO:

Mg (Magnesium) $\rightarrow Mg^{2+}$ (Magnesium ion) + $2e^-$ (electrons)

:O: (Oxygen) + $2e^- \rightarrow O^{2-}$ (Oxide ion)

Transfer of electrons

$Mg^{2+} + O^{2-} \rightarrow MgO$ (Magnesium oxide)

(iii) The ions present in Na_2O are Na^+ and O^{2-} ions. Here, Na+ is a positive ion and O^{2-} is a negative ion. The ions present in MgO are Mg^{2+} and O^{2-} ions. Here, Mg^{2+} is a positive ion and O^{2-} is a negative ion.

2. Why do ionic compounds have high melting points?

A. (i) Ionic compounds have high melting points.

(ii) Because of the strong electrostatic attraction between the positively charged metallic ions (cations) and the negatively charged non - metallic ions (anions). It requires a huge amount of energy to overcome.

(iii) As a result, ionic compounds have high melting points.

Question 4:

1. Define the following terms.

(i) Mineral (ii) Ore (iii) Gangue

A. (i) Mineral: The elements or compounds, which occur naturally in the earth's crust, are known as Minerals.

(ii) Ore: Some minerals contain a very high percentage of a particular metal and the metal can be profitably extracted from it. These minerals are called ores.

(iii) Gangue: An unwanted material or impurity that is present in an ore is known as Gangue

2. Name two metals which are found in nature in the Free State.

A. Gold, Silver, Copper and Platinum, etc||

3. What chemical process is used for obtaining a metal from its oxide?

A. Reduction is the chemical process used for obtaining a metal from its oxide by using reducing agents like carbon, sodium, aluminium or calcium.

Question 5:

1. Metallic oxides of zinc, magnesium and copper were heated with the following metals.

Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			
Copper oxide			

In which cases will you find displacement reactions taking place?

A.

Metal	Zinc	Magnesium	Copper
Zinc oxide	-	Displaces	-
Magnesium oxide	-	Displaces	-
Copper oxide	Displaces	-	-

Magnesium is the most reactive metal among all the three. So, it can displace both copper and zinc from their oxides. Zinc is reactive than copper but less reactive than magnesium. So, it can displace copper from its oxide but not magnesium. Copper is least reactive among all the three. So, copper does not show displacement reaction.

2. Which metals do not corrode easily?

A. Metals which are placed at the bottom of activity series (low reactivity metals) like silver, gold, and platinum do not corrode easily.

3. What are alloys?

A. Homogeneous mixtures of two or more metallic elements or one metal with another non-metal are called alloys.

Exercises

1. Which of the following pairs will give displacement reactions?

(a) NaCl solution and copper metal **(b) $MgCl_2$ solution and aluminium metal**

(c) $FeSO_4$ solution and silver metal **(d) $AgNO_3$ solution and copper metal.**

A. (c) and (d) (Fe and Cu are more reactive metals than silver)

2. Which of the following methods is suitable for preventing an iron frying pan from rusting?

(a) Applying grease (b) Applying paint (c) Applying a coating of zinc (d) All of the above.

A. (d) All the above

3. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be

(a) Calcium (b) carbon (c) silicon (d) iron.

A. (a) Calcium

4. Food cans are coated with tin and not with zinc because

(a) Zinc is costlier than tin **(b) Zinc has a higher melting point than tin.**

(c) Zinc is more reactive than tin **(d) Zinc is less reactive than tin.**

A. (c) zinc is more reactive than tin.

5. You are given a hammer, a battery, a bulb, wires and a switch.

(a) How could you use them to distinguish between samples of metals and non-metals?

(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.

A. (a) With the hammer, we can beat the sample and if it can be beaten into thin sheets (that is, it is malleable), then it is a metal otherwise a non-metal. Similarly, we can use the battery, bulb, wires, and a switch to set up a circuit with the sample. If the sample conducts electricity, then it is a metal otherwise a non-metal.

(b) The above tests are useful in distinguishing between metals and non-metals as these are based on the physical properties. No chemical reactions are involved in these tests.

6. What are amphoteric oxides? Give two examples of amphoteric oxides.

A. Amphoteric oxides are metal oxides that exhibit both acidic and basic properties, reacting with both acids and bases. Two examples are:

a. Aluminium oxide (Al_2O_3) b. Zinc oxide (ZnO)

They can act as either an acid or a base, depending on the reaction conditions.

7. Name two metals which will displace hydrogen from dilute acids & two metals which will not.

A. Two metals that will displace hydrogen from dilute acids: 1. Zinc (Zn) 2. Magnesium (Mg)

They are more reactive than hydrogen and will replace it in dilute acids, releasing hydrogen gas.

Two metals that will not displace hydrogen from dilute acids: 1. Copper (Cu) 2. Silver (Ag)

They are less reactive than hydrogen and will not replace it in dilute acids.

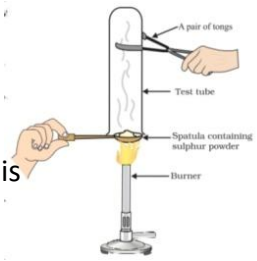
8. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?

A. For the electrolytic refining of a metal M:

Anode: Impure metal M (to be refined) ; Cathode: Pure metal (orinert electrode like graphite)

Electrolyte: A solution of a salt of metal M (e.g., MCl_2 or MSO_4) or a mixture of salts.
The impure metal M at the anode is oxidized and dissolved, while pure metal M is deposited at the cathode, leaving impurities behind.

9. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below.



(a) What will be the action of gas on?
(i) Dry litmus paper? (ii) Moist litmus paper?
(b) Write a balanced chemical equation for the reaction taking place.

A. (a) Action of gas: When sulphur powder is heated in air, it forms sulphur dioxide, which is acidic in nature and its aqueous solution is called sulphurous acid (H_2SO_3)
(i) There will be no effect of gas on dry litmus paper.
(ii) Moist blue litmus paper changes its colour to red due to H^+ ions present in the aqueous solution of H_2SO_3 formed from SO_2 obtained after burning sulphur.
(b) Balanced chemical equation for the above activity is as given below:
$S(s) + O_2(g) \rightarrow SO_2(g)$
$SO_2(g) + H_2O(l) \rightarrow H_2SO_3(aq)$ (Sulphurous acid)

10. State two ways to prevent the rusting of iron.

A. Two ways to prevent the rusting of iron:
(i) Galvanizing: Coating the iron with a layer of zinc (galvanizing) protects it from rusting. Zinc is more reactive than iron, so it prevents iron from coming into the contact with moisture and oxygen.
(ii) Painting or applying a coating: Applying a layer of paint, varnish, or a waterproof coating to the iron surface prevents moisture and oxygen from reaching the iron, thereby preventing rust. Additionally, other methods like oiling, greasing, or using rust inhibitors can also help prevent rusting.

11. What type of oxides is formed when non-metals combine with oxygen?

A. When non-metals combine with oxygen, they typically form acidic oxides or neutral oxides.
Acidic oxides: Ex :- sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and chlorine oxide (Cl_2O)etc..
Neutral oxides: Ex :- carbon monoxide (CO) and water (H_2O)etc .
(Some non-metal oxides can exhibit both acidic and basic properties, depending on the reaction conditions).

12. Give reasons

(a) Platinum, gold and silver are used to make jewellery.

A. Platinum, gold, and silver are used to make jewellery because they are:
(i) Highly attractive and lustrous
(ii) Durable and resistant to corrosion
(iii) Valuable and highly prized
(iv) Easy to shape and mould into intricate designs
(v) Rare and symbolic of wealth and status

(b) Sodium, potassium and lithium are stored under oil.

A. Sodium, potassium, and lithium are stored under oil because they are:
(i) Highly reactive alkali metals
(i) Easily oxidized in air

(iii) Reactive with water, causing fires or explosions
(iv) Protected from moisture and air by the oil, preventing accidents and degradation.
The oil acts as a barrier, keeping them safe and preserving their properties.

(c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.

A. (I) Aluminium metal forms a thin layer of aluminium oxide all over its surface under the action of moist air.
(ii) This layer prevents the metal underneath from further corrosion.
(iii) It is cheap easily available malleable and ductile. Therefore it is used to make utensils for cooking.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.

A. Carbonate and sulphide ores are converted into oxides during extraction because:
(i) Carbonates and sulphides are difficult to reduce directly to metals
(ii) Converting them to oxides makes it easier to extract the metal through reduction
(iii)Oxides can be reduced using carbon or other reducing agents, allowing for the extraction of the metal (This step is often necessary to make the extraction process more efficient and feasible.)

13. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

A. Sour substances like lemon or tamarind juice are effective in cleaning tarnished copper vessels because they contain acids (citric acid and tartaric acid, respectively) that:
React with the copper oxide (tarnish) and break down and dissolve the oxide layer, exposing the underlying shiny copper.
Help restore the metal's original luster and appearance.

14. Differentiate between metal and non-metal on the basis of their chemical properties.

A. A detailed differentiation between metals and non-metals based on their chemical properties:

Metals	Non - Metals
(i) Metals tend to lose electrons to form positive ions (cations).	(i) Non-metals tend to gain electrons to form negative ions (anions).
(ii) Metals react with acids to produce hydrogen gas and a salt.	(ii) Non-metals do not react with acids to produce hydrogen gas.
(iii) Metals react with oxygen to form basic oxides.	(iii) Non-metals react with oxygen to form acidic or neutral oxides.
(iv) Metals can displace hydrogen from water and acids.	(iv) Non-metals do not displace hydrogen from water and acids.
(v) Many metals exhibit catalytic properties, speeding up chemical reactions.	(v) Non-metals do not exhibit catalytic properties
(vi) Metals can form alloys with other metals.	(vi) Non-metals form compounds with metals and other non-metals.

15. A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced

drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

A. The goldsmith used a solution of aqua-regia, a mixture of nitric acid and hydrochloric acid in a molar ratio of 1:3.Aqua-regia (nitro hydrochloric acid) is a powerful acid that dissolves gold. When the gold bangles are dipped in this solution, the outer layer of gold melts and the inner shiny layer is exposed. A large amount of gold melts causes weight loss.

16. Give reasons why copper is used to make hot water tanks and not steel (an alloy of Iron)

A. (i) Copper is more resistant to corrosion from water especially hot water as compared to steel.

(ii) Copper is an excellent conductor of heat, so it can perform heat transfer and distribution more efficiently than steel tanks.

(iii) Copper is more ductile than steel and can be moulded into desired shapes, making it easier to make complex vessels.

(iv) Copper has antimicrobial properties that help reduce bacterial growth and contamination in water, making it a safe choice for hot water storage.

Extra questions:

1. Explain the physical properties of metals with suitable examples?

A. Physical properties of metals:

(i) Appearance: Generally metals are lustrous. Most of the metals appear shining.

Ex: Gold, silver, copper

(ii) Sonority: When metals dropped on a hard surface produce a particular sound.

Ex: School bells, coins produce sound.

(iii) Malleability: Metals can be beaten and made into thin sheets.

Ex: Silver foils used in sweets.

(iv) Ductility: Metals can be drawn into fine wires.

Ex: Copper wires used in electric wires. Iron mesh has iron strings.

(v) Electrical conductivity: Metals are good conductors of electricity.

Ex: Copper is used in electric wires.

(vi) Heat conductivity: Metals are good conductors of heat.

Ex: Aluminium, copper are is used in utensils.

(vii) Physical state: Generally metals are in solid state except like mercury, gallium.

(viii) Hardness: Generally metals are hard except like sodium, lithium.

2. After completion of metals and non metals chapter. Raheem understood that metals are hard and non-metals are soft. During the discussion with his brother he came to know that Diamond is a hardest material and it is a non-metal. Similarly mercury is a soft material and it is a metal. These findings from the discussion raised some questions in Raheem's mind. Can you guess those questions? Write them.

A. The following questions may be raised to Raheem.

(i) Non-metals do not shine. But why diamond shines?

(ii) Diamond shines. Why it is not treated as metal?

(iii) Generally metals are hard. Why mercury is in liquid state?

(iv)What is the content present in a diamond?

3. What are Amphoteric oxides?

A. Metal oxides which react with both acids as well as bases to produce salts and water are known as amphoteric oxides.

Ex:- $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$; $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$ ($2NaAlO_2$ - Sodium Aluminate)

4. Metals like potassium and sodium react with water to cause fire. But when calcium is mixed with water it does not burn. What is the reason?

A. Metals like potassium and sodium react violently with cold water. In case of sodium and potassium, the reaction is so violent and exothermic that the evolved hydrogen immediately catches fire energy.

$2K (s) + 2H_2O (l) \rightarrow 2KOH (aq) + H_2 (g) + heat$

$2Na (s) + 2H_2O (l) \rightarrow 2NaOH(aq) + H_2 (g) + heat\ energy$

The reaction of calcium with water is less violent. The heat evolved is not sufficient for the hydrogen to catch fire. So there is no fire.

$Ca (s) + 2H_2O (l) \rightarrow Ca(OH)_2(aq) + H_2 (g)$

5. Write equations for the reactions of magnesium, aluminium, zinc and iron with dilute hydrochloric acid.

A. (i) Reaction of magnesium with dilute hydrochloric acid.

$$Mg (s) + 2HCl (aq) \rightarrow MgCl_2 (aq) + H_2 (g)$$

(ii) Reaction of aluminium with dilute hydrochloric acid.

$$2Al (s) + 6HCl (aq) \rightarrow 2AlCl_3 (aq) + 3H_2 (g)$$

(iii) Reaction of zinc with dilute hydrochloric acid.

$$Zn (s) + 2HCl (aq) \rightarrow ZnCl_2 (aq) + H_2 (g)$$

(iv) Reaction of iron with dilute hydrochloric acid.

$$Fe (s) + 2HCl (aq) \rightarrow FeCl_2 (aq) + H_2 (g)$$

6. What is activity series? How it helps in extraction of metals?

A. Activity series: Arrangement of metals in descending order of their reactivity is known as Activity series.

The activity series of metals is …

K, Na, Ca, Mg, Al - High reactivity ; Zn, Fe, Pb, Cu, Hg - Moderate reactivity

Ag, Pt, Au -Less reactivity

Significance of activity series in extraction of metals:

(i) High reactivity metals are extracted by electrolytic reduction of their fused ores.

(ii) Moderate reactivity metals are found in the form of sulphides or carbonates.

These are roasted into their oxides and reduced.

(iii) Less reactivity metals are often found in Free State. Sometimes the oxides or sulphides of these metals can be reduced by heat alone or by displacement from their aqueous solutions.

(iv) Activity series is very useful to select the process in which the metal is extracted from its ore easily.

7. Show the formation of magnesium Chloride and sodium chloride by transfer of electrons.

A. Formation of NaCl and $MgCl_2$ by transfer of electrons

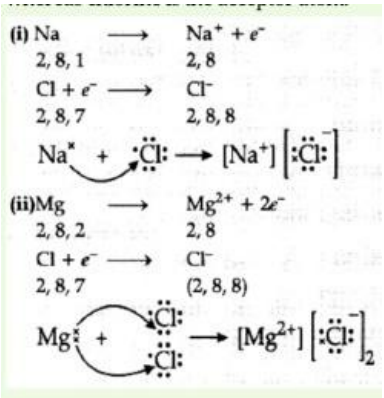
(i)Electrons are transferred from atoms of one element to atoms of another, resulting in positive and negative ions.

(ii)Metals and non-metals are the only substances that participate in electrovalent bonding.

(iii) NaCl and $MgCl_2$ are formed by the transfer of electrons.

(iv) In NaCl, sodium is the donor atom whereas chlorine is the acceptor atom.

(v) Similarly, in $MgCl_2$ Magnesium is the donor atom whereas chlorine is the acceptor atom



8. What are the properties of ionic compounds?

A. The properties of ionic compounds are as follows:

(i)They are crystalline solids, and are brittle in nature.

(ii)They have high melting and boiling points ; (iii)They are soluble in water.

(iv)They conduct electricity in their solution and molten states.

9. What is Thermite process? Mention its applications in daily life?

A. (i) Thermite process: An exothermic redox reaction between a metal and a metal oxide as reactants such as aluminium and iron oxide is called thermite process.

(ii) High reactivity metals such as Na, Ca, Al, etc., used as reducing agents.

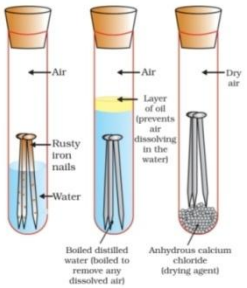
(iii) A large amount of heat is evolved in this process.

(iv) So the metals produced in molten state.

(v) Ex: $2AL + Fe_2O_3 \rightarrow Al_2O_3 + 2\ Fe + \text{Heat}$; $2Al + Cr_2O_3 \rightarrow Al_2O_3 + 2Cr + \text{Heat}$

10. Suggest an experiment to prove that the presence of air and water are essential for corrosion. Explain the procedure.

A. Experiment to prove that air and water are essential for corrosion:



(i) Take three test tubes and place clean iron nails in each of them.

(ii) Label these test tubes A, B and C.

(iii) Pour some water in test tube A and cork it.

(iv) Pour boiled distilled water in test tube B, add about 1 ml of oil and cork it.

(v) Put some anhydrous calcium chloride in test tube C and cork it.

(vi) Leave these test tubes for a few days.

(vii) We will observe that iron nails rust in test tube A, but they do not rust in test tubes B and C.

(viii) In the test tube A, The nails are exposed to both air and water. So they were rusted.

(ix) In the test tube B, the nails are exposed to only water. The oil will float on water and prevent the air from dissolving in the water.
(x) Anhydrous calcium chloride will absorb the moisture, if any, from the air. So the nails in test tube C are exposed to dry air. So we conclude that Corrosion of iron (commonly known as rusting) occurs in the presence of water and air.

11. Define and explain the following.

(i) Roasting (ii) Calcinations

A. (i) Roasting: It is the process of heating ore in the presence of air. This method is used for sulphide ores.
(ii) Calcination: It is the process of heating ore in the absence of air. This method is used for carbonate ores or hydrated ores to remove volatile impurities present in the ore.

12. What is alloy? What are the main metals present in Bronze, Brass and Stainless Steel?

A. A homogeneous mixture of two or more metals or metal + non-metal is called Alloy.
The alloy of Tin and Copper is in Bronze
The alloy of Zinc and Copper is in Brass.
The alloy of Iron, Chromium, Nickel and Carbon is in Stainless steel.

13. Jewellery is not made with pure gold. Why?

A. (i) Pure gold is soft.
(ii) So no jewellery will be made with it.
(iii) Jewellery is made by mixing a small amount of metals like silver or copper to the pure gold

14. Write the names of noble or inert gases. Why are they unreactive?

A. Helium, neon, argon, krypton, xenon, and radon are the names of noble or inert gases.
Noble gases are unreactive because the outer shell of the atoms of noble gases consists entirely of electrons. Noble gases cannot lose, gain or share electrons. That is why noble gases are less reactive and do not participate in chemical reactions.

Bits:

1. Match the following.

(i) Making into thin sheets	**( )**	**(a) ductility**
(ii) Shining materials	**( )**	**(b) conductivity**
(iii) Making into wires	**( )**	**(c) sonority**
(iv) Transmission of heat	**( )**	**(d) lustrous**
(v) Making ringing sound	**( )**	**(e) malleability**

A. (i) - [e], (ii) - [d], (iii) - [a], (iv) - [b],(v) - [c]

2. Sulphur dioxide is ……. in

(a) Basic oxide **(b) Acidic oxide** **(c) Neutral oxide** **(d) Amphoteric oxide**

A. [b]

3. Define Anodising?

A. Anodising is a process of forming a thick oxide layer of metal.

4. What is Aqua regia?

A. Aqua regia is a freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid in the ratio of 3:1.

5. Name any two alloys.

A. Alloys: (i) Bronze (ii) Brass (iii) Steel.

6. What is 22 carat Gold?

A. The alloy having 22 parts of pure Gold and 2 parts of other metals like Silver, Copper is called 22 carat Gold. Therefore, the 22 carat gold purity percentage is 91.67%.

7. What is the chemical name of rust of Iron? Write its general formula.

A. (i) The chemical name of rust of Iron is hydrated ferric oxide. (ii) Its formula is Fe_2O_3. x H_2O.

8. What is Amalgam?

A. If one of the metals is mercury, then the alloy is known as an amalgam.

9. Name the cation and anion in the following compounds.

$MgCl_2$, NaCl, CaO and $CaCl_2$

A. In $MgCl_2$ - Mg : cation, Cl : anion

In NaCl - Na : cation, Cl : anion

In CaO - Ca: cation,O: anion

In $CaCl_2$ - Ca : cation, Cl : anion

10. What is Anode Mud?

A. During metal refining, the insoluble impurities that settle down at the bottom of the anode during the electrolytic process is known as Anode Mud.

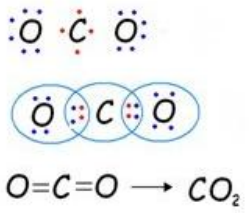
11. Why was Oil added to distilled water is Test tube B in an experiment to prove that air and water are necessary for corrosion?

A. In an experiment to prove air and water are necessary for metal corrosion oil is added to distilled water in test tube B because the oil floats on the water and prevent the air from dissolving in water.

Carbon and Its Compounds

Question 1:

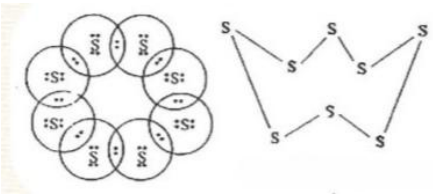
1. What would be the electron dot structure of carbon dioxide which has the formula CO_2?



A. Carbon (C) has an atomic number of 6, with an electronic configuration of $1s^2\ 2s^2\ 2p^2$. Therefore, carbon has 4 valence electrons (2 from 2s and 2 from 2p).
Oxygen (O) has an atomic number of 8, with an electronic configuration of $1s^2\ 2s^2\ 2p^4$. Therefore, oxygen has 6 valence electrons (2 from 2s and 4 from 2p).
Arrange the Atoms - In CO_2, carbon is the central atom because it can form more bonds oxygen. The electron dot structure of carbon dioxide (CO_2) is: :O = C = O:

2. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint-The eight atoms of sulphur are joined together in the form of a ring.)

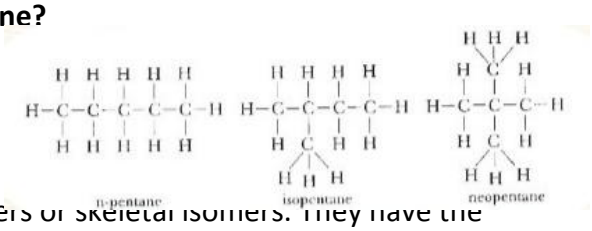
A. The atomic number of sulphur is 16 and its electronic configuration is 2, 8, 6.
Each sulphur atom has 6 valence electrons and shares 2 electrons with each adjacent sulphur atom.
This creates a ring structure with 8 sulphur atoms, each with a valence shell electron configuration of 2-8-8.
This structure is also known as an octagonal ring.



Question 2:

1. How many structural isomers can you draw for pentane?

A. There are 3 structural isomers for pentane:
a. Pentane (normal pentane): $CH_3CH_2CH_2CH_2CH_3$
b. Iso pentane (methyl butane): $CH_3CH(CH_3)CH_2CH_3$
c. Neo pentane (dimethyl propane): $CH_3CH_2C(CH_3)_3$



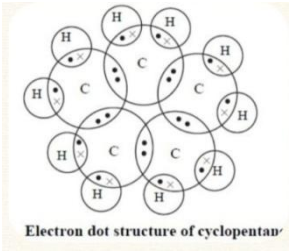
Structural isomers are also known as constitutional isomers or skeletal isomers. They have the same molecular formula but differ in the connectivity of their atoms.

2. What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

A. The two features of carbon that give rise to a large number of compounds are as follows:
(i) Tetra valence: With the valence of four, carbon is capable of bonding with other atoms to form single, double, and triple bonds.
(ii) Catenation: Carbon has the unique ability bonds with other atoms of carbon, giving rise to large molecules. These compounds may have long chains of carbon, branched chains of carbon even carbon atoms arranged in rings.

3. What will be the formula and electron dot structure of cyclo pentane?

A. The molecular formula of cyclo pentane is C_5H_{10}.
(5 carbon (pent) compound, in a cyclic (ring) structure (cyclo), with single bonded carbons (-ane)). Each carbon atom completes its octet by sharing two of its valence electrons with two other carbon atoms and by sharing remaining two electrons with two hydrogen atoms.


Electron dot structure of cyclopentane

4. Draw the structures for the following compounds. (i) Ethanoic acid (ii) Bromo pentane (iii) Butanone (iv) Hexanal.

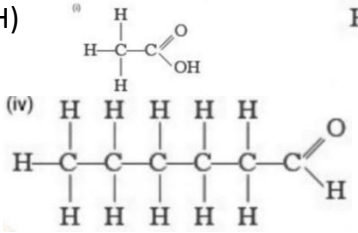
Are structural isomers possible for bromo pentane?

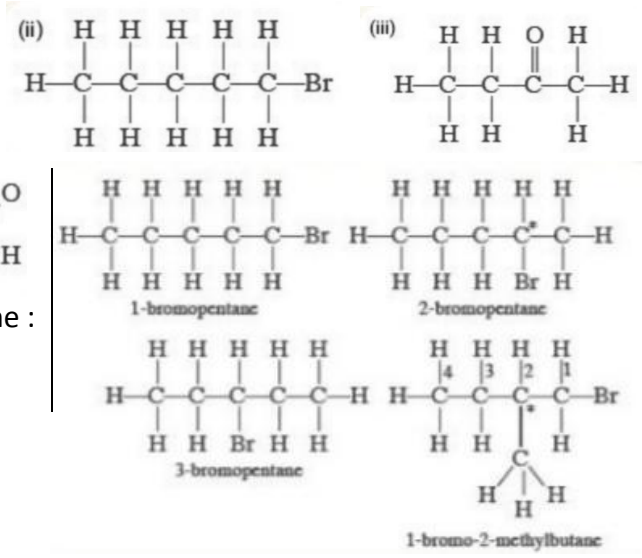
A.(i) Ethanoic acid (CH_3COOH)

(ii) Bromopentane ($C_5H_{11}Br$)

(iii) Butanone ($C_2H_5C(O)CH_3$)

(iv) Hexanal ($C_6H_{12}O$)





Yes, structural Isomers are possible for Bromo pentane :

5. How would you name the following compounds?

A. **(1) The compound is named as, 1- Bromo ethane.**

Explanation:

(i) Since the structure has 2 carbon atoms connected only by single bonds, hence we will call it 'ethane'.

(ii) A Br atom is attached to the chain. We start counting from both ends of the chain.

(iii) From one end we get, 2 Bromo- ethane, and from the other end we get, 1- Bromo ethane.

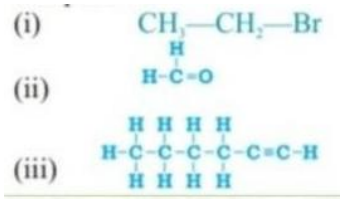
(iv) But we always take the count where the functional group has the least count (position).

(v) Hence, the compound is named as, 1- Bromo ethane.

(2)The compound is named as - Methanal

There is a single carbon atom hence, we use Meth and an aldehyde group present, so we add - al, combining we get Methanal.

(3) The compound is named as, Hex-1-yne



Explanation:

(i) The Chain has 6 carbon atoms, so we use 'hex'.

(ii) 1st position has triple bond(unsaturated chain) Hence suffix - yne

(iii) Therefore, it is called Hex-1-yne .

Question 3:

1. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

A. The equation of conversion of ethanol to ethanoic acid Reaction is :

$$CH_3CH_2O + O_2 \rightarrow CH_3{-}O{=}C{-}O + H_2O$$

The conversion of ethanol (C_2H_5OH) to ethanoic acid (C_2H_5COOH) is an oxidation reaction because: Loss of hydrogen, Gain of oxygen, In this reaction, a molecule of ethanol contains one oxygen atom while ethanoic acid contains two oxygen atoms. Hence, oxygen atom is added during the reaction, therefore, this conversion is an oxidation reaction.

2. A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

A. A mixture of ethyne (acetylene) and oxygen is ignited for welding. Because it produces a high temperature flame (about 3000-3200°C), and a controlled flame with less sooty smoke, it is ideal for welding. Whereas using a mixture of ethane and air produces a low temperature

(about 1200-1300°C), less controlled flame with soot.(Incomplete combustion occurs as saturated hydrocarbons limiting the air supply) It is not suitable for welding. So, the perfect choice for welding is a mixture of ethene and oxygen.

Question 4:

1. How would you distinguish experimentally between an alcohol and a carboxylic acid?

A. (j) Carboxylic acids turn blue litmus paper red; Alcohols do not affect litmus paper.
(ii) Carboxylic acids react with NaOH to produce a salt and water; Alcohols do not react with NaOH. (Or)
(iii) Alcohols react with sodium metal to produce hydrogen gas and sodium alkoxide. Carboxylic acids do not react with sodium metal.

(Or)

Acid reacts with carbonate and hydrogen carbonate to evolve CO_2 gas that turns lime water milky. Alcohols do not react with carbonates and hydrogen carbonates.
By using one or a combination of these methods, you can experimentally distinguish between an alcohol and a carboxylic acid.

2. What are oxidising agents?

A. Substances capable of removing hydrogen atoms from other compounds or adding oxygen to other compounds are called oxidants. Ex: Halogens, potassium nitrate, Potassium permanganate or acidified potassium dichromate etc.

Question 5:

1. Would you be able to check if water is hard by using a detergent?

A. Yes, you can check if water is hard by using a detergent. Here's a simple method:
1. Fill a bottle with water and add a small amount of detergent (preferably a non-foaming type).
2. Shake the bottle well and observe the suds formation.
3. If the water is soft, the detergent will lather easily and produce a rich foam.
4. If the water is hard, the detergent will not lather as well, and the foam will be scarce or nonexistent. But some detergents are specifically designed to work well in hard water, so the results may vary depending on the detergent used.

2. People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?

A. Agitation is essential for effective cleaning, as it helps to (i) Distribute soap,(ii) Remove impurities, (iii) Work soap into a lather, (iv) Rinse away impurities, and (v) Prevent soap redepositing.
Whether done manually or through a washing machine, agitation plays a crucial role in getting clothes clean.

Exercises

1. Ethane, with the molecular formula C_2H_6 has **A.** (b)
(a) 6 covalent bonds **(b) 7 covalent bonds**
(c) 8 covalent bonds **(d) 9 covalent bonds**

2. Butanone is a four-carbon compound with the functional group **A.** (c)
(a) carboxylic acid **(b) aldehyde**
(c) ketone **(d) alcohol**

3. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that

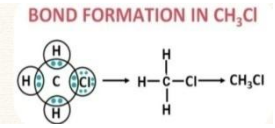
(a) the food is not cooked completely (b) the fuel is not burning completely. A. (b)

(c) the fuel is wet (d) the fuel is burning completely.

4. Explain the nature of the covalent bond using the bond formation in CH_3Cl.

A. Covalent bonds are chemical bonds formed by sharing of electrons between atoms.

In CH_3Cl, have Covalent bonds. In CH_3Cl, Carbon (C) atom with 4 valence electrons, Hydrogen (H) atoms with 1 valence electron each (3 H atoms in total),Chlorine (Cl) atom with 7 valence electrons



<u>During bond formation:</u>

(i) Carbon shares its 4 valence electrons with the 3 Hydrogen atoms, forming 3 C-H covalent bonds (sigma bonds).

(ii) Carbon shares a pair of electrons with Chlorine, forming a C-Cl covalent bond (sigma bond). Sharing of electrons leads to a strong chemical bond.

5. Draw the electron dot structures for

(a) Ethanoic acid (b) H_2S (c) Propanone (d) F_2

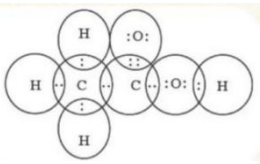
(a) CH_3COOH (Ethanoic acid)

(b) H_2S (Hydrogen sulphide)

(c) CH_3COCH_3 (Propanone)

(d) F_2 (Fluorine)

(i)



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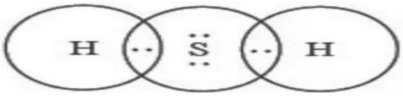

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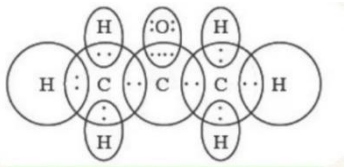

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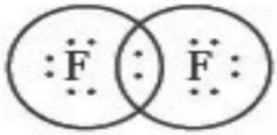


6. What is a homologous series? Explain with an example.

A. A series of compounds in which the same functional group substitutes for Hydrogen in a carbon and similar chemical properties is called a homologous series. There is a difference of CH_2 group between 2 successive compounds.

<u>For example:</u> Methane (CH_4) - Ethane (C_2H_6) - Propane (C_3H_8) - Butane (C_4H_{10}) - Pentane (C_5H_{12})

If we compare methane and ethane, the latter has 1 carbon atom and 2 hydrogen atoms more as compared to the former. There is a difference of CH 2 group between the two and so, they belong to the same homologous series.

7. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

A. <u>Physical Properties:</u>

Ethanol (C_2H_5OH)	**Ethanoic acid (CH_3COOH)**
1.Ethanol is a colourless, transparent liquid, has pleasant smell	1. Ethanoic acid is a colourless liquid with a pungent (vinegar-like) odour.
2.It has a burning taste	2.It is sour in taste
3.Ethanol boils at 78.5°C and melts at -114.5°C,	3. Ethanoic acid boils at 118°C. and melts at 16.6°C.
4.It is miscible with water, and does not freeze in winters	4. It is soluble in water and freezes in winters.

Chemical Properties:

Ethanol	Ethanoic acid
1.Ethanol is an alcohol (C_2H_5OH),	1. Ethanoic acid is a carboxylic acid (CH_3COOH).
2. Ethanol is a neutral molecule.	2. Ethanoic acid is a weak acid.
3.Ethanol has a neutral pH (around 7),	3. Ethanoic acid has a pH of around 3 (acidic).
4.Ethanol can undergo oxidation to form acetaldehyde,	4. Ethanoic acid can react with bases to form salts and with alcohols to form esters.
5.It does not react with $NaHCO_3$	5.It reacts with $NaHCO_3$ and gives CO_2

8. Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

A. Micelle is formed when soap is mixed with water due to the unique properties of soap molecules, which are both hydrophobic (repulsion to water) and hydrophilic (attraction to water).

In water, the hydrophobic tails of the soap molecules are in the interior of the molecular clusters and the hydrophilic (ionic) ends are on the surface of the molecular clusters. This formation is called a micelle. Micelle formation occurs only in polar solvents such as water. In non - polar solutions such as ethanol, micelles do not form because ethanol can dissolve soap molecules without forming micelles.

9. Why are carbon and its compounds used as fuels for most applications?

A. Carbon and its compounds are widely used as fuels for several reasons:

(i) Carbon-based fossil fuels release a lot of energy per unit mass.

(ii) Carbon is the fourth most abundant element in the universe, and its compounds are readily available in nature (eg, coal, oil, natural gas).

(iii) Carbon based fuels are easy to transport and store as they are mostly in liquid or gaseous form.

(iv) Carbon-based fuels release more energy due to higher combustion efficiency.

(v) Very cheap as compared to other sources of energy.

(vi) Carbon-based fuels Can be used for various applications i.e ; power generation, transport and industrial processes etc.

10. Explain the formation of scum when hard water is treated with soap.

A. When cleaning with soap in hard water, remove a difficult scum is formed. Because

(i) Hard water contains high levels of calcium (Ca2+) and magnesium (Mg2+) ions.

(ii) Soap molecules (usually sodium or potassium salts of fatty acids) react with these ions to form insoluble calcium and magnesium salts.

(iii) These salts precipitate out of solution to form a solid. This is called a scum.

11. What change will you observe if you test soap with litmus paper (red and blue)?

A. Since soap is alkaline/ basic in nature, it will turn red litmus blue, whereas no colour change will be observed in case of blue litmus paper.

12. What is hydrogenation? What is its industrial application?

A. The addition of hydrogen to unsaturated hydrocarbons in the presence of catalyst such as nickel or palladium to obtain saturated hydrocarbons is called hydrogenation.

Industrial applications of hydrogenation: Food processing, Petroleum refining, Chemical synthesis, Pharmaceuticals, Environmental applications....etc

13. Which of the following hydrocarbons undergo addition reactions: C_2H_6, C_3H_8, C_3H_6 , C_2H_2 and CH_4. .

A. The hydrocarbons that undergo addition reactions are: C_3H_6 (propene), C_2H_2 (ethyne) Remaining do not undergo addition reactions.

14. Give a test that can be used to differentiate between saturated and unsaturated hydrocarbons.

A. One test that can be used to differentiate between saturated and unsaturated hydrocarbons is the: Bromine Water Test

Procedure:

(i) Add a small sample of the hydrocarbon to a test tube.

(ii) Add bromine water (a solution of bromine in water) to the test tube.

(iii) Observe the colour change:

(a) If the hydrocarbon is unsaturated (alkene or alkyne), the bromine water will turn colourless or pale yellow, indicating a reaction has occurred.

(b) If the hydrocarbon is saturated (alkane), the bromine water will remain reddish-brown, indicating no reaction has occurred.

Unsaturated hydrocarbons (alkenes or alkynes) react with bromine water, whereas saturated hydrocarbons (alkanes) do not.

15. Explain the mechanism of the cleaning action of soaps.

A. (i) Soaps form micelles in water.

(ii) The dirt from clothes get attached to the centre of micelle.

(iii) They stay in solution of soap as colloid and are easily rinsed away.

(iv) Thus the soap cleans the dirt.

Extra questions:

1. What is covalent bond? Explain with examples how many types are formed?

A. A bond formed by sharing of electrons between two atoms is called a covalent bond.

Covalent bond is generally formed in three types they are .

(i) Single bond: Example is the bond formed between hydrogen atoms.

The valence of hydrogen is 1, allowing each hydrogen atom to occupy the configuration of the nearest inert gas, helium, with two electrons in K shell.

Valence electrons can be represented by dots or crosses as follows.

Single bond between two hydrogen atoms

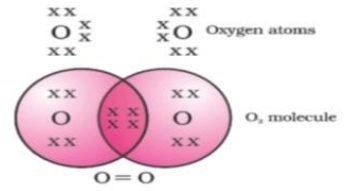
(ii) Double Bond: Example: A bond formed between oxygen atoms.

Oxygen valency is 8

Oxygen has six electrons in its L atom

(Oxygen has atomic number eight).And two more Electrons are required to complete the octet structure.

Valence electrons can be represented by dots or crosses as follows.

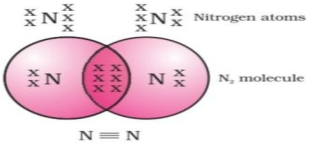


Double bond between two oxygen atoms

(iii) Triple bond: Example: A bond formed between nitrogen atoms.

Nitrogen valency is 7. To obtain the octet structure, each nitrogen atom in the nitrogen molecule donates three electrons, forming three shared electron pairs. A triple bond is formed between two atoms.

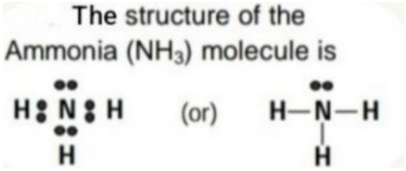
Valence electrons can be represented by dots or crosses as follows.



Triple bond between two nitrogen atoms

2. A molecule of ammonia has the formula NH3. Can you draw the electron dot structure for this molecule showing how all four atoms achieve noble gas configuration? Will the molecule have single, double or triple bonds?

A.



This molecule have single bonds.

3. Why does carbon form compounds mainly by covalent bonding?

A. The atomic number of carbon is Z=6.

Its electronic configuration is $1s^2\ 2s^2\ 2p^2$

The number of valence electrons is 4. It is not possible either to remove 4 electrons or to add 4 electrons to carbon because carbon is a small atom and electrons are strongly bound to the nucleus.

So carbon can only form covalent compounds by sharing of electrons.

4. What are the general molecular formulae of alkanes, alkenes and alkynes.

A.

Sl No.	Type of Hydrocarbon	General molecular formula
1	Alkane	C_nH_{2n+2}
2	Alkene	C_nH_2
3	Alkyne	C_nH_{2n-2}

5. Why Alkanes do not undergo addition reactions?

A . Addition reactions occur when a molecule adds to another molecule, often involving unsaturated compounds like alkenes (C=C) or alkynes (C≡C). Saturated compounds like alkanes (single bonds only) typically undergo substitution reactions.

One Mark Questions:

1. What is Octet rule?

A. The atoms of elements tend to undergo chemical changes that help to leave their atoms with eight outer-shell electrons.

2. Why are carbon compounds poor conductors of electricity?

A. The force of attraction between the atoms of carbon compounds is not strong. Therefore, carbon compounds have lower melting and boiling points.

3. Covalent compounds have lower melting and evaporation points. Why?

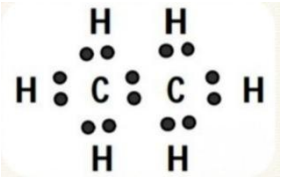
A. The electrons are shared between atoms and no charged particles are formed, such covalent compounds are generally poor conductors of electricity.

4. What is allotrope? What are the allotropes of carbon?

A. The property of an element that exist in two or more physical forms is called Allotropy. The different forms of elements are called allotropes of that element.

Allotropes of carbon: Diamond, Graphite, Buckminster fillence...etc

5. What do we call the Self linking property of carbon?
A. The Self linking property of carbon is called catenation.
6. Define the isomers.
A. Compounds having different structures with the same molecular formula are called Isomers.
7. Draw the electronic dot structure of ethane molecule.
A. Ethane formula is C_2H_6. The electronic dot structure of ethane is



8. What is Catalyst?
A. A catalyst is a substance which regulates (increase/decrease) the rate of a given reaction without itself finally undergoing any chemical change.
9. What is substitute reaction?
A. A reaction in which an atom or a group of atoms in a given compound is replaced by other atom or group of atoms is called a substitution reaction.
10. Name the acid present in vinegar.
A. Acetic acid (CH_3COOH) is present in Vinegar.
11. Explain esterification reactions of organic compounds.
A. Esterification: The reaction between carboxylic acid and alcohol in the presence of conc. H_2SO_4, to form a sweet odoured substance, ester with functional group –COOR is called esterification.
12. What is absolute alcohol?
A. Pure ethanol is called absolute (100%) alcohol.
13. What is Saponification reaction?
A. The hydrolysis process of fats or oils with alkali to obtain soap is called Saponification.
14. Names of Halogens: F, Cl, Br, I

Fill In The Blanks:

1. Carbon compounds containing double, triple bonds are called **A.** Unsaturated hydro carbons.
2. A compound which is basic constituent of many cough syrups .,,..... A. Ethol/Alcohol
3. Very dilute solution of ethanoic acid..... A. Vinegar
4. A sweet odour substance formed by the reaction of an alcohol , a carboxylic acid is..... A. Ester
5. When sodium metal is dropped in ethanol .....gas will be released. A. Hydrogen
6. The functional group present in methanol is.... A. OH
7. IUPAC name of alkene containing 3 carbon atoms is..... A. Propene
8. The first member of homologous series among alkynes is...,..... A. Ethyne
9. The product that is formed by dehydration of ethanol in conc. sulphuric acid is. A. Ethene
10. Number of single covalent bonds in ammonia are...,.,. A. 3
11. Type of reactions shown by alkanes is....,. A. Addition reactions.
12. Formula of Chloroform .... A. $CHCl_3$

Multiple Choice Questions:

1. Which of the following solution of acetic acid in water can be used as preservative? [ ]

a) 5 - 10% **b) 10 - 15%** **c) 15 - 20%** **d) 100%**

A. a) 5-10%

2. The suffix used for naming an aldehyde is [ ]

a) -ol **b) -al** **c)-one** **d) -ene**

A. b) -al.

3. Which one of the following hydrocarbon can show isomerism? [ ]

a) C_2H_4 **b) C_2H_6** **c) C_2H_8** **d)C_4H_{10}**

A. d) C_4H_{10}

4. Combustion of hydrocarbon is generally accompanied by the evolution of [ ]

a) Heat **b) Light** **c) both heat & light** **d) Electric current**

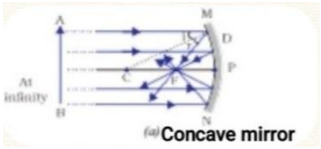
A. c) both heat and light

Light Reflection and Refraction

Exercise 1:

1. Define the principal focus of a concave mirror.

A. Many rays incident on a concave mirror parallel to the principal axis are reflected and converge/intersect at a point on the principal axis of the mirror. This point is called the principal focus of the concave mirror.



(a) Concave mirror

2. The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

A. The Radius of Curvature of mirror is equal t to twice the Focal length. So

R = 2f, (or) 2f = R

2f = 20cm,

f = 20/2 =10cm. Therefore Focal length of a spherical mirror is = 10cm

3. Name a mirror that can give an erect and enlarged image of an object.

A. A concave mirror is one that can give an erect and enlarged image of an object.

4. Why do we prefer a convex mirror as a rear-view mirror in vehicles?

A. (1) Convex mirrors are preferred because they always give an erect, though diminished, image.

(2) Also, they have a wider field of view as they are curved outwards.

(3) Thus, convex mirrors enable the driver to view much larger area than would be possible with a plane mirror.

(4) That's why we prefer a convex mirror as a rear-view mirror in vehicles.

Exercise 2:

1. Find the focal length of a convex mirror whose radius of curvature is 32 cm.

A. The Radius of Curvature of a convex q mirror is equal t to twice the Focal length. So

R = 2f, (or) 2f = R

f = R/2, f= 32/ 2 = 16cm. Therefore Focal length of a convex mirror is = 16cm

2. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?

A. Distance of object from concave mirror u = -10 cm

As magnification of image is 3 and image is real, hence m = -3 $\because m = -v/u$

Hence, v = -(m)(−u) = − (−3)(−10)=−30 cm

Thus, image is formed 30 cm in front of the concave mirror.

Exercise 3:

1. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

A. (i) When a ray of light travelling in air enters obliquely into water, it bends towards the normal.

(ii) This is because water is optically denser than air.

(iii) On entering water, the speed of light decreases and the light bends towards normal.

2. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3 x 10^8m/s.

A. The speed of light in a medium is given by the formula: v = c / n

Here: v = speed of light in the medium c = speed of light in vacuum (approximately 3 x 10^8 m/s) n = refractive index of the medium

Given that n = 1.50 (refractive index of glass),

v = (3 x 10^8m/s) / 1.50 ; v = 2 x 10^8m/s So, the speed of light in the glass is 2 x 10^8m/s.

(Note: The speed of light is reduced in the glass due to the increased density of the medium, as described by Snell's law.)

3. Find out, from Table 9.3, the medium having highest optical density. Also find the medium with lowest optical density.

A. The medium with the highest optical density in Table 9.3 is diamond, with a refractive index of 2.42

The medium with the lowest optical density in Table 9.3 is air, with a refractive index of 1.0003.

4. Kerosene, turpentine and water are given to you. In which of these does the light travel fastest? Use the information given in Table 9.3.

A. According to Table 9.3, the refractive indexes of the given substances are:

Kerosene: 1.44, Turpentine: 1.47, Water: 1.33

Since light travels faster in media with lower refractive index, light travels fastest in water (with the lowest refractive index of 1.33) among the given options.

5. The refractive index of diamond is 2.42. What is the meaning of this statement?

A.(i) The statement "The refractive index of diamond is 2.42" means that diamond bends light 2.42 times more than vacuum (or air, approximately).

(ii) In other words, if light passes from air into diamond, it will change direction by 2.42 times more than if it were passing through a vacuum.

(iii) Refractive index is a unique property of each material and is used to describe how much the material affects the path of light passing through it.

Exercise 4:

1. Define 1 dioptre of power of a lens.

A. (i)1 dioptre (D) is the power of a lens that can focus light at a distance of 1 meter.

(ii) A lens with a power of 1 dioptre can converge light rays to a point at a distance of 1 meter.

1 dioptre = 1 /meter (m-1)

(iii) A lens with a power of 1 dioptre has a focal length of 1 mete

2. A convex lens forms a real and inverted mage of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

A. The image is real and inverted, and equal in size to the object, the needle is placed at the principal focus of the convex lens.

The distance between the object (needle) and the image is 50 cm, so the focal length of the lens is 25 cm (since the object and image distances are equal).

The power of the lens is: Power = 1/Focal length (in meters)

= 100/25 m = 4 dioptres (D)

So, the needle is placed 25 cm in front of the convex lens, and the power of the lens is 4 D.

3. Find the power of a concave lens of focal length 2 m.

A. The power of a lens is calculated by the formula:

Power = 1/Focal length (in meters)

Power of concave lens = 1/2 m = -0.5 D. (The focal length of a concave lens is negative)

Exercises

1. Which one of the following materials cannot be used to make a lens?

(a) Water (b) Glass (c) Plastic (d) Clay

A. (d)

2. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?

(a)Between the principal focus and the centre of curvature (b) At the centre of curvature

(c)Beyond the centre of curvature (d) Between the pole of the mirror and its principal focus.

A. (d)

3. Where should an object is placed in front of a convex lens to get a real image of the size of the object?

(a)At the principal focus of the lens (b) At twice the focal length

(c)At infinity (d) Between the optical centre of the lens and its principal focus.

A. (b)

4. A spherical mirror and a thin spherical lens have each a focal length of -15 cm. The mirror and the lens are likely to be

(a) both concave. (b)both convex.

(c) the mirror is concave and the lens is convex. (d) the mirror is convex, but the lens is concave.

A. (d)

5. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be

(a) only plane. (b) only concave.

(c) only convex. (d) either plane or convex.

A. (d)

6. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?

(a) A convex lens of focal length 50 cm. (b) A concave lens of focal length 50 cm.

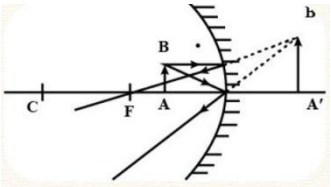
(c) A convex lens of focal length 5 cm. (d) A concave lens of focal length 5 cm.

A. (c)

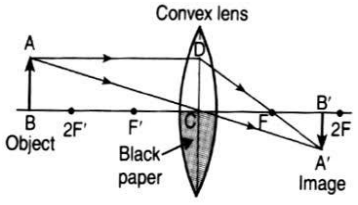
7. We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case.

A. (i) Concave mirror gives a virtual and erect image only when the object is placed between its pole and focus.

(ii) Therefore, we can get virtual and upright image only when the distance of the object from the mirror is less than 15 cm (lesson than focal length).
(iii) Ray diagram to obtain an erect image using a concave mirror is shown below:



8. Name the type of mirror used in the following situations.
(a). Headlights of a car. (b) Side/rear-view mirror of a vehicle. (c) Solar furnace.
Support your answer with reason.
A. Here are the answers:
(a) Headlights of a car: Concave mirror
Reason: Concave mirrors are used in headlights to converge light rays and produce a focused beam of light, illuminating the road ahead.
(b) Side/rear-view mirror of a vehicle: Convex mirror
Reason: Convex mirrors are used in side and rear-view mirrors to provide a wider field of view, allowing the driver to see a larger area behind and around the vehicle.
(c) Solar furnace: Concave mirror
Reason: Concave mirrors are used in solar furnaces to focus sunlight onto a small area, generating heat and concentrating the sun's energy. The concave shape allows for the collection and concentration of sunlight, increasing the intensity of the energy.
9. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.
A. (i) When one-half of a convex lens is covered with a black paper, this lens produces a complete image of the object.
(ii)To prove it we perform an experiment as given below:
(a) Take a convex lens and cover half part of it by using a black paper.
(b) Place it vertically in a stand.
(c) On one side of it place a burning candle. On opposite side of the lens fix a white screen. Adjust the position of candle or screen till clear image of burning candle is formed on the screen.
(d) We observe that the image is a complete image of the object (burning candle).
(c) From the experimental observations, we find that image formation does not depend upon the size of a lens.
(d) A smaller lens can also form complete image of an object placed in front of it.
(e) However, brightness of the image decreases when some part of lens is blocked. It is because now lesser number of rays passes through the lens.



10. An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed.

A. Object distance (u) = -25 cm

Focal length (f) = 10 cm

Ray diagram is shown aside:

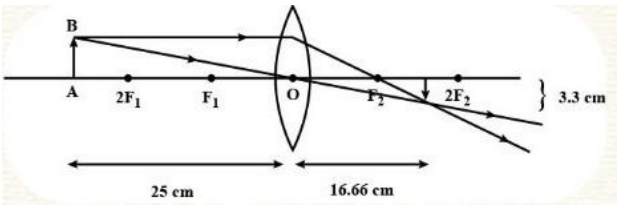


Image distance (v) =?

Image height (h_i) =?

According to the Lens formula, 1/f = 1/v -1/u

Substituting the values we get,

1/v − 1/−25 = 1/10

1/ v + 1/25 =1/10

⇒1/v =1/10 −1/25

⇒1/v=5−2 /50

⇒1/v=3 /50

⇒v=16.66 cm

Therefore, the distance of the image is 16.66 cm on the opposite side of the lens.

Magnification (m) = v/u= height of image/height of object

Substituting the values we get,

16.66/−25 = height of image/5

Height of image = 16.66×5/−25 = -3.3

Negative sign of the height of image means that an inverted image is formed.

The image is reduced, real and inverted.

11. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

A. f = -15 cm [∵ focal length of concave lens is negative]

v = -10 cm [∵ image distance of concave lens is negative]

u =?

According to the lens formula,1/f = 1/v - 1lu

Substituting the values we get,

1/-15 = 1/-10 - 1/u

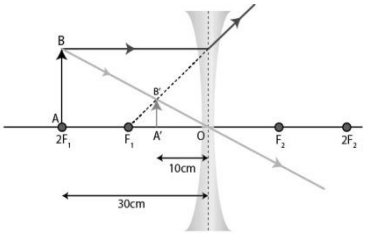
⇒1/u = 1/-10 + 1/15

⇒1/u = -3 + 2/30 = -1/30

⇒u = -30 cm

The object is placed 30 cm in front of the concave lens.

<u>Ray diagram:</u>



12.An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image.

A. Using the mirror equation: 1/f = 1/v+ 1/u

Where:

f = 15 cm (focal length of the convex mirror)

u = -10 cm (object distance)

v=? (Image distance)

Rearranging the equation to solve for v:

1/v= 1/f - (1/-u) = 1/15 - (1/-10) = 1/15 + 1/10

1/v = 2 + 3/30 = 5/30 = 6cm

Therefore v= 6 cm

The positive sign indicates that the image is virtual and erect.

(Since the object is within the focal length of the convex mirror, the image will be virtual and erect).

13. The magnification produced by a plane mirror is +1. What does this mean?

A. The magnification of +1 produced by a plane mirror means that:

(I) The image is the same size as the object (no magnification or reduction).

(ii) The image is upright (not inverted).

(iii)The positive sign shows that the image formed is virtual and erect.

(iv) This is in contrast to convex or concave mirrors, which can produce magnifications greater than or less than 1, resulting in enlarged or reduced images.

14. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.

A. First, let's find the focal length (f) of the convex mirror using the radius of curvature (R):

f = R/2 = 30/2 = 15 cm

Object distance (do) = -20 cm (since the object is in front of the mirror)

Focal length (f) = +15 cm

Object height (ho) = +5 cm

Using the formula: 1/f = 1/v + 1/u

1/v = 1/f - 1/u

= 1/15 - 1/-20 = 1/15 + 1/20 = 7/60

v = 60/7 = +8.57 cm (image distance)

The positive sign indicates that the image is virtual and erect.

Magnification (m) = -v/u = -8.57/-20 = +0.428 (approximately)

Image height (hi) = |m| x ho = 0.428 x 5 = 2.14 cm

So, the image is:

- Virtual and erect
- Located 8.57 cm behind the mirror (not on the mirror itself)
- 2.14 cm in length (reduced in size)

15. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focused image can be obtained? Find the size and the nature of the image.

A. Object distance (u) = -27 cm (since the object is in front of the mirror)

Focal length (f) = -18 cm (since the mirror is concave) Object height (ho) = +7 cm (since the object is upright)
Using the mirror formula: 1/f = 1/v + 1/u
1/v = 1/f - 1/u = 1/-18 - 1/-27 = -1/18 + 1/27
= -1/54
v = -54 cm (image distance)
The negative sign indicates that the image is real and inverted.
Magnification (m) = -v/u = - (-54)/- 27 = -2
Image height (hi) = |m| x ho =- 2 x 7 = -14 cm
So, the image is: - Real and inverted and magnified located 54 cm in front of the mirror.
(The negative sign in the magnification indicates that the image is inverted.)

16. Find the focal length of a lens of power -2.0 D. What type of lens is this?

A. The power of a lens (P) is related to the focal length (f) by the formula: P = 1/f
Therefore 1/f = -2.0
f = -1/2.0 = -0.5 m
Therefore f = -50 cm
The negative sign indicates that the lens is concave (diverging). Therefore, this lens is a concave lens with a focal length of 50 cm.

17. A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

A. The power of a lens (P) is related to the focal length (f) by the formula: P = 1/f
Given the power of the lens is +1.5 D, we can find the focal length as: 1/f = 1.5
f = 1/1.5 = 0.67 m (change into cm 0.67×100)
f = 67 cm
The positive sign indicates that the lens is converging (convex).
Therefore, the prescribed lens is a converging lens with a focal length of 67 cm.

Additional Question and Answers

1. What do you know about the terms given below related to spherical mirrors?

a) Pole b) Centre of curvature c) Focus
d) Radius of curvature e) Focal length f) Principal axis
g) Object distance h) Image distance i) Magnification

A. a) Pole: The centre of the reflecting surface of a spherical mirror is called as Pole. It is denoted by 'P'.

b) Centre of curvature: The centre of sphere, of which the reflecting surface of a spherical mirror is a part is called the centre of curvature. It is denoted by 'C'.

c) Focus: The point on the principal axis at which the parallel rays coming from infinity converges after reflection is called focus of the spherical mirror. It is denoted by 'F'.

d) Radius of curvature: The radius of sphere, of which the reflecting surface of a spherical mirror is apart is called the radius of curvature. It is denoted by 'R'.

e) Focal length: The distance between pole and focus is called focal length of the spherical mirror. It is denoted by 'f'.

f) Principal axis: The line passing through the pole and centre of curvature of spherical mirror is called principal axis of the mirror.

g) Object distance: The distance from the pole of spherical mirror to object is called object distance. It is denoted by 'u'.

h) Image distance: The distance from the pole of spherical mirror to image is called image distance. It is denoted by 'v'.

i) Magnification: The relative ratio of size of image formed by spherical mirror to the size of object is known as magnification. It is denoted by 'm'.

m = height of image/height of object (or)
Image distance/object distance

2. State the differences between convex and concave mirrors.

A.

Convex Mirror	Concave Mirror
1. This is a spherical mirror whose reflecting surface is curved outward is called convex mirror.	1. This is a spherical mirror whose reflecting surface is curved inward is called concave mirror.
2. The focus lies behind the mirror.	2. The focus lies in front of the mirror.
3. It is also known as diverging mirror	3. It is also known as converging mirror

3. Write the rules for sign convention.

A. Sign convention for the parameters related to the mirror equation

(i) All distances should be measured from the pole.

(ii) The distances measured in the direction of incident light, to be taken positive and those measured in the direction opposite to incident light to be taken negative.

(iii) Height of object (Ho) and height of image (Hi) are positive if measured upwards from the axis and negative if measured downwards.

4. How do you appreciate the role of spherical mirrors in daily life?

A. Spherical mirrors plays an important role in our day to day life.

(i) We can get different sizes of images and at desired distances by spherical mirrors.

(ii) Spherical mirrors, which converges light at a point used in solar appliances.

(iii) Concave mirrors are used by ENT doctors to see the effected parts more visible.

(iv) Spherical mirrors are used in wars in olden days to destroy the ships.

(v) Concave mirrors are used in telescopes to see celestial bodies.

(vi) Convex mirrors are used as rear view mirrors.

(vii) Concave mirrors are used as reflectors in head lights of vehicles.

So, I appreciate the role of spherical mirrors in daily life.

5. Why is it difficult to shoot a fish swimming in water?

A. (i) Due to refraction at water and air interface, the fish appears to be raised and seems to be close to the surface.

(ii)This is called apparent depth.

(iii)The shooter aims the gun to apparent position of fish instead of real position.

(iv)Hence it is very difficult to shoot a fish swimming in water.

6. When we sit at a camp fire, objects beyond the fire are seen swaying. Give the reason for it.

A.(i) At camp fire, heat is transformed to the surroundings by convection.

(ii)Due to this process, the density of surrounding air changes continuously.

(iii)The refractive index continuously changes slightly.

(iv)As a result the objects beyond the fire are seen swaying.

7. Why do stars appear twinkling?

A.(i) The light rays from the stars travel through many layers of the earth's atmosphere which are having different refractive index values.

(ii)The rays bent many times and in random directions.

(iii)As a result, the stars appear twinkling.

8. Write Snell's law and name the terms in it.

A.(i) Snell's law: n_1. sin i = n_2. sin r

(ii) Here n_1 = Refractive index of the first medium

N_2 = Refractive index of the second medium i = Angle of incidence r = Angle of refraction

9. State the laws of refraction.

A. <u>Laws of refraction:</u>

(i)The incident ray, the refracted ray and the normal drawn to the interface of two transparent media at the point of incidence – all lie in the same plane.

(ii) During refraction, light ray follows Snell's law. Snell's law : n_1. sin i = n_2. sin r

10. Refractive indices of some material are given in the following table.

Material	Water.	Benzene	Ice	Diamond
Refractive index (n)	1.33	1.50	1.31	2.42

Answer the following questions by using the information given in the table.

(i)In which of the above material, the speed of light is less?

(ii)Which of the above is a rarer medium? Why?

(iii)In the formula of refractive index: n = c /v, what is 'c'? What is its value?

(iv)Find the speed of light in Benzene.

A. (i) Speed of light is less in Diamond.

(ii)Ice is optically denser medium. Because it has less refractive index.

(iii) 'c' is the speed of light in vacuum. Its value is 3 x 10^8 m/s.

(iv)Speed of light in Benzene: c/v

= 3 X 10^8/ 1.5 x 10^8m/s. = 2R

11. Refractive indices of some material are given in the following table.

Material	Water	Kerosene	Ice	Benzene
Refractive index (n)	1.33	1.44	1.31	1.50

Answer the following questions by using the information given in the table.

(i)In which of the above material, the speed of light is less?

(ii)Which of the above is a denser medium?

(iii)What is the formula for refractive index?

(iv) A light ray incident with an angle at water-Ice interface. Is the light ray bends towards the normal? Or away from the normal? after refraction?

A. (i) Speed of light is less in Benzene.

(ii)Benzene is denser medium

(iii)Refractive index: n = c

(iv)It bends away from the normal.

12. Refractive indices of some materials are given below.

Substance	Water	Diamond	Crown glass	Flint glass	Coconut oil	Hydrogen gas
Refractive Index(n)	1.33	2.42	1.53	1.65	1.445	1.000132

Answer the following questions by using the information given in the table.

(i)Which is optically denser than flint glass?

(ii)Which is optically rarer than water?

(iii)In which material, does the light travel faster than in coconut oil?

(iv)In which material, does the light travel slowly than in crown glass?

A.(i) Diamond is optically denser than flint glass.

(ii)Hydrogen gas is optically rarer than water.

(iii)The light travels fast in water and Hydrogen gas than in coconut oil.

(iv)The light travels slowly in flint glass and Diamond than in crown glass.

13. Speed of light in a medium is 1.5 x 10^8 m/s. Find the refractive index of that medium.

A. Refractive index of the medium (n) =? Speed of light in vacuum (c) = 3 x 10^8m/s Speed of light in medium (V) = 1.5 x 10^8 m/s

Formula: n = c /v = 3 X 10^8/1.5 X 10^8 = 3/1.5 = 2

14. The refractive index of glass is 3 /2. Find the speed of light in glass?

A. Refractive index of glass (n) = 3/2

Speed of light in vacuum (c) = 3 x 10^8m/s Speed of light in glass (V) =?

Formula: n = c/v

v = c n = 3 X 10^8× 3/2 = 3 x 10^8m/s × 2/3

= 10^8×2

15. Why does a diamond shine more than a glass piece cut to the same shape?

A. (i) Diamonds have high refractive index value. (n = 2.42)

(ii)It is more than normal glass.

(iii)The critical angle of diamond is very less due to high refractive index. (C =24.4o)

(iv)So most of the incident rays on diamond get total internal reflection.

(v)So a diamond shines more than a glass piece even they cut to the same shape.

16. Write the differences between real image and virtual image.

A. Differences between real and virtual images:

Real image	Virtual image
1.Image can be obtained on the Screen.	1. Image cannot be obtained on the screen.
2. It is formed when light converges to a point after reflection or refraction.	2. It is formed when light appears to be diverges from a point after reflection or refraction.
3. It is always inverted with respect to object.	3. It is always erect with respect to object.
4. We cannot see the image with eyes.	4. We can see the image with eyes.
5. Real image is formed always in front of the mirror.	5. Virtual image is formed always behind the mirror.
6. Object and real image both are at either side to a lens.	6. Object and real image both are same at side to a lens

17. Write the lens formula. Explain the terms in it.

A. Lens formula: 1/f = 1/v -1/u

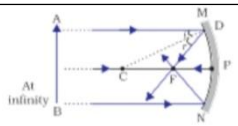
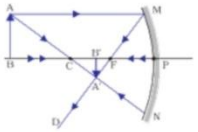
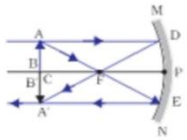
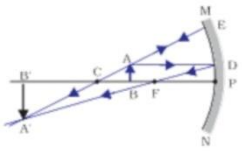
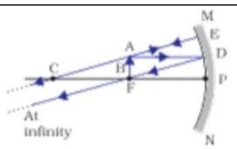
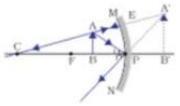
Here f = Focal length of the lens u = Object distance v = Image distance

18. Write any two differences between convex lens and concave lens.

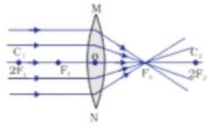
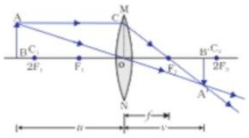
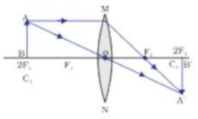
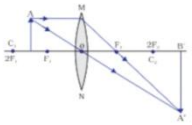
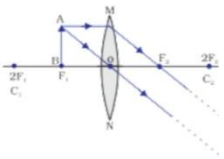
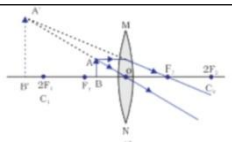
A. Differences between convex and concave lens:

Convex lens	Concave lens
1. If two surfaces of a lens are curved out ward, then it is called convex lens.	1. If two surfaces of a lens are curved inward, then it is called concave lens.
2. Generally, it is converging lens.	2. Generally, it is diverging lens.
3. It can form real and virtual images.	3. It always forms virtual images.
4. It can form different sized images.	4. It always forms diminished images.
5. It can form either erect or invert image	5. It forms only erect image.
6. 	6. 

19. Draw the ray diagrams of images forming a concave mirror and describe the properties and positions of images

Position of the Object	Position of the Image	Size of the Image	Nature of the Image	Ray Diagram
At Infinity	At the Focus 'F'	Highly diminished, point sized	Real and Inverted	
Beyond 'C'	Between 'F; and 'C'	Diminished	Real and Inverted	
At 'C'	At 'C'	Same size	Real and Inverted	
Between 'C' and 'F'	Beyond 'C'	Enlarged	Real and Inverted	
At 'F'	At infinity	Highly Enlarged	Real and Inverted	
Between 'F' , 'P'	Behind the mirror	Enlarged	Virtual and Erect	

20. Draw the ray diagrams of images forming a convex lens and describe the properties and positions of images

Position of the Object	Position of the Image	Size of the Image	Nature of the Image	Ray Diagram
At Infinity	At the Focus 'F_2'	Highly diminished, point sized	Real and Inverted	
Beyond '$2F_1$'	Between ' F_2' '$2F_2$'	Diminished	Real and Inverted	
At '$2F_1$'	At '$2F_2$'	Same size	Real and Inverted	
Between ' F_1', '$2F_1$'	Beyond '$2F_2$'	Enlarged	Real and Inverted	
At focus 'F_1'	At infinity	Highly Enlarged	Real and Inverted	
Between 'F_1' and Optical centre 'O'	The object side of the lens	Enlarged	Virtual and Erect	

Human Eye and Colorful World

1. What is meant by power of accommodation of the eye?

A. The ability of the eye lens to adjust its focal length is called power of accommodation.

2. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?

A. A person with a myopic eye (nearsightedness) should use a concave lens (negative power) to restore proper vision. This type of lens will spread out light rays, allowing them to see distant objects clearly.

3. What is the far point and near point of the human eye with normal vision?

A. The minimum distance, at which objects can be seen most distinctly without strain, is called the least distance of distinct vision. It is also called the near point of the eye.

For a young adult with normal vision, the near point is about 25 cm.

The farthest point upto which the eye can see objects clearly is called the far point of the eye.

4. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

A. The student is likely suffering from Myopia (Nearsightedness), which makes it difficult to see distant objects clearly.

Correction: Bi Concave lens (negative power) glasses or contact lenses can correct Myopia, allowing the student to see the blackboard clearly.

Exercises:

1. The human eye can focus on objects at different distances by adjusting the focal length of the eye lens. This is due to

(a) Presbyopia **(b) near-sightedness** **(c) accommodation** **(d) far-sightedness**

A. (c) accommodation

2. The human eye forms the image of an object at its

(a) Cornea **(b) Iris** **(c) Pupil** **(d) Retina**

A. (d) retina

3. The least distance of distinct vision for a young adult with normal vision is about

(a) 25 m **(b) 2.5 cm** **(c) 25 cm** **(d) 2.5 m**

A. (c) 25 cm

4. The change in focal length of an eye lens is caused by the action of the

(a) Pupil **(b) Retina** **(c) Ciliary muscles** **(d) Iris**

A. (c) Ciliary muscles.

5. A person needs a lens of power -5.5 dioptres for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting (i) distant vision, and (ii) near vision?

A. To find the focal length, we need to use the formula:

Focal length (f) = 1 / Power (P)

Where Power (P) is given in dioptres.

(i) Distant vision:

Power (P) = -5.5 dioptres

Focal length (f) = 1 / (-5.5) = -0.18 m (concave lens)

(ii) Near vision:

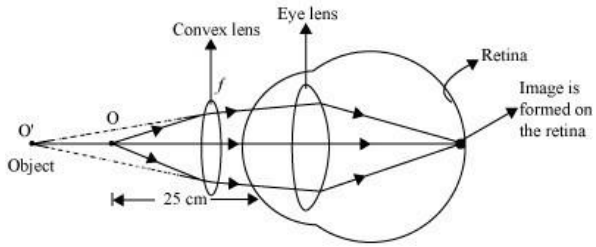
Power (P) = +1.5 dioptres
Focal length (f) = 1 / (1.5) = 0.67 m (convex lens)
So, the focal lengths of the lenses required are:
(i) -0.18 m or -18.18 cm (concave lens) for distant vision
(ii) 0.67 m or 66.67 cm (convex lens) for near vision

6. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?

A. The person is suffering from myopia and hence need a concave lens to correct the defect. The lens should be such that an object at infinity must form its image at the far point.
Hence, f = −80 cm = − 0.8 m
The power of the lens can be obtained as:
P = 1/f
P = 1/ (−0.8) = −1.25 D

7. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.

A. Hypermetropia can be corrected by using a convex lens. A convex lens converges the incoming light such that the image is formed on the retina.
An object at 25 cm forms an image at the near point of the hypermetropic eye. Here, near point is 1 m.
Given,
Object distance, u=−25 cm
Image distance, v=−100 cm
From lens formula, 1v−1u=1f
1−100−1−25=1f
Focal length, f=100/3 cm=1/3 m
Power, P = 1f = 1/ $\frac{1}{3}$ =3 D



8. Why is a normal eye not able to see clearly the objects placed closer than 25 cm?

A. A normal eye is unable to clearly see the objects placed closer than 25 cm because the ciliary muscles of eyes are unable to contract beyond a certain limit.
If the object is placed at a distance less than 25 cm from the eye, then the object appears blurred and produces strain in the eyes.

9. What happens to the image distance in the eye when we increase the distance of an object from the eye?

A. When we increase the distance of the object from the eye, the image distance in the eye does not change. Due to the changing value of the lens of the eye, the image distance remains the same for different object distances. Because the lens adjusts its focal length between a minimum of 2.27 cm and a maximum of 2.5 cm.

10. Why do stars twinkle?

A. Stars twinkle because of the Earth's atmosphere. Why because
(i) Starlight enters Earth's atmosphere and travels through various layers of air.
(ii) The light is refracted (or bent) by the air molecules, which changes its path.
(iii) The air is constantly moving, causing the light to be refracted at different angles.

(iv) This constant change in refraction makes the star's light appear to flicker or twinkle!
So, it's not the stars themselves that are twinkling, but the Earth's atmosphere that's causing the twinkling effect!

11. Explain why the planets do not twinkle.

A. Planets do not twinkle because:
(i) Planets are not a source of light. Instead, they reflect low intensity light reaching them.
(ii) They are also closer to the Earth than the distant stars. Hence, the shift due to atmospheric refraction is smaller.
(iii) As the planets are closer, planets appear larger in comparison to the stars. Hence, the shift is not enough for the planets to twinkle.

12. Why does the sky appear dark instead of blue to an astronaut?

A. Scattering of light causes the blue colour of sky. Scattered blue light enters our eyes. If the Earth had no atmosphere, the sky would appear dark. The sky appears dark to travellers at high altitudes because scattering is not as prominent at such altitudes. Hence the sky appear dark instead of blue to an astronaut.

Extra question and answers:

1.What is accommodation of lens?

A. The ability of eye lens to change is focal length is called accommodation of eye lens.

2.Write the minimum and maximum focal lengths of eye lens.

A. (i) The minimum focal length of eye lens = 2.27cm
(ii) The maximum focal length of eye lens = 2.5cm

3. What is least distance of distinct vision? What is the distance of least distance of distinct vision for the normal healthy people?

A. (i) The minimum distance of an object from our eye, such that we are able to see the object comfortably and clearly is called the least distance of distinct vision.
(ii) It varies from person to person and with age.
(iii) The distance of least distance of distinct vision for the normal healthy people is 25cm.

4. How do you appreciate the working of Ciliary muscles in the eye?

A. (i) Eye lens is attached to the ciliary muscle.
(ii) The ciliary muscle helps to change the focal length of eye lens, by changing the radii of curvature of the eye lens.
(iii) When eye lens is focused on a distant object, the ciliary muscles are relaxed so that the focal length of eye lens has its maximum value.
(iv) We can see the clear image then.
(v) When eye lens is focused on a closer object, the ciliary muscles are strained and focal length of eye lens decreases.
(vi) So we can see the image clearly.
(vii) This process of adjusting focal length is called accommodation.
(viii) So we appreciate the working of ciliary muscles in the eye.

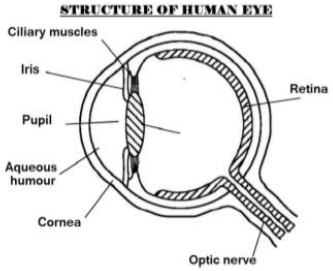
5. How can we get the image on the retina with same image distance for various positions of objects?

A. (i) Eye lens is attached to the ciliary muscle.

(ii) The ciliary muscle helps to change the focal length of eye lens, by changing the radii of curvature of the eye lens.
(iii) So we can see the image on the retina irrespective of the object distance.

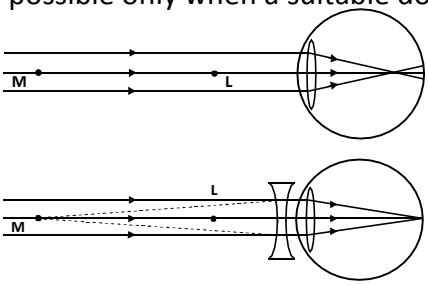
6. Draw a neat labeled diagram of structure of Human eye.

A. Structure of Human eye



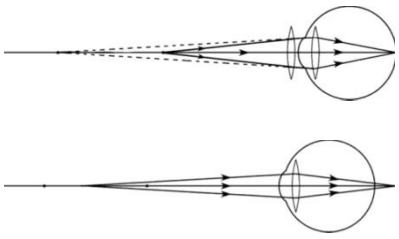
7. How do you correct the eye defect Myopia?

A. (i) The eye lens can form clear image on the retina, when an object is placed between far point
And point of least distance of distinct vision.
(ii)The inability to see the objects kept beyond far point is called myopia.
(iii)If we are able to bring the image of the object kept beyond far point, between the far point and the point of least distance of distinct vision using a lens; this image acts as an object for the eye lens. Then the eye can see the object clearly.
(iv) This can be made possible only when a suitable double concave lens is used.



8. Explain the correction of the eye defect Hypermetropia.

A. (i) Eye lens can form a clear image on the retina when any object is placed beyond near point.
(ii) The inability to see the objects kept between near point and point of least distance of distinct vision is called Hypermetropia
(iii) If we are able to bring the image of the object kept between near point and point of least distance of distinct vision beyond near point; this image acts as an object for the eye lens. Then the eye can see the object clearly.
(iv) This is possible only when a suitable double convex lens is used.



9. What is Presbyopia? Which lens is used to correct Presbyopia?

A. The ability of accommodation of the eye usually decreases with ageing. This type of eye defect is called Presbyopia.

(i)Bi focal lens is used to correct presbyopia.

(ii)The bi focal lens consists of concave lens in its upper portion and a convex lens in its lower portion.

10. What is Accommodation of eye lens?

A. The ability of eye lens to change its focal length is called Accommodation of eye lens.

11. How many types of common eye defects of vision are there? What are they?

A. There are mainly three common eye defects of vision.

They are: (i)Myopia (ii)Hypermetropia (iii)Presbyopia

12. Your friend has either Myopia or Hypermetropia. Prepare any two questions to be asked your friend to determine the type of eye defect.

A. Friend has either Myopia or Hypermetropia. I can ask the following questions to determine the defect of vision:

(i) Are the letters in this Newspaper visible?

(ii) Are the letters in that Calendar on the wall visible?

(iii) Are you able to see pictures in T.V. clearly?

(iv) Are the flexi banners on the divider appear clearly, while you are walking roadside?

13. The far point of a person is at 50cm distance. Then..

(i) Which eye defect he has?

(ii) Which lens is to be used to correct the eye defect?

(iii) What is the focal length of the lens?

(iv) What is the power of the lens?

A. The far point of a person D=50cm

(i) Far point is given, so the eye defect of the person is Myopia.

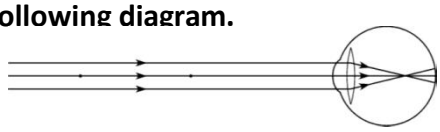
(ii) The lens used to correct myopia is Bi concave lens.

(iii) The focal length of the lens to be used f = - D = - 50cm

(iv) The power of the lens to be used P = 100/-f = 100/ -50

= -2 diapotre

14. Observe the following diagram.



Which type of eye defect is shown in the figure? Which lens is to be used to correct the defect?

A. (i) In the given diagram: The light rays coming from infinite distance converges before retina.

(ii) It means, the person is unable to see the far objects clearly.

(iii) This type of vision defect: Myopia.

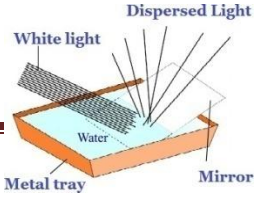
(iv) To correct myopia, Bi concave lens of suitable focal length should be used

15. Suggest an experiment to produce a rainbow in your classroom and explain the procedure.

A. (i) Take a metal tray and fill it with water.

(ii) Place a mirror in water such that it makes an angle to the water surface.

(iii) Keep a white cardboard screen/sheet above the water surface.



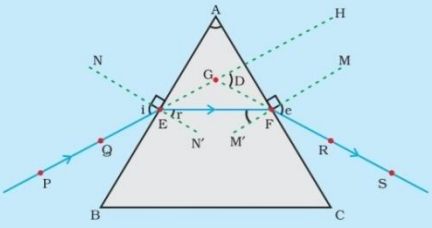
(iv) Now focus white light on the mirror through water.
(v) Try to obtain the colours on the screen.
(vi) We can see the seven colours (VIBGYOR) of rainbow on the screen.
(vii) We can place the water tray with mirror inside in sunlight to produce rainbow on the wall.

16. Define Dispersion.

A. The splitting of white light into different colours (Generally VIBGYOR) is called dispersion.

17. Explain Refraction through Prism.

A. (i) Fix a sheet of white paper on a drawing board using drawing pins.
(ii) Place a glass prism on it in such a way that it rests on its triangular base. Trace the outline of the prism using a pencil.
(iii) Draw a straight line PE inclined to one of the refracting surfaces, say AB, of the prism.
(iv) Fix two pins, say at points P and Q, on the line PE as shown in Fig.
(v) Look for the images of the pins, fixed at P and Q, through the other face AC.
(vi) Fix two more pins, at points R and S, such that the pins at R and S and the images of the pins at P and Q lie on the same straight line.
(vii) Remove the pins and the glass prism.
(viii) The line PE meets the boundary of the prism at point E (see Fig.I). Similarly, join and produce the points R and S. Let these lines meet the boundary of the prism at E and F, respectively. Join E and F.
(ix) Draw perpendiculars to the refracting surfaces AB and AC of the prism at points E and F, respectively.
(x) Mark the angle of incidence (∠i), the angle of refraction (∠r) and the angle of emergence (∠e) as shown in Fig.



PE – Incident ray
EF – Refracted ray
FS – Emergent ray
∠A – Angle of the prism
∠i – Angle of incidence
∠r – Angle of refraction
∠e – Angle of emergence
∠D – Angle of deviation

Refraction of light through a triangular glass prism

18. Define scattering.

A. The process of re-emission of absorbed light in all directions with different intensities by atoms or molecules is called scattering of light.

19. What is the reason for appearance of red colour of the Sun during sunrise and sunset?

A. (i) Molecules having a size that is comparable to the wave length of red light are less in the atmosphere.
(ii) Hence scattering of red light is less when compared to the other colours of light.
(iii)The light from the Sun needs to travel more distance in atmosphere during sunrise and sunset to reach our eye.
(iv) So except red colour, all the colours scatter more and vanish before they reach our eye.

(v) As the scattering of red light is less, it can reach our eye.
(vi) So the Sun appears red during sunrise and sunset.

20. Why are danger signals are red?

A. Red is least scattered by fog or smoke. Therefore it can be seen in the same color intensity at a distance.

Electricity

Question 1:

1. What does an electric circuit mean?

A. An electric circuit is a path through which electric current flows. It consists of: A power source (like a battery), Conductors (like wires) that carry the current, A load (like a light bulb) that uses the energy, A control device (like a switch) to turn the circuit on/off

2. Define the unit of current.

A. The unit of electric current is the Ampere (A), "amp".

If 1 Coulomb of electric charge flows through a point in 1 second, the current is 1 Ampere.

1 Ampere = 1 Coulomb (charge) / second

3. Calculate the number of electrons constituting one coulomb of charge.

A. The charge of one electron is approximately 1.6×10^{-19} Coulombs (C), we can calculate the number of electrons constituting one Coulomb of charge as follows:

Number of electrons = Charge (Coulombs) / Charge of one electron

$= 1\ C / (1.6 \times 10^{-19}\ C)$

$= 6.25 \times 10^{18}$ electrons

So, approximately 6.25 x 10^18 electrons constitute one Coulomb of charge!

Question 2:

1. Name a device that helps to maintain a potential difference across a conductor.

A. A device that helps to maintain a potential difference across a conductor is a:

VOLTAGE SOURCE like Batteries (or) Power supplies (or) Generators.

2. What is meant by saying that the potential difference between two points is 1 V?

A. One volt is the potential difference between two points in a current carrying conductor when 1 joule of work is done to move a charge of 1 coulomb from one point to the other.

Therefore, 1 volt = 1 joule/1 coulomb

1 V = 1 J/C

3. How much energy is given to each coulomb of charge passing through a 6 V battery?

A. The potential difference of the battery is = 6 V

Charge passing through a battery = 1C

Energy = Voltage x Charge = 6 V x 1 C = 6 Joules

So, each Coulomb of charge passing through a 6V battery gains 6 Joules of energy.

Question 3:

1. On what factors does the resistance of a conductor depend?

A. the resistance of the conductor depends:

(i) on its length, (ii) on its area of cross-section, and (iii) on the nature of its material.

2. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source? Why?

A. Electricity flows easily through a thick wire. This is because (according to Ohm's law) the resistance of a uniform metallic conductor is inversely proportional to its area of cross-section(A).

3. Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?

A. According to the law, the electric current is directly proportional to the potential difference.

$V \propto I$

So when the resistance of the device is constant, if the potential difference of that device is reduced by half, the electric current of the device will also decrease.

4. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal?

A. Both resistivity and resistivity of a material change with its temperature. The resistivity of an alloy is higher than that of its component metals. Alloys do not readily oxidize (burn) at high temperatures. For this reason, they are used in electric heaters such as electric irons and toasters commonly used in equipment.

5. Use the data in Table 11.2 to answer the following –

(a) Which among iron and mercury is a better conductor?

(b) Which material is the best conductor?

A. (a) Comparing iron and mercury:

Iron has a resistivity of 1.04×10^{-7} Ωm ; Mercury has a resistivity of 9.58×10^{-7} Ωm

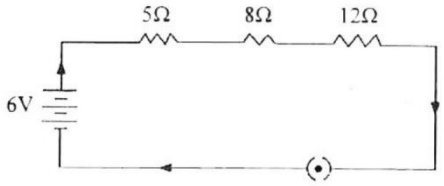
Since iron has a lower resistivity, it is a better conductor than mercury.

(b) The best conductor is: Silver, with the lowest resistivity of 1.59×10^{-8} Ωm

Question 4:

1. Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a 5 Ω resistor, an 8 Ω resistor, and a 12 Ω resistor, and a plug key, all connected in series.

A. (i) Three cells of potential 2 V, each connected in series therefore the potential difference of the battery will be 2V+2V+2V=6V.



(ii) The following circuit diagram shows three resistors of resistance 5Ω, 8Ω and 12Ω respectively connected in series.

(iii)A battery of potential 6V and a plug key which is closed means the current is flowing in the circuit.

2. Redraw the circuit of Question 1, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the 12 Ω resistors. What would be the readings in the ammeter and the voltmeter?

A. It is noted that the ammeter has been put in series with the circuit and the voltmeter has been put in parallel with the 12Ω resistor.

(i) Calculation of current reading in the ammeter: Here, R_1=5Ω, R_2 =8Ω, and R_3 =12Ω

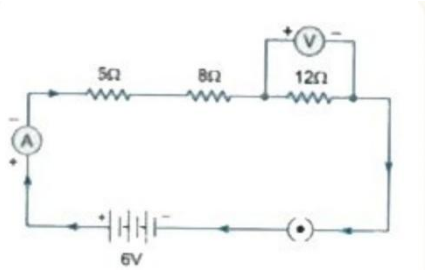
These three resistors are connected in series.

∴Total resistance R= R= $R_1 + R_2 + R_3$= 5+ 8+ 12=25Ω

Potential difference, V = 6V, resistance, R = 25Ω

Current, I = ? ; Applying Ohm's law, V = IR

$I = V/R = \frac{6}{25}$ = 0.24A ; Therefore, ammeter will show a reading of 0.24A



(ii) Calculation of potential difference reading across 12Ω resistor:

Current, I = 24 A, Resistance, R = 12Ω, Potential difference, V = ?

Applying Ohm's law V = IR = 0.24 × 12 = 2.88V ; Therefore, the voltmeter reading is 2.88 V.

Question 5:

1. Judge the equivalent resistance when the following are connected in parallel –

(a) 1 Ω and 10^6 Ω, (ωb) 1Ω, 10^3 Ω and 10^6 Ω

A. (a) When two or more resistances R_1, R_2, R_3 etc are joined in parallel, the resultant resistance in parallel arrangement R is given by $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}$ ..... etc

When R_1 =1Ω and $R_2 = 10^6$ Ω

$\frac{1}{R}=\frac{1}{1}+\frac{1}{10^6}$ = 1 + 10^{-6} ≈ 1.000001 (since 10^{-6} is very small) = 1Ω ∴ R=1Ω

(b) When R_1=1Ω, R_2=10^3 Ω and R_3=10^6 Ω

$\frac{1}{R}=\frac{1}{1}+\frac{1}{10^6}+\frac{1}{10^6}$ = 1 + 10^{-3} + 10^{-6} = 1+10^{-9} ≈ 1.001001 (since 10^{-9} is very small) = 1Ω

∴ R=1Ω

2. An electric lamp of 100 Ω, a toaster of resistance 50 Ω, and a water filter of resistance 500 Ω are connected in parallel to a 220 V source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances, and what is the current through it?

A. First calculate the total current drawn by the three appliances:

Total current flowing through appliances = in lamp + in toaster + in filter

Using Ohm's Law ($I=\frac{V}{R}$):

Current flowing through lamp I = $\frac{220}{100}$ =2.2A

Current flowing through toaster I = $\frac{220}{50}$ = 4.4 A

Current flowing through filter I = $\frac{220}{500}$ = 0.44A

Total = 2.2 A + 4.4 A + 0.44 A = 7.04 A

Now, we find the resistance of the electric iron (R - iron) that draws the same total current (7.04 A) from the 220 V source:

Current flowing through iron I = $\frac{V}{R}$ = 7.04 A = 220 V / R_iron

∴ Resistance of the electric iron R = $\frac{220}{7.04}$ = 31.25 Ω

So, the resistance of the electric iron is approximately 31.25 Ω. The current through the iron is the same as the total current: 7.04 A.

3. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?

A. Connecting electrical devices in parallel with the battery has several advantages over connecting them in series:

(i) In parallel connection each device works independently, if one device is switched off or malfunctions, the others continue to function normally.

(ii) Current flowing in a series circuit is uniform throughout. So each device receives the same voltage, which is not useful for devices with specific voltage requirements.

(iii) Devices can be added or removed in the circuit without affecting other devices,

(iv) If one device in the circuit fails or short circuits occur, it avoids the risks of failure of other devices.

(v) Since parallel connection affects the performance of each device, it is easy to identify and repair failed devices

4. How can three resistors of resistances 2 Ω, 3 Ω, and 6 Ω are connected to give a total resistance of (a) 4 Ω, (b) 1 Ω?

A. (a) To get 4 Ω equivalent resistance, 3 Ω and 6 Ω resistors are connected in parallel and 2 Ω in series.

When 3 Ω and 6 Ω are added in parallel = $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}$ = $\frac{1}{R}=\frac{1}{3}+\frac{1}{6}$ = $\frac{1}{R}=\frac{2+1}{6}$ = $\frac{3}{6}$ = 2Ω ,

When its equivalent resistance is connected in series with a resistor of 2 Ω,

then $R = R_1 + R_2$ = R= 2 + 2 = 4Ω

(b) When all three resistors are connected, the equivalent resistance is 1 Ω.

$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$

$\frac{1}{R}=\frac{3+2+1}{6}=\frac{6}{6}=\frac{1}{1}$ ∴ R = 1Ω

5. What is (a) the highest, (b) the lowest total resistance that can be secured by combinations of four coils of resistance 4 Ω, 8 Ω, 12 Ω, 24 Ω

A. (a) The highest resistance is secured when all the four coils are connected in series.

In that case,

R = 4Ω + 8Ω + 12Ω + 24Ω = 48Ω

(b) The lowest resistance is secured when all the four coils are connected in parallel.

In that case, $\frac{1}{R}=\frac{1}{4}+\frac{1}{8}+\frac{1}{12}+\frac{1}{24}=\frac{6+3+2+1}{24}=\frac{12}{24}$

Where R = $\frac{24}{12}$ Ω = 2Ω.

Question 6:

1. Why does the cord of an electric heater not glow while the heating element does?

A. (i) The heating element of a water heater is made of high resistance alloy metal, designed to convert electrical energy into thermal energy.

(ii) But the wire of the heater is designed to conduct electricity only.

(iii) So the heating part of an electric heater heats up, but its wire does not.

2. Compute the heat generated while transferring 96000 coulomb of charge in one hour through a potential difference of 50 V.

A. Potential difference = 50V

Charge v = 9600C

Time = one hour - 3600 seconds

Produced Heat H = V. I. t

I = $\frac{Q}{t}=\frac{9600}{3600}=\frac{960}{36}=\frac{80}{3}$ A

H = V. I. t = 50 × $\frac{80}{3}$ × 3600 = 50 × 80× 1200

= 4000 × 1200 = 4800000J = 48×10^5 or 4.8×10^6 J

3. An electric iron of resistance 20 Ω takes a current of 5A. Calculate heat developed in 30 s.

A. Resistance of An electric iron =20 Ω

Flowing Current = 5A

Time = 30 sec

Heat developed $H = I^2Rt = 5^2 \times 20 \times 30$

= 25 × 20× 30 = 25 × 600 = 15000J

= 15×10^3 or 1.5×10^4 J

Question 7:

1. What determines the rate at which energy is delivered by a current?

A. Electric power determines the rate at which energy is delivered by a current.

2. An electric motor takes 5 A from a 220v line. Determine the power of the motor and the energy consumed in 2 h.

Power of the electric motor is given by: P = VI Where, V = 220 V and I = 5 A

Power P = 220 x 5 = 1100 W

The energy consumed = Power x time

Where, P = 1100 W, t = 2 hours

2 x 60 x 60 seconds = 7200 seconds

So, the energy consumed (E) = 1100 x 7200 = 79,20,000 J.

Exercises:

1. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R', then the ratio $\frac{R}{R'}$ is –

(a) $\frac{1}{25}$ **(b)** $\frac{1}{5}$ **(c) 5** **(d) 25**

A. (d) 25

2. Which of the following terms does not represent electrical power in a circuit?

(a) I^2R **(b)** IR^2 **(c) VI** **(d)** V^2/R

A. I^2R

3. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be –

(a) 100 W **(b) 75 W** **(c) 50 W** **(d) 25 W**

A. (d) 25 W

4. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be –

(a) 1:2 **(b) 2:1** **(c) 1:4** **(d) 4:1**

A. (d) 4:1

5. How is a voltmeter connected in the circuit to measure the potential difference between two points?

A. A voltmeter is connected in parallel between the two points where you want to measure the potential difference (voltage).

6. A copper wire has diameter 0.5 mm and resistivity of 1.6×10^{-8} Ωm. What will be the length of this wire to make its resistance 10 Ω? How much does the resistance change if the diameter is doubled?

A. Diameter of wire = 0.5 mm = 0.0005 m

Resistance, R=10Ω

We know that $R = \rho \frac{I}{A}$

Area of cross-section of the wire,

$A = \pi (\frac{d}{2})$,

$I = R \frac{A}{\rho}$

$= 10 \times 3.14 \times \frac{(0.0005/2)^2}{1.6 \times 10^{-8}}$

$= 10 \times 3.14 \times \frac{25}{4} \times 1.6 = 122.72m$

∴ Length of the wire = 122.72 m

If the diameter of the wire is doubled,

new diameter = 2 × 0.5 =1mm = 0.001m

Let new resistance be R'

$R' = \rho \frac{I}{A}$

$= 1.6 \times 10^{-8} \times \frac{122.72}{\pi(\frac{1}{2} X\, 10^{-3})^2} = 1.6 \times 10^{-8} \times \frac{122.72 X\, 4}{3.14 X\, 10^{-6}}$

$= 1.6 \times 122.72 \times 4 \times \frac{10^{-8+6}}{3.14}$

$R' = 250.2 \times 10^{-2} = 2.5\Omega$

Therefore, the length of the wire is 122.7 m and the new resistance is 2.5Ω.

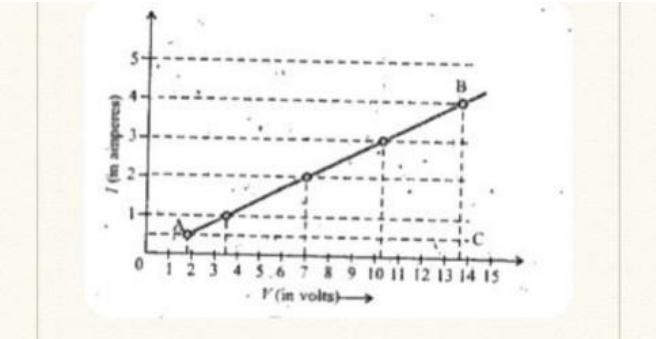
7. The values of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below –

I (amperes)	0.5	1.0	2.0	3.0	4.0
V (volts)	1.6	3.4	6.7	10.2	13.2

Plot a graph between V and I and calculate the resistance of that resistor.

A. Potential difference (V) is taken along X-axis and current (I) is taken along Y-axis. The values of the current for different values of the voltage are shown in the given table.

I (amperes)	0.5	1.0	2.0	3.0	4.0
V (volts)	1.6	3.4	6.7	10.2	13.2



The graph between V and I will be as shown in Fig.

Resistance of the resistor = $= \frac{1}{R}$

$\frac{1}{R} = \frac{1}{\text{slope of the graph}} = \frac{1}{\frac{CB}{AC}} = \frac{AC}{CB}$

$= \frac{13.2 - 1.6}{4.0 - 0.5}\ \Omega \quad = \frac{11.6}{3.5}\Omega = 3.31\Omega$

8. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

A. Here voltage of battery V=12V

Current I= 2.5mA. (1mA = 10^{-3} A)

$= 2.5 \times 10^{-3}$ A

∴ Resistance $R = \frac{V}{I} = \frac{12}{2.5} \times 10^{-3} = 4800\Omega \quad = 4.8 \times 10^{-3}\ \Omega$ or 4.8 kΩ

9. A battery of 9 V is connected in series with resistors of 0.2 Ω, 0.3 Ω, 0.4 Ω, 0.5 Ω and 12 Ω, respectively. How much current would flow through the 12 Ω resistors?

A. To find the current flowing through the 12 Ω resistors, we need to first calculate the total resistance of the circuit. Total resistance $R = R_1 + R_2 + R_3 + R_4 + R_5$

$= 0.2\ \Omega + 0.3\ \Omega + 0.4\ \Omega + 0.5\ \Omega + 12\ \Omega \quad = 13.4\ \Omega$

As per Ohm's Law $I = \frac{V}{R} = \frac{9}{13.4}\ \Omega = 0.67$ A (approximately)

10. How many 176 Ω resistors (in parallel) are required to carry 5 A on a 220 V line?

A. Here, I = 5A, V=220V.

Resistance required in the circuit, $R = \frac{V}{I}$

$= \frac{220V}{5A} = 44\Omega$

Resistance of each resistor, r=176Ω

If n resistors, each of resistance r, are connected in parallel to get the required resistance R, then

$R = \frac{r}{n}$, $44\Omega = \frac{176\Omega}{n}$; $n = \frac{176\Omega}{44\Omega} = 4$.

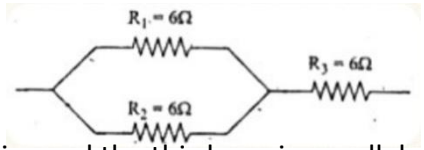
So, four 176 Ω resistors in parallel are required to carry 5 A on a 220 V line.

11. Show how you would connect three resistors, each of resistance 6 Ω, so that the combination has a resistance of (i) 9 Ω, (ii) 4 Ω.

A. (i) Let two-resistances should be connected in parallel and the third one should be connected in series.

Equivalent resistance of the combination

$R = \frac{R_1R_2}{R_1+R_2+R_3} = \frac{6\ X\ 6}{6+6+6} = 3 + 6 = 9\Omega$



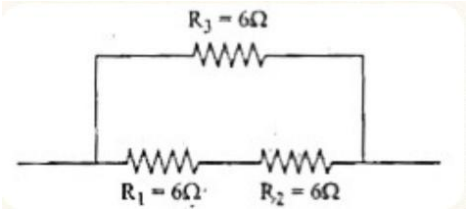
(ii) Let two resistances of 6 ohm should be connected in series and the third one in parallel with them.

If R is the equivalent resistance of the combination, then

$\frac{1}{R} = \left(\frac{1}{R_1} + \frac{1}{R_2}\right) + \frac{1}{R_3}$

$\frac{1}{R} = \left(\frac{1}{6} + \frac{1}{6}\right) + \frac{1}{6} = \frac{1}{12} + \frac{1}{6} = \frac{1+2}{12} = \frac{3}{12} = \frac{1}{4}$

$\therefore R = 4\Omega$



12. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W. How many lamps can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5 A?

A. We can use the formula:

P = V. I, rearrange the forma to find the number of lamps.

$I = \frac{P}{V}$, (here P = total Power)

Current I =Total Power / Voltage

Let's calculate the total power:

Let the number of lamps be = N

Total Power = Number of Lamps x Power per Lamp = N x 10 W. (Here N = Number of Lamps)

The voltage is 220 V and the maximum allowable current is 5 A:

As per $I = \frac{P}{V}$; $5\ A = \frac{N\ X\ 10\ W}{220V}$

Now rearrange the equation: $N = \frac{5\ A\ X\ 220\ V}{10\ W} = \frac{1100}{10} = 110$

So, 110 lamps can be connected in parallel across the 220 V line.

13. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24 Ω resistances, which may be used separately, in series, or in parallel. What are the currents in the three cases?

A. Let's calculate the currents in each case:

Case (I) : Coils A and B used separately

Current in coil A (IA) = Voltage / Resistance = $I = \frac{V}{R} = \frac{220\ V}{24\ \Omega} = 9.17\ A$

Current in coil B (IB) = Voltage / Resistance = $I = \frac{V}{R} = \frac{220\ V}{24\ \Omega} = 9.17\ A$

Case (II): Coils A and B used in series

Total Resistance (R_{total}) = $R_1 + R_2 = 24\ \Omega + 24\ \Omega = 48\ \Omega$

Current (I) = $\frac{V}{R} = \frac{220\ V}{48\ \Omega} = 4.58\ A$

Case (III): Coils A and B used in parallel

Total Resistance (R_{total}) = $\frac{(R_1\ x\ R_2)}{(R_1 + R_2)} = \frac{(24\ \Omega\ x\ 24\ \Omega)}{(24\ \Omega\ + 24\ \Omega)} = 12\ \Omega$

Current (I) = $\frac{V}{R} = \frac{220\ V}{12\ \Omega} = 18.33\ A$

14. Compare the power used in the 2Ω resistor in each of the following circuits: (i) a 6 V battery in series with 1 Ω and 2 Ω resistor, and (ii) a 4 V battery in parallel with 12 Ω and 2 Ω resistors.

A. (i) Potential difference $V_1 = 6V$; Resistance $R_1 = 1\Omega$ and $R_2 = 2\Omega$

As per ohm's law V=IR.

(P= VI substitute the 'V') $P = I^2R$

Equivalent Resistance= $R = R_1 + R_2$ (connected in series)

$R = 1 + 2 = 3\Omega$

As per ohm's law. V = IR

$I = \frac{V_1}{R}$ (Here V= 6, I= 3) ; $I = \frac{6}{3} = 2A$

Since there is no division in the series circuit, the current will pass through every component. 2Ω resistor has a current of 2A will flow through it as a result.

Since the current remains constant

$P_1 = I^2R = 2^2 \times 2 = 4 \times 2 = 8\ W$

(ii) Potential difference $V_2 = 4V$; Resistance $R_3 = 1\Omega$ and $R_4 = 2\Omega$

Potential difference $V_2 = 4V$

Since it is a parallel circuit, the voltage will remain constant. The voltage across 2Ω resistor will be 4V.

$P_2 = \frac{(V_2)^2}{R} = \frac{(4)^2}{2} = 8\ W$; Power used by both circuits is 8 W.

15. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to electric mains supply. What current is drawn from the line if the supply voltage is 220 V?

A. To find the total current drawn from the line, we need to calculate the current drawn by each lamp and then add them together.

($P = VI, I = \frac{P}{V}$)

Lamp 1: 100 W at 220 V ; Current (I) = (I) = $\frac{\text{Power}}{\text{Voltage}} = \frac{100\ W}{220\ V} = \frac{10}{22} = 0.45$ A

Lamp 2: 60 W at 220 V

Current (I) = (I) = $\frac{\text{Power}}{\text{Voltage}} = \frac{60\ W}{220\ V} = \frac{6}{22} = 0.27$ A

Total current = Current 1 + Current 2 = 0.45 A + 0.27 A = 0.72 A

So, the total current drawn from the line is 0.72 A.

The total power consumed is the sum of the powers of the individual lamps: 100 W + 60 W = 160 W.

16. Which uses more energy, a 250 W TV set in 1 hr (or) a 1200 W toaster in 10 minutes?

A. Let's calculate the energy used by each appliance:

TV set:

Power (P) = 250 W

Time (t) = 1 hour = 3600 seconds (convert hour to seconds)

Energy (E) = P x t = 250 W x 3600 s = 900,000 J or 9×10^5 J or 0.9 kWh

Toaster:

Power (P) = 1200 W

Time (t) = 10 minutes = 600 seconds (convert minutes to seconds)

Energy (E) = P x t = 1200 W x 600 s = 720,000 J or 7.2×10^5 J or 0.72 kWh

Since 0.9 kWh is greater than 0.72 kWh, the TV set uses more energy in this scenario.

17. An electric heater of resistance 8 Ω draws 15 A from the service mains 2 hours. Calculate the rate at which heat is developed in the heater.

A. Given:

Resistance (R) = 8 Ω

Current (I) = 15 A

Time (t) = 2 hours = 7200 seconds (convert hours to seconds)

First, let's calculate the power (P) consumed by the heater:

$P = I^2 \times R = (15A)^2 \times 8\ \Omega = 1800$ W

Since the heater is used for 2 hours, the total energy (E) consumed is:

E = P x t = 1800 W x 7200 s = 12,960,000 J or 12.96 kWh

Calculate the rate of heat development in the heater :

Rate of heat development = E / t = 12,960,000 J / 7200 s = 1800 W

18. Explain the following.

(a) Why is the tungsten used almost exclusively for filament of electric lamps?

A. Tungsten is used almost exclusively for the filament of electric lamps because of its unique combination of properties of

(i) Tungsten has high resistance and high melting point.

(ii) It cannot melt even the temperature is more than 1650oC.

(iii) While current is passing through a wire, it becomes hot and emits light.

(iv) So Tungsten is the suitable material for making filaments of a bulb.

(b) Why are the conductors of electric heating devices, such as bread-toasters and electric irons, made of an alloy rather than a pure metal?

A. The conductors of electric heating devices such as bread toasters and electric irons are made of alloy because the resistivity of an alloy is more than that of pure metals which produces a large amount of heat.

(c) Why is the series arrangement not used for domestic circuits?

A. The series arrangement is not used for domestic circuits for following reasons:

(i) In a series circuit, the voltage is divided equally across each component. This means that if one device is turned off, the entire circuit is broken and no other devices will work.

(ii) The current in a series circuit is limited by the device with the highest resistance. This means that if one device has a high resistance, it will limit the current available to all other devices in the circuit.

(iii) If one device in a series circuit fails or is turned off, the entire circuit is affected. This can be inconvenient and even dangerous in some situations.

(iv) Series circuits are less flexible than parallel circuits, as adding or removing devices can be more complicated.

(v) In a series circuit, if one device is turned off, the voltage across the other devices increases, which can be dangerous.

(d) How does the resistance of a wire vary with its area of cross-section?

A. The resistance of a wire is inversely proportional to its area of cross-section. This means that as the area of cross-section increases, the resistance decreases, and vice versa.

Mathematically, this can be expressed as: $R \propto \frac{1}{A}$

where R is the resistance and A is the area of cross-section.

(e) Why are copper and aluminium wires usually employed for electricity transmission?

A. Copper and aluminium wires are commonly used for electricity transmission due to their:

(i) Copper and aluminium have high electrical conductivity, meaning they can efficiently transfer electricity with minimal loss of energy.

(ii) They have low resistivity, which reduces energy loss during transmission.

(iii) Copper and aluminium have high tensile strength, making them suitable for overhead power lines and underground cables.

(iv) Copper and aluminium have a natural oxide layer that provides some corrosion resistance, helping to extend their lifespan.

(v) Copper and aluminium are highly ductile, making them easy to draw into thin wires and shape into various forms.

(vi) Copper has a low melting point, making it easy to solder and join wires.

Extra Questions (Electricity):

Bits:

1. What do we call the amount of charge crossing though any cross section in the conductor in one second?

A. The amount of charge crossing though any cross section in the conductor in one second is electric current.

2. Define electric current.

A. The amount of charge crossing though any cross section in the conductor in one second is called electric current.

3. Write the formula for electric current.

A. (i) Electric current: $I = \frac{Q}{t}$

(ii) Here I = Electric current

Q = Amount of charge ; t = Time

4. What are the units of electric current?

A. The S.I. units of electric current is ampere (Or) coulomb/second

5. Define potential difference.

A. The amount of work done by electric force to move unit positive charge in b/w two points.

6. Write the formula for potential difference.

A. (i) Potential difference: $V = \frac{W}{Q}$

(ii) Here V = Potential difference ; W = Work done ; Q = Amount of charge

7. What are the units of potential difference?

A. The S.I. units of potential difference is volt (Or) joule/coulomb

8. What is specific resistance (or) resistivity?

A. The resistance of a conductor having unit length and unit area of cross section is called its resistivity.

9. What are the units of specific resistance (or) resistivity?

A. The S.I. units of specific resistance is ohm-meter. It can be written as Ω-m.

10. Define resistance.

A. The obstruction to the motion of electrons in a conductor is called resistance.

11. Write the formula for resistance.

A. Resistance: $R = \frac{V}{I}$; Here V= Potential difference, I = current

(Or)

Resistance: $R = \rho \frac{l}{A}$

Here ρ = Specific resistance (or) resistivity

R = Resistance of the conductor ; A = Area of cross section ; l = Length of the conductor

12. Write the units of resistance.

A. The S.I. units of resistance are ohm. It can be written as Ω.

13. What happened to the resistance, if the length of conductor increases?

A. (i) Resistance of a conductor is directly proportional to its length.

(ii) So if the length increases, the resistance of the conductor increases.

14. What is the value of 1 KWH in joules?.

A. 1 KWH = 3.6 x 106 Joules.

15. Silver is better conductor of electricity than copper. Why do we use copper wire for conduction of electricity?

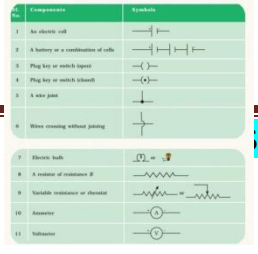
A. (i) Silver is better conductor than copper.

(ii) But economically copper is available at low cost.

(iii) So we use copper wire for conduction of electricity.

2, 4, 8 Marks Q & A:

16. Symbols of some commonly used components in circuit diagrams



17. State Ohm's law. Suggest an experiment to verify it and explain the procedure.

A. Ohm's law: The potential difference between the ends of a conductor in a circuit is directly proportional to the flow of current in the circuit.

$V \propto I$ (or) $V = RI$ (R= constant)

Experiment:

(i) Connect a closed circuit with the devices battery with one cell, plug key, iron spoke (for resistance), and ammeter in series combination.

(ii) Attach volt meter at the ends of the resistor in parallel combination.

(iii) Now switch on and allow the flow of current in the circuit.

(iv) Take the readings of ammeter as flow of current 'I' and the reading in the volt meter as potential difference 'V'. Note down the values in the table.

(v) Find the value of V and I

S.No.	Potential difference (V)	Electric current (I)(amp)	$\frac{V}{I}$
1			
2			

(vi) Repeat the same with battery having 2 or 3 cells.

(vii) In each case find the value of $\frac{V}{I}$

(viii) We get a constant value. So = $\frac{V}{I}$

(ix) Hence Ohm's law is verified.

18. List out the required material to perform Ohm's aw experiment.

A. Required material to perform Ohm's aw experiment : Battery, Switch, Manganin string for resistance, Rheostat, Ammeter, Volt meter, Connecting wires

19. Derive of $R = \rho \frac{l}{A}$

A. At constant temperature, the resistance of conductor R is directly proportional to the length of the conductor l

$R \propto l$

At constant temperature, the resistance of a conductor is inversely proportional to the area of cross section of the conductor.

$R \propto \frac{1}{A}$; $R \propto \frac{l}{A}$; $R = \rho \frac{l}{A}$ Here, rho is called as specific resistance or resistivity.

20. A wire of length 1m and radius 0.1mm has a resistance of 100Ω. Find the resistivity of the material.

A. The length of resistance (l) = 1 m

Radius of the wire (r) = 0.1 mm = 0.1 x 10^{-3} m = 1 x 10^{-4} m

Area of cross section of wire (A) = $\pi r^2 = \frac{22}{7} \times (1 \times 10^{-4}\ m)^{-2} = \frac{22}{7} \times 1 \times 10^{-8}$

Resistance (R) = 100 Ω

Resistivity (ρ) = $\frac{RA}{l}$ = 100 × ($\frac{22}{7} \times 10^{-8}$) × 1 = 3.14 x$10^{-6}$ Ω – m

21. Resistivity values of different substances are given below. Answer the following questions from the information given in above table.

(i) Which of the above material has more resistivity?

(ii) Which of the above material is a best conductor?

(iii) Silver and Gold should not be used in electricity conducting wires. Why?

(iv) What are the units of resistivity?

Resistivity (Specific resistance) of various materials

Sl. No.	Material	Resistivity (ρ) Ω-m (at 20°C)	Sl. No.	Material	Resistivity (ρ) Ω-m (at 20°C)
1.	Silver	1.59 x 10^{-8}	11.	Nichrome	1.10 x 10^{-6}
2.	Copper	1.68 x 10^{-8}	12.	Carbon (graphite)	2.50 x 10^{-5}
3.	Gold	2.44 x 10^{-8}	13.	Germanium	4.60 x 10^{-1}
4.	Aluminium	2.82 x 10^{-8}	14.	Drinking water	2.00 x 10^{1}
5.	Calcium	3.36 x 10^{-8}	15.	Silicon	6.40 x 10^{2}
6.	Tungsten	5.60 x 10^{-8}	16.	Dry wood	1.00 x 10^{3}
7.	Zinc	5.90 x 10^{-8}	17.	Glass	10.0 x 10^{10}
8.	Nickel	6.99 x 10^{-8}	18.	Rubber	1.00 x 10^{13}
9.	Iron	1.00 x 10^{-7}	19.	Air	1.30 x 10^{16}
10.	Lead	2.20 x 10^{-7}			

A. (i) Aluminium has more resistivity.

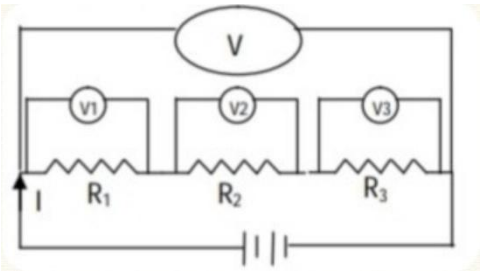
(ii) Silver is the best conductor.

(iii) Silver and Gold are precious metals. So they should not be used in electric wires.

(iv) The units of resistivity are Ω-m

22. Deduce an expression for the equivalent resistance of three resistors connected in series.

A. <u>Series combination of resistors:</u>



(i) Consider three resistors R_1, R_2 and R_3 are connected in series.

(ii) V_1, V_2 and V_3 are the potential differences between the ends of the resistors R_1, R_2 and R_3 respectively.

(iii) Let 'I' is the flow of current through them in the circuit.

(iv) Ohm's law : V = I R

(v) Apply this ohm's law for R_1, R_2 and R_3

Then $V_1 = IR_1$, $V_2 = IR_2$, $V_3 = IR_3$

(vi) Let the resultant potential difference V and R is the resultant resistance.

(vii) Then V = I R In series arrangement V = IR

$V = V_1 + V_2 + V_3$

$IR = IR_1 + IR_2 + IR_3 = I(R_1 + R_2 + R_3) = R = R_1 + R_2 + R_3$

(viii) If resistors connected in series combination then the resultant resistance is equal to the sum of the individual resistances of resistors.

23. Deduce the expression for the equivalent resistance of three resistors connected in parallel.

A. <u>Parallel combination of resistors:</u>

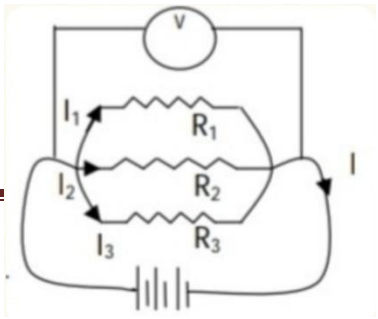
(i) Consider three resistors R_1, R_2 and R_3 are connected in parallel.

(ii) I_1, I_2 and I_3 are the flow of current through the resistors R1, R2 and R3 respectively

(iii) Let 'V' is the potential difference between the ends of each resistor.

(iv) Ohm's law : $V = \frac{I}{R}$,

(v) Apply this ohm's law for R_1, R_2 and R_3.



Then $V = \frac{I_1}{R_1} + \frac{I_2}{R_2} + \frac{I_3}{R_3}$

$\frac{I}{R} = \frac{I_1}{R_1} + \frac{I_2}{R_2} + \frac{I_3}{R_3}$

(vi) Let the resultant flow of current is 'I' and R is the resultant resistance.

(vii) Then $I = \frac{V}{R}$

In parallel arrangement $\frac{I}{R} = I\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right) \quad = \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

(viii) If resistors connected in parallel combination then the reciprocal of the resultant resistance is equal to the sum of the reciprocals of the individual resistances of resistors.

24. Are the head lights of a car connected in series or parallel? Why?

A. (i) In a series arrangement, if one bulb fails then the flow of electricity will be stopped in that circuit.

(ii) It means that if a bulb is failed, then all other bulbs will stop as the circuit is opened.

(iii) So we don't use series arrangement for head lights of a car.

(iv) They should be connected in parallel.

25. A house has 3 tube lights, two fans and a television. Each tube light draws 40W. The fan draws 80W and the television draws 60W. On the average, all the tube lights are kept on for five hours, two fans for 12 hours and television for five hours every day. Find the cost of electric energy used in 30 days at the rate of Rs. 3.00 per KWH.

A. Energy consumed in a day = $\frac{\text{Wattage X Number of devices X usage hours per day}}{1000}$

Device	Wattage	Number of devices	Usage hours per day	Consumed energy in KWH
Tube light	40	3	5	$\frac{40X3X5}{1000} = 0.6$
Fan	80	2	12	$\frac{80X2X12}{1000} = 1.92$
TV	60	1	5	$\frac{60X1X5}{1000} = 0.3$

Energy consumed in a day = 0.6 +1.92 + 0.3 = 2.82 KWH

Energy consumed in 30 days = 30 X 2.82 = 84.6 KWH

Rate of current for 1 KWH = Rs. 3.00

Total cost (Current bill) = 84.6 X 3.00 = Rs. 253.80

Magnetic Effects of Electric Current

Question 1:

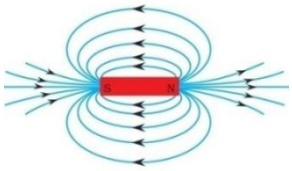
1. Why does a compass needle get deflected when brought near a bar magnet?

A. A compass needle is a small bar magnet. When it is brought near a bar magnet, its magnetic field lines interact with that of the bar magnet. Hence, a compass needle shows a deflection when brought near the bar magnet.

Question 2:

1. Draw magnetic field lines around a bar magnet.

A.



Field lines around a bar magnet

2. List the properties of magnetic field lines.

A. The properties of magnetic field lines:

(i) Magnetic field lines form continuous loops, with no beginning or end.

(ii) Magnetic field lines emerge from the North Pole and enter the south pole.

(iii) Magnetic field lines never intersect or cross each other.

(iv) Magnetic field lines form closed paths, with each line eventually returning to its starting point.

(v) The direction of the magnetic field line at any point indicates the direction of the magnetic force.

(vi) Magnetic field lines are invisible, but their presence can be detected by their effects on moving charges or other magnetic fields.

(vii) Magnetic field lines exist in three-dimensional space, not just in a plane.

3. Why don't two magnetic field lines intersect each other?

A. No two field-lines are found to cross each other. If they did, it would mean that at the point of intersection, the compass needle would point towards two directions, which is not possible.

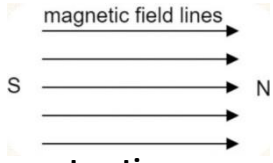
Question 3:

1. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.

A. Current in the coil is clockwise. Applying the right hand thumb rule at every point of the wire, the direction of magnetic field inside the loop is found to be into the plane of table and outside the loop as out from the plane of table.

2. The magnetic field in a given region is uniform. Draw a diagram to represent it.

A.



3. Choose the correct option.

The magnetic field inside a long straight solenoid-carrying current

(a) Is zero **(b) decreases as we move towards its end**

(c) increases as we move towards its end **(d) Is the same at all points.**

A. (d) is the same at all points.

Question 4:

1. Which of the following property of a proton can change while it moves freely in a magnetic field? (There may be more than one correct answer)

(a) Mass (b) speed (c) velocity (d) momentum

A. (c) velocity and (d) Momentum

2. In Activity 12.7, how do we think the displacement of rod AB will be affected if (i) current in rod AB is increased; (ii) a stronger horse-shoe magnet is used; and (iii) length of the rod AB is increased?

A. (i) When current in rod AB is increased, force on the conductor increases. Hence, the displacement of the rod increases.

(ii) A stronger horseshoe magnet has a stronger magnetic field and increases the displacement of the rod.

(iii) Since the force on the rod is proportional to its length, the displacement increases if the length of the rod is increased.

3. A positively-charged particle (alpha-particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is

(a) Towards south (b) towards east (c) Downward (d) upward

A. (d) upward

Question 5:

1. Name two safety measures commonly used in electric circuits and appliances.

A. Two common safety measures are used in electric circuits and appliances:

(i) Earthling: (Grounding): Earthling involves connecting the metal body of an appliance or circuit to the earth, providing a safe path for electric current to flow to the ground if there's a fault or short circuit. This prevents the buildup of electric shock or electrocution.

(ii) Fuses: A fuse is a device that melts and breaks the circuit when the current exceeds a certain limit, preventing damage from overloads or short circuits.

2. An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect? Explain.

A. Power, P = 2kW = 2 × 1000W = 2000W

Voltage, V=220V

Current drawn, I=?

Power, P = V × I

I = P/V = 2000/220=9.9A (approx)

I = 9.09 A

The current drawn by this electric oven is 9.09A whereas the fuse in the circuit is only 5 A capacity. When high current flows through the 5 A fuse, the fuse will get heated too much, melt and break the circuit. Therefore, when a 2 kW power rating electric oven is operated in a circuit having 5 A fuse, the fuse will blow off cutting off the power supply in this circuit.

3. What precaution should be taken to avoid the overloading of domestic electric circuits?

A. The precautions that should be taken to avoid the overloading of domestic circuits are as follows: (i)Too many appliances should not be connected to a single socket.

(ii)Too many appliances should not be used at the same time.

(iii) Faulty appliances should not be connected in the circuit.
(iv) Fuse should be connected in the circuit.

Exercises:

1. Which of the following correctly describes the magnetic field near a long straight wire?
(a) The field consists of straight lines perpendicular to the wire.
(b) The field consists of straight lines parallel to the wire.
(c) The field consists of radial lines originating from the wire.
(d) The field consists of concentric circles centered on the wire.
A. (d) The field consists of concentric circles centered on the wire.

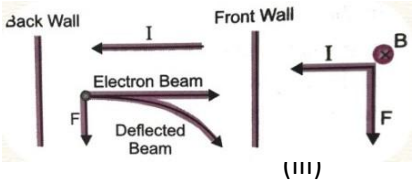
2. At the time of short circuit, the current in the circuit
(a) reduces substantially (b) does not change (c) increases heavily (d) vary continuously.
A. (c) increases heavily

3. State whether the following statements are true or false.
(a) The field at the centre of a long circular coil carrying current will be parallel straight lines.
A. True: The field at the centre of a long circular coil carrying current will be parallel straight lines.
(b) A wire with a green insulation is usually the live wire of an electric supply.
A. False: In most electrical systems, live wires typically have red or brown insulation, not green. Green is often used for grounding or earthling.

4. List two methods of producing magnetic fields.
A. Two common methods of producing magnetic fields:
(i) Electromagnets: Magnetic fields can be produced by wrapping a coil of wire around a core (such as iron) and passing an electric current through it.
(ii) Permanent Magnets: Magnetic fields can also be produced by permanent magnets, which are made from materials that are naturally magnetized, such as iron, nickel, and cobalt.

5. When is the force experienced by a current–carrying conductor placed in a magnetic field largest?
A. The force acting on a current-carrying conductor placed in a magnetic field is maximum (largest) when the conductor is perpendicular to the magnetic field, since the sine value of the angle between them is 1 (sine 90° = 1).

6. Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of magnetic field?



(iii)

A. (i) The electron beam is moving horizontally from the back wall to the front wall.
(ii) The beam is deflected to the right side, which means the force (F) is acting in that direction.
Applying Fleming's left-hand rule, we determine that the magnetic field (B) is acting vertically downwards, perpendicular to the plane of the paper, and directed inwards shown by this figure.

7. State the rule to determine the direction of a (i) magnetic field produced around a straight conductor-carrying current, (ii) force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, and (iii) current induced in a coil due to its rotation in a magnetic field.

A. <u>The rules to determine the direction of:</u>

(i) Magnetic field around a straight current-carrying conductor: Maxwell's right-hand thumb rule helps us determine the direction of the magnetic field generated by a current-carrying conductor.

(ii) Force experienced by a current-carrying straight conductor in a magnetic field: Fleming's left-hand rule helps us determine the direction of force

(iii) Current induced in a straight conductor moving in a magnetic field: Fleming's right-hand rule help us determine the direction of induced current in various situations involving magnetic fields and moving conductors

8. When does an electric short circuit occur?

A. The live wire and the neutral wire come into direct contact. The current in the circuit abruptly increases. This is called short-circuiting. It happens when (a) Insulation fails (b) Connections are loose(c) Conductor touches another (d) A fault in the electrical system (e) Faulty switch or a malfunctioning appliance.

9. What is the function of an earth wire? Why is it necessary to earth metallic appliances?

A. The earth wire, which has insulation of green colour, is usually connected to a metal plate deep in the earth near the house. This is used as a safety measure, especially for those appliances that have a metallic body

Earthling metallic appliances is necessary because it

(i) Prevents electrical shock

(ii) Protects against short circuits

(iii) Ensures safety during maintenance.

<u>Extra questions:</u>

1. Explain the procedure of Oersted's experiment to prove the relation between electricity and magnetism (Or) How can you verify that a current carrying wire produces a magnetic field with the help of an experiment?

A. <u>Experiment to prove the relation between electricity and magnetism:</u>

(i) Insert two small wooden 'Y' stands at 1feet distance on a thermocole sheet.

(ii) Place a copper wire on the stands.

(iii) Connect the copper wire to the battery and switch.

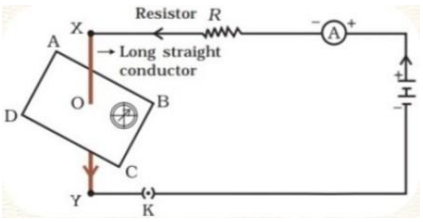
(iv) Place a magnetic compass under the wire.

(v) Switch on to allow the flow of current in the circuit.

(vi) We observe the compass needle gets deflected.

(vii) This indicates that the current carrying wire produces magnetic field.

(viii) This is Oersted's experiment.



2. How can we identify the magnetic field lines? Explain the procedure of an activity.

A. (i) Place a bar magnet at the centre of a paper.

(ii) The north pole of the bar magnet should be in the north direction of the Earth.

(iii) Mark a point at the north pole side of the bar magnet.

(iv) Keep a magnetic compass at that point.

(v) The south pole of the needle in the compass attracted by the north pole of the bar magnet.

(vi) The needle in the compass settles in a certain direction.

(vii) Mark a dot on the paper, at North Pole of the compass needle.

(viii) Place the compass again at this dot.
(ix) Mark a point that shows the magnetic field direction at that place.
(x) Continue like this and join all the dots marked.
(xi) The curve formed is the magnetic field line.
(xii) In the same way, we can draw magnetic field lines at different places.

3. Write the properties of magnetic field lines.

A. Properties of magnetic field lines:

(i) The magnetic field lines are extended from North Pole to South Pole in the magnetic field.
(ii) The magnetic field lines are extended from South Pole to North Pole inside the magnet.
(iii) No two magnetic field lines intersect each other.
(iv) Magnetic field lines are closed curves.
(v) These are imaginary lines.

4. Are the magnetic field lines closed? Explain.

A. (i) The magnetic lines of forces distributed from North Pole to South Pole in magnetic field.
(ii) The magnetic lines of forces distributed from South Pole to North Pole inside the magnet.
(iii) No two magnetic lines of forces intersect each other.
(iv) Hence, the magnetic lines of forces are closed.

5. Explain with the help of two activities that current carrying wire produces magnetic field.

A. Activity-1:

(i) Connect a copper wire to the battery and switch.
(ii) Place one compass below the wire.
(iii) Switch on to allow the flow of current in the circuit.
(iv) We observe, the compass needle gets deflected.
(v) This indicates that the current carrying wire produces magnetic field.

Activity-2:

(i) Connect a copper coil to the battery and switch.
(ii) Sprinkle iron dust near the coil.
(iii) Switch on to allow the flow of current in the circuit.
(iv) We observe the iron fillings move towards the coil.
(v) This indicates that the current carrying coil produces magnetic field.

6. Raj kumar said to you that the magnetic field lines are open and they start at north pole of bar magnet and end at south pole. What questions do you ask Raj kumar to correct him by saying "field lines are closed"?

A. I asked Raj kumar, the following.
(i) Are the magnetic field lines passing through bar magnet?
(ii) Why the direction of magnetic lines of forces shows from north pole?
(iii) What is the direction of magnetic lines of force within the magnet?
(iv) Why the magnetic field experienced around the magnet?
(v) What is the direction of magnetic lines of force outside the magnet?

7. State Right - hand thumb rule

A. Imagine that you are holding a current-carrying straight conductor in your right hand such that the thumb points towards the direction of current. Then your fingers will wrap around the

conductor in the direction of the field lines of the magnetic field, this is known as the Right-hand thumb rule.

8. State Maxwell's corkscrew rule

A. If we consider ourselves driving a corkscrew in the =direction of the current, then the direction of the rotation of corkscrew is the direction of the magnetic field. This rule is called Maxwell's corkscrew rule.

9. State Fleming's left - hand rule.

A. Stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor. These three directions can be illustrated through a simple rule, called Fleming's left- hand rule.

Bits (one Mark):

1. The region around the magnet where its effect present. **A.** Magnetic field

2. The field having constant field strength and direction at all points... **A.** Uniform field

3. Who stated the relation between electricity and magnetism.... **A.** Oersted

4. The shape of field line around a bar magnet **A.** Closed curves

5. The current carrying wire produce..... **A.** Magic field.

6. Characteristics: (i) Closed (ii) Curves (iii) Imaginary

The characteristics of magnetic field lines **[B]**

(A) (i) and (iii) only (B) (i) and (ii) only (C) (ii) and (iii) only (D) (i), (ii) and (iii)

7. The field around the magnet **[C]**

(A) Single dimensional (B) Two dimensional (C) Three dimensional (D) We can't say correctly

8. The field around the magnet **[D]**

(A) Uniform field (B) Equal field (C) Non uniform field (D) None of the above

9. The magnetic field lines due to a bar magnet **[B]**

(A) Straight lines (B) Closed curves (C) Open curves (D) None of these.

10. Units of magnetic field ..... **A.** Oestard

11. MRI means..... **A.** Magnetic Resonance Imaging

12. Write Oersted's law.

A. (i) The current carrying wire produces electric field. (ii) There is a relation between electricity and magnetism. This is Oersted's law.

13. What is magnetic field?

A. The three dimensional region around a magnet where a compass is affected by the magnet is called the magnetic field.

14. What is uniform magnetic field?

A. (i) We can define the nature of a field by its field strength and direction. (ii) If both field strength and direction are constant throughout the field, then it is said to be uniform field.

15. What is Solenoid?

A. A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid

16. What is the use of fuse?

A. Fuse is the most important safety device, used for protecting the circuits due to short-circuiting or overloading of the circuits.

17. What is overload?

A. The current drawn from the mains exceeds the maximum limit 20A. This leads to overheating occurs in the current carrying wires and may catches fire. This is called overloading.