ICSE 2024 EXAMINATION

CHEMISTRY

SAMPLE PAPER - 5

Time allowed: Two hours ***Max. Marks : 80***

Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 15 minutes.
This time is to be spent in reading the question paper.
The time given at the head of this Paper is the time allowed for writing the answers.

Section A is compulsory. Attempt any four questions from Section B.
The intended marks for questions or parts of questions are given in brackets [ ].

SECTION A

(Attempt all questions from this Section.)

Question 1 : Choose one correct answer to the questions from the given options : **[15]**

(i) Elements belonging to the same group have similar properties, because :
(a) they have similar electronic configuration in valence shell.
(b) their atomic numbers increase as we move down a group.
(c) they are all metallic or non-metallic elements.
(d) their number of electrons increase steadily.

(ii) With the increase in atomic number in a period :
(a) the metallic character increases. (b) the metallic character decreases.
(c) the chemical reactivity decreases. (d) the chemical reactivity increases.

(iii) Amongst lithium, sodium and potassium the atomic size of :
(a) All of them is same. (b) Sodium has the largest atomic size.
(c) Lithium has the largest atomic size. (d) Potassium has the largest atomic size.

(iv) Amongst Be, B, Si, C and Cl :
(a) Be and B are metalloids. (b) B and Si are metalloids.
(c) Si and Cl are metalloids. (d) Si and C are metalloids.

(v) On moving horizontally across a period, the number of electrons in outermost shell increase from :
(a) 2 to 8 (b) 1 to 8 (c) 1 to 18 (d) 2 to 18.

(vi) Magnesium atom loses 2 electrons in its valence shell to acquire the stable configuration of nearest noble gas is:
(a) Neon (b) Argon (c) Helium (d) None of these

(vii) A compound of two non-metals which dissolves in water to form an alkali is :
(a) Methane (b) Carbon dioxide
(c) Phosphorous penta oxide (d) Ammonia.

(viii) One twelfth mass of carbon atom ${}_6C^{12}$ is called :
(a) Atomic mass (b) Atomic number (c) Atomic mass unit (d) All of these.

(ix) The electrolyte used during silver plating is :

(a) silver nitrate solution (b) fused silver chloride

(c) sodium argento cyanide solution (d) all of these

(x) Non-metals are generally :

(a) oxidizing agents (b) reducing agents (c) bleaching agents (d) neutral in nature

(xi) A strong electrolyte from the following is :

(a) Acetic acid (b) Oxalic acid

(c) Ammonium hydroxide (d) Sodium hydroxide

(xii) Electron affinity is maximum in:

(a) Alkali metals (b) Alkaline earth metals (c) Halogens (d) Inert gases

(xiii) The main components of brass are :

(a) Copper and zinc (b) Copper and lead (c) Copper and tin (d) Copper and iron

(xiv) The drying agent used to dry NH_3 is:

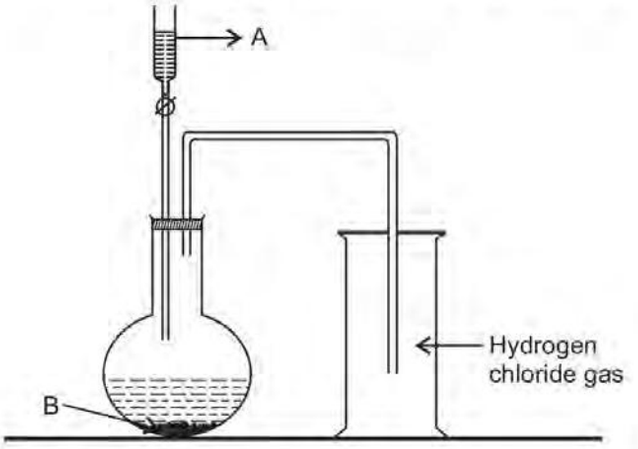
(a) P_2O_5 (b) conc. H_2SO_4 (c) $CaCl_2$ (d) CaO

(xv) The general formula of alkynes is:

(a) C_nH_{2n-2} (b) C_nH_{2n+2} (c) C_nH_{2n} (d) $C_nH_{2n+2}O$

Question 2

(i) The diagram shows an apparatus for the laboratory preparation of hydrogen chloride. [5]



(a) Identify A and B.

(b) Write the equation for the reaction.

(c) How would you check whether or not the gas jar is filled with hydrogen chloride?

(d) What does the method of collection tell you about the density of hydrogen chloride?

(ii) Match the following column A with Column B. [5]

Column A	Column B
(a) Sodium chloride	1. Increases
(b) Ammonium ion	2. Covalent bond
(c) Electronegativity across the period	3. Ionic bond
(d) Non metallic character down the group	4. Covalent and Coordinate bond
(e) Carbon tetrachloride	5. Decreases

(iii) Complete the following by choosing the correct answers from the bracket : [5]

(a) The basicity of Acetic Acid is _____ (3, 1, 4)

(b) The compound formed when ethanol reacts with sodium is _____ (sodium ethanoate, sodium ethoxide, sodium propanoate)

(c) Quicklime is not used to dry HCl gas because _____ (CaO is alkaline, CaO is acidic, CaO is neutral)

(d) Ammonia gas is collected by _____ (an upward displacement of air, a downward displacement of water, a downward displacement of air)

(e) Cold, dilute nitric acid reacts with copper to form _____ (Hydrogen, nitrogen dioxide, nitric oxide).

(iv) Identify the following : [5]

(a) The energy required to remove an electron from valence shell of a neutral isolated gaseous atom.

(b) The method used to separate ore from gangue by preferential wetting.

(c) The property by which carbon bonds with itself to form a long chain.

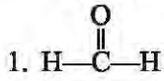
(d) A bond formed by a shared pair of electrons with both electrons coming from the same atom.

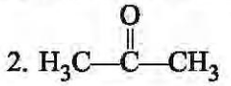
(e) A substance that conducts electricity in molten or aqueous state.

(v) (a) Draw the structural formula for the following : [5]

1. Methanoic acid 2. Ethanal 3. Ethyne

(b) Name the following organic compounds in IUPAC system :

1. 

2. 

Section B

*(Attempt **any four** questions.)*

Question 3

(i) (a) Name two acids used in the formation of aqua regia. [2]

(b) What is the ratio of these acids?

(ii) Write the products and balance the equation. [2]

(a) $CuO(s) + NH_3(g) \rightarrow$

(b) $NH_3(g) + Cl_2(g) \rightarrow$

(iii) Arrange the following as per the instruction given in the brackets. [3]

(a) Na, Al, Cl [increasing order of Ionization potential]

(b) O_2, N_2, Cl_2 [increasing order of number of covalent bonds]

(c) Zn^{2+}, Na^+, Cu^{+2} [order of preference of discharge at the cathode]

(iv) Fill in the blanks selecting the appropriate word from the given choice : [3]

(a) Metals have ..... ionisation potential. (low/high)

(b) Group 18 elements have ..... valence electrons (4/8) with the exception of helium.

(c) Group 2 elements are called ..... metals (alkali/alkaline earth).

Question 4

(i) The metals of Group 2 from top to bottom are Be, Mg, Ca, Sr, and Ba. [2]

(a) Which one of these elements will form ions most readily and why?

(b) State the common feature in the electronic configuration of all these elements.

(ii) (a) Calculate the vapour density of ethene [C = 12, H = 1] [2]

(b) Give the empirical formula of $C_6H_{18}O_3$.

(iii) (a) Ammonia gas can be prepared from magnesium nitride. Write a fully balanced equation for the preparation of gas. [3]

(b) Why ammonia gas is not prepared in laboratory by above mentioned method.

(c) The solution of ammonia in water behaves as an alkali. Explain.

(iv) Give reasons for each of the following: [3]

(a) Direct absorption of HCl gas in water is not preferred.

(b) All glass apparatus is used in the laboratory preparation of HNO_3.

(c) NaCl has a high melting point.

Question 5

(i) Name the gas that is produced in the following cases : [2]

(a) Sulphur is oxidised by concentrated nitric acid.

(b) Action of cold and dilute nitric acid on copper.

(ii) Identify the substance in each of the following : [2]

(a) The electrode that increases in mass during the electro-refining of silver.

(b) The catalyst used to oxidise ammonia into nitric oxide.

(iii) State how the following conversions can be carried out. [3]

(a) Ethyl chloride to ethyl alcohol (b) Ethyl alcohol to ethene.

(c) Ethyl bromide to ethane.

(iv) State your observations when : [3]

(a) Barium chloride solution is added to sodium sulphate solution.

(b) Neutral litmus solution is added to solution of carbon dioxide in water.

(c) Small piece of copper is placed in silver nitrate solution.

Question 6

(i) (a) What do you understand by the term empirical formula? [2]

(b) A compound of X and Y has the empirical formula XY_2. Its vapour density is equal to its empirical formula weight. Determine its molecular formula.

(ii) Given: $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$ [2]

2000 cc of O_2 was burnt with 400 cc of ethane.

Calculate the volume of CO_2 formed and unused O_2.

(iii) 500 g of magnesium carbonate of 64% purity dissolves in excess of HCl as under. [3]

$$MgCO_3 + 2HCl \longrightarrow MgCl_2 + H_2O + CO_2(g)$$

Calculate the weight of pure CO_2 formed. [Mg = 24, C = 12, O = 16, H = 1, Cl = 35.5]

(iv) Mention the property of conc. H_2SO_4 exhibited in each of the following reactions with: [3]

(a) sugar (b) metallic chloride (c) non-metal such as carbon.

Question 7

(i) A compound gave a following data: [2]

C = 57.82%, O = 38.58% and the rest hydrogen. Its relative molecular mass is 166.

Find its empirical formula and molecular formula.

[C = 12, O = 16, H = 1]

(ii) Identify the functional group in the following organic compounds. [2]

(a) C_2H_5OH (b) $CH_3—CO—CH_3$

(iii) Classify the following as oxidation and reduction reaction, also complete the reaction. [3]

(a) $Cu \rightarrow Cu^{2+}$ (b) $Fe^{3+} \rightarrow Fe^{2+}$ (c) $Cl^{-} \rightarrow Cl$

(iv) From the list of the following salts choose the salt that most appropriately fits the description given in the following : [3]

$[Ca(NO_3)_2; ZnCO_3; AgCl; PbCO_3; MgCl_2]$

(a) A deliquescent salt (b) An insoluble chloride

(c) On heating this salt, a brown coloured gas is evolved.

Question 8

(i) Give the electron dot structure of the following : [2]

(a) NH_3 (b) CH_4

(ii) Distinguish between the following pairs of compounds using the test given within the brackets. [2]

(a) Calcium sulphite and calcium carbonate (using dil. HCl)

(b) Lead nitrate solution and Zinc nitrate solution (using an alkali)

(iii) Draw a neat and well labelled diagram for the silver plating on a brass article. [3]

(iv) There are three elements E, F, G with atomic numbers 19, 8 and 17 respectively. [3]

(a) Classify the elements as metals and non-metals.

(b) Give the molecular formula of the compound formed between E and G and state the type of chemical bond in this compound.

SOLUTION

Time allowed: Two hours *Max. Marks* : **80**

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Section A** is compulsory. Attempt **any four** questions from **Section B.
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SECTION A

*(Attempt **all** questions from this Section.)*

Question 1 : Choose one correct answer to the questions from the given options : **[15]**

(i) Elements belonging to the same group have similar properties, because :
  (a) they have similar electronic configuration in valence shell.
  (b) their atomic numbers increase as we move down a group.
  (c) they are all metallic or non-metallic elements.
  (d) their number of electrons increase steadily.

(ii) With the increase in atomic number in a period :
  (a) the metallic character increases.
  (b) the metallic character decreases.
  (c) the chemical reactivity decreases.
  (d) the chemical reactivity increases.

(iii) Amongst lithium, sodium and potassium the atomic size of :
  (a) All of them is same.
  (b) Sodium has the largest atomic size.
  (c) Lithium has the largest atomic size.
  (d) Potassium has the largest atomic size.

(iv) Amongst Be, B, Si, C and Cl :
  (a) Be and B are metalloids.
  (b) B and Si are metalloids.
  (c) Si and Cl are metalloids.
  (d) Si and C are metalloids.

(v) On moving horizontally across a period, the number of electrons in outermost shell increase from :
  (a) 2 to 8 (b) 1 to 8 (c) 1 to 18 (d) 2 to 18.

(vi) Magnesium atom loses 2 electrons in its valence shell to acquire the stable configuration of nearest noble gas is:
  (a) Neon (b) Argon (c) Helium (d) None of these

(vii) A compound of two non-metals which dissolves in water to form an alkali is :
  (a) Methane
  (b) Carbon dioxide
  (c) Phosphorous penta oxide
  (d) Ammonia.

(viii) One twelfth mass of carbon atom ${}_6C^{12}$ is called :
  (a) Atomic mass (b) Atomic number (c) Atomic mass unit (d) All of these.

(ix) The electrolyte used during silver plating is :

(a) silver nitrate solution (b) fused silver chloride

(c) sodium argento cyanide solution (d) all of these

(x) Non-metals are generally :

(a) oxidizing agents (b) reducing agents (c) bleaching agents (d) neutral in nature

(xi) A strong electrolyte from the following is :

(a) Acetic acid (b) Oxalic acid

(c) Ammonium hydroxide (d) Sodium hydroxide

(xii) Electron affinity is maximum in:

(a) Alkali metals (b) Alkaline earth metals (c) Halogens (d) Inert gases

(xiii) The main components of brass are :

(a) Copper and zinc (b) Copper and lead (c) Copper and tin (d) Copper and iron

(xiv) The drying agent used to dry NH_3 is:

(a) P_2O_5 (b) conc. H_2SO_4 (c) $CaCl_2$ (d) CaO

(xv) The general formula of alkynes is:

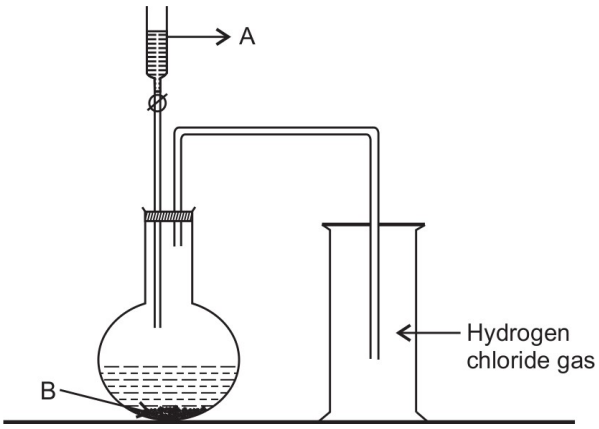
(a) C_nH_{2n-2} (b) C_nH_{2n+2} (c) C_nH_{2n} (d) $C_nH_{2n+2}O$

ANSWERS

(i) (a)	**(ii)** (b)	**(iii)** (d)	**(iv)** (b)	**(v)** (b)	**(vi)** (a)	**(vii)** (d)	**(viii)** (c)
(ix) (c)	**(x)** (a)	**(xi)** (d)	**(xii)** (c)	**(xiii)** (a)	**(xiv)** (d)	**(xv)** (a)	

Question 2

(i) The diagram shows an apparatus for the laboratory preparation of hydrogen chloride. [5]



(a) Identify A and B.

(b) Write the equation for the reaction.

(c) How would you check whether or not the gas jar is filled with hydrogen chloride?

(d) What does the method of collection tell you about the density of hydrogen chloride?

Ans. (a) A is conc. sulphuric acid. B is dry sodium chloride.

(b) $NaCl + H_2SO_4$ (conc) $\xrightarrow{<200°C}$ $NaHSO_4 + HCl$.

(c) By holding a glass rod dipped in ammonia solution near the mouth of gas jar. If dense white fumes appear around the glass rod, it implies that gas jar is filled.

(d) From this method of collection we can safely conclude that HCl is heavier and hence, denser than air.

(ii) Match the following column A with Column B. [5]

Column A	Column B
(a) Sodium chloride	1. Increases
(b) Ammonium ion	2. Covalent bond
(c) Electronegativity across the period	3. Ionic bond
(d) Non metallic character down the group	4. Covalent and Coordinate bond
(e) Carbon tetrachloride	5. Decreases

Ans. (a) Ionic bond— Sodium chloride.

(b) Covalent and coordinate bond— Ammonium ion.

(c) Increases— Electronegativity across the period.

(d) Decreases— Non-metallic character down a group.

(e) Covalent bond— Carbon tetrachloride.

(iii) Complete the following by choosing the correct answers from the bracket : [5]

(a) The basicity of Acetic Acid is _____ (3, 1, 4)

(b) The compound formed when ethanol reacts with sodium is _____ (sodium ethanoate, sodium ethoxide, sodium propanoate)

(c) Quicklime is not used to dry HCl gas because _____ (CaO is alkaline, CaO is acidic, CaO is neutral)

(d) Ammonia gas is collected by _____ (an upward displacement of air, a downward displacement of water, a downward displacement of air)

(e) Cold, dilute nitric acid reacts with copper to form _____ (Hydrogen, nitrogen dioxide, nitric oxide).

Ans. (a) The basicity of Acetic Acid is **1**.

(b) The compound formed when ethanol reacts with sodium is **sodium ethoxide**.

(c) Quicklime is not used to dry HCl gas because **CaO is alkaline**.

(d) Ammonia gas is collected by **a downward displacement of air**.

(e) Cold, dilute nitric acid reacts with copper to form **nitric oxide**.

(iv) Identify the following : [5]

(a) The energy required to remove an electron from valence shell of a neutral isolated gaseous atom.

(b) The method used to separate ore from gangue by preferential wetting.

(c) The property by which carbon bonds with itself to form a long chain.

(d) A bond formed by a shared pair of electrons with both electrons coming from the same atom.

(e) A substance that conducts electricity in molten or aqueous state.

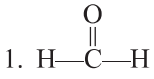
Ans. (a) Ionisation potential (b) Froth floatation process (c) Catenation

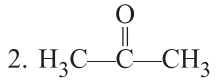
(d) Coordinate bond (e) Electrolyte

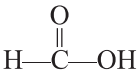
(v) (a) Draw the structural formula for the following :

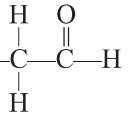
1. Methanoic acid 2. Ethanal 3. Ethyne

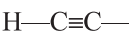
(b) Name the following organic compounds in IUPAC system :

1. 

2. 

Ans. (a) 1.  (Methanoic acid)

2.  (Ethanal)

3.  (Ethyne)

(b) 1. Methanal 2. Propanone

Section B

*(Attempt **any four** questions.)*

Question 3

(i) (a) Name two acids used in the formation of aqua regia. [2]

(b) What is the ratio of these acids?

Ans. (a) Conc. HCl and Conc. HNO_3

(b) Three parts of conc. HCl and one part of conc. HNO_3

(ii) Write the products and balance the equation. [2]

(a) $CuO(s) + NH_3(g) \rightarrow$

(b) $NH_3(g) + Cl_2(g) \rightarrow$

Ans. (a) $3CuO(s) + 2NH_3(g) \longrightarrow 3Cu(s) + 3H_2O(l) + N_2(g)$

(b) $8NH_3(g) + 3Cl_2(g) \longrightarrow 6NH_4Cl + N_2(g)$

(iii) Arrange the following as per the instruction given in the brackets. [3]

(a) Na, Al, Cl [increasing order of Ionization potential]

(b) O_2, N_2, Cl_2 [increasing order of number of covalent bonds]

(c) Zn^{2+}, Na^+, Cu^{+2} [order of preference of discharge at the cathode]

Ans. (a) $Na < Al < Cl$ (b) $Cl_2 < O_2 < N_2$ (c) $Na^+ < Zn^{2+} < Cu^{2+}$

(iv) Fill in the blanks selecting the appropriate word from the given choice : [3]

(a) Metals have ..... ionisation potential. (low/high)

(b) Group 18 elements have ..... valence electrons (4/8) with the exception of helium.

(c) Group 2 elements are called ..... metals (alkali/alkaline earth).

Ans. (a) low (b) 8 (c) alkaline earth

Question 4

(i) The metals of Group 2 from top to bottom are Be, Mg, Ca, Sr, and Ba. [2]

(a) Which one of these elements will form ions most readily and why?

(b) State the common feature in the electronic configuration of all these elements.

Ans. (a) Barium will ionise most readily because the 2 electrons in its valence shell are far away from the nucleus. Thus, barium can easily donate these electrons and ionises readily.

(b) All the elements in the list have two valence electrons.

(ii) (a) Calculate the vapour density of ethene [C = 12, H = 1] [2]

(b) Give the empirical formula of $C_6H_{18}O_3$.

Ans. (a) Molecular mass of ethene (C_2H_4) = $2 \times 12 + 4 \times 1 = 28$ amu

The vapour density of ethene = $\frac{\text{Molecular mass}}{2} = \frac{28}{2} = 14$.

(b) Empirical formula of $C_6H_{18}O_3 = C_2H_6O$

[Because simplest ratio of whole number of atoms in compound $C_6H_{18}O_3 = 2 : 6 : 1$]

(iii) (a) Ammonia gas can be prepared from magnesium nitride. Write a fully balanced equation for the preparation of gas. [3]

(b) Why ammonia gas is not prepared in laboratory by above mentioned method.

(c) The solution of ammonia in water behaves as an alkali. Explain.

Ans. (a) $Mg_3N_2 + 6H_2O \longrightarrow 2NH_3 + 3Mg(OH)_2$

(b) If the amount of water is not controlled, the ammonia gas formed, dissolves in excess of water, furthermore Mg_3N_2 is an expensive compound.

(c) The ammonia gas dissolves in water to form ammonium hydroxide, which furnishes (OH^-) ions. So, ammonia solution behaves like an alkali.

(iv) Give reasons for each of the following: [3]

(a) Direct absorption of HCl gas in water is not preferred.

(b) All glass apparatus is used in the laboratory preparation of HNO_3.

(c) NaCl has a high melting point.

Ans. (a) It is because, the reverse rise in level of water in the delivery tube which is known as back suction. Due to back suction the water enters hot flask and breaks it.

(b) The glass apparatus is purposely used because HNO_3 vapours are highly corrosive in nature and corrodes cork, rubber, etc., if used as stopper.

(c) NaCl is an electrovalent (ionic) compound. Its cations and anions are held very strongly due to strong electrostatic forces. Thus, a large amount of heat energy is required to snap the electrostatic bonds, before the ions could actually start interchanging their positions. Due to this large requirement of heat energy, NaCl has high melting and boiling points.

Question 5

(i) Name the gas that is produced in the following cases : [2]

(a) Sulphur is oxidised by concentrated nitric acid.

(b) Action of cold and dilute nitric acid on copper.

Ans. (a) Nitrogen dioxide (NO_2).

(b) Nitric oxide (NO).

(ii) Identify the substance in each of the following : [2]

(a) The electrode that increases in mass during the electro-refining of silver.

(b) The catalyst used to oxidise ammonia into nitric oxide.

Ans. (a) Cathode (b) Platinum

(iii) State how the following conversions can be carried out. [3]

(a) Ethyl chloride to ethyl alcohol (b) Ethyl alcohol to ethene.

(c) Ethyl bromide to ethane.

Ans. (a) When ethyl chloride is treated with aqueous potassium hydroxide, then hydrolysis takes place with the formation of ethyl alcohol.

$$C_2H_5Cl + KOH(aq.) \longrightarrow KCl + \underset{\text{Ethyl alcohol}}{C_2H_5OH}$$

(b) When ethyl alcohol is treated with conc. sulphuric acid, ethene is formed as a product.

$$C_2H_5OH + H_2SO_4\ (\text{conc.}) \xrightarrow{> 160^\circ C} \underset{\text{Ethyl hydrogen sulphate}}{C_2H_5HSO_4} + H_2O$$

$$C_2H_5HSO_4 \xrightarrow[\text{Excess of } H_2SO_4]{< 160^\circ C} \underset{\text{Ethene}}{C_2H_4} + H_2SO_4$$

(c) Ethyl bromide is reduced by nascent hydrogen, obtained by the action of zinc-copper couple in alcohol to form ethane.

$$C_2H_5Br + \underset{\text{Nascent hydrogen}}{2[H]} \xrightarrow[\text{Alcohol}]{\text{Zn/Cu couple}} \underset{\text{Ethane}}{C_2H_6} + HBr$$

(iv) State your observations when : [3]

(a) Barium chloride solution is added to sodium sulphate solution.

(b) Neutral litmus solution is added to solution of carbon dioxide in water.

(c) Small piece of copper is placed in silver nitrate solution.

Ans. (a) A thick white precipitate of barium sulphate is formed, which rapidly settles down to the base of test tube.

(b) The litmus solution changes to red colour.

(c) A silvery deposit is formed on copper and the solution gradually changes to blue colour.

Question 6

(i) (a) What do you understand by the term empirical formula? [2]

(b) A compound of X and Y has the empirical formula XY_2. Its vapour density is equal to its empirical formula weight. Determine its molecular formula.

Ans. (a) Empirical formula : It is a formula of a compound which shows the simplest whole number ratio between the atoms of various elements in a compound.

(b) Molecular formula = 2 × V.D.

$\therefore$ Molecular formula = 2 × Empirical formula

= 2 × $[XY_2]$

= X_2Y_4

(ii) Given: $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$ [2]

2000 cc of O_2 was burnt with 400 cc of ethane.

Calculate the volume of CO_2 formed and unused O_2.

Ans. $\underset{\text{2 Vol.}}{2C_2H_6} + \underset{\text{7 Vol.}}{7O_2} \longrightarrow \underset{\text{4 Vol.}}{4CO_2} + 6H_2O$ [By Gay Lussac's law]

2 volumes of ethane require oxygen = 7 volumes

$\therefore$ 400 cc of ethane require oxygen = $\frac{7}{2}$ × 400 cc = 1400 cc

Thus, volume of unused O_2 = 2000 cc – 1400 cc = **600 cc.**

Again, 2 volumes of ethane produce CO_2 = 4 volumes

$\therefore$ 400 cc of ethane produce CO_2 = $\frac{4}{2}$ × 400 cc = **800 cc.**

(iii) 500 g of magnesium carbonate of 64% purity dissolves in excess of HCl as under. [3]

$$MgCO_3 + 2HCl \longrightarrow MgCl_2 + H_2O + CO_2(g)$$

Calculate the weight of pure CO_2 formed. [Mg = 24, C = 12, O = 16, H = 1, Cl = 35.5]

Ans. Weight of pure $MgCO_3$ in 500 g = 500 × $\frac{64}{100}$ = 320 g

$$\underset{(24 + 12 + 48) = 84}{MgCO_3} + 2HCl \longrightarrow MgCl_2 + H_2O + \underset{(12 + 32) = 44}{CO_2}$$

When pure $MgCO_3$ is 84, the weight of carbon dioxide formed = 44

When pure $MgCO_3$ is 320 g, the weight of carbon dioxide formed = $\frac{44 \times 320}{84}$ g = **167.6 g**

(iv) Mention the property of conc. H_2SO_4 exhibited in each of the following reactions with: [3]

(a) sugar (b) metallic chloride (c) non-metal such as carbon.

Ans. (a) Dehydration of organic compound (b) As a non-volatile acid (c) Oxidising property.

Question 7

(i) A compound gave a following data: [2]

C = 57.82%, O = 38.58% and the rest hydrogen. Its relative molecular mass is 166.

Find its empirical formula and molecular formula.

[C = 12, O = 16, H = l]

Ans.

Element	Percentage weight	Atomic weight	Relative number of moles	Simple ratio of atoms
C	57.82	12	57.82 ÷ 12 = 4.82	4.82 ÷ 2.41 = 2 or, 2 × 2 = 4
O	38.58	16	38.58 ÷ 16 = 2.41	2.41 ÷ 2.41 = 1 or, 2 × 1 = 2
H	100 – (57.82 + 38.58) = 100 – 96.40 = 3.60	1	3.60 ÷ 1 = 3.60	3.60 ÷ 2.41 ≈ 1.5 or, 2 × 1.5 = 3

Thus, empirical formula of compound = $C_4H_3O_2$

So, empirical formula weight of $C_4H_3O_2$ = 4 × 12 + 3 × 1 + 2 × 16 = 48 + 3 + 32 = 83

Now, $n = \dfrac{\text{Molecular mass}}{\text{Empirical formula mass}} = \dfrac{166}{83} = 2$

Thus, Molecular formula = 2 × Empirical formula = 2 ($C_4H_3O_2$) = $C_8H_6O_4$.

(ii) Identify the functional group in the following organic compounds. [2]

(a) C_2H_5OH (b) $CH_3—CO—CH_3$

Ans. (a) —OH (Hydroxyl group) (b) > C = O (Ketonic group)

(iii) Classify the following as oxidation and reduction reaction, also complete the reaction. [3]

(a) $Cu \rightarrow Cu^{2+}$ (b) $Fe^{3+} \rightarrow Fe^{2+}$ (c) $Cl^- \rightarrow Cl$

Ans. (a) $Cu \rightarrow Cu^{2+} + 2e^-$ — Oxidation reaction

(b) $Fe^{3+} + e^- \rightarrow Fe^{2+}$ — Reduction reaction

(c) $Cl^- \rightarrow Cl + e^-$ — Oxidation reaction

(iv) From the list of the following salts choose the salt that most appropriately fits the description given in the following : [3]

$[Ca(NO_3)_2; ZnCO_3; AgCl; PbCO_3; MgCl_2]$

(a) A deliquescent salt (b) An insoluble chloride

(c) On heating this salt, a brown coloured gas is evolved.

Ans. (a) $MgCl_2$ is a deliquescent salt. (b) AgCl is an insoluble chloride.

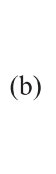
(c) $Ca(NO_3)_2$ on heating gives a brown coloured gas.

Question 8

(i) Give the electron dot structure of the following : [2]

(a) NH_3 (b) CH_4

Ans. (a)  Ammonia (NH_3)

(b)  Methane (CH_4)

(ii) Distinguish between the following pairs of compounds using the test given within the brackets. [2]

(a) Calcium sulphite and calcium carbonate (using dil. HCl)

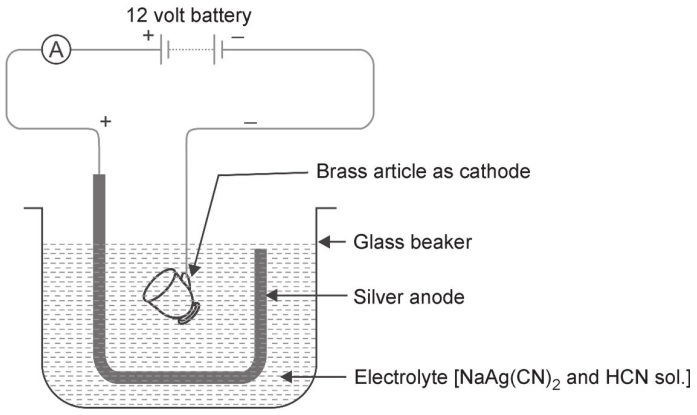
(b) Lead nitrate solution and Zinc nitrate solution (using an alkali)

Ans. (a) Calcium sulphite reacts with dil. HCl to form calcium chloride, water and sulphur dioxide gas. But calcium carbonate reacts with dil. HCl to form calcium chloride, water and carbon dioxide gas.

(b) Lead nitrate solution reacts with an alkali (NH_4OH) to form chalky white precipitate of lead (II) hydroxide, which is insoluble in excess of alkali NH_4OH. But zinc nitrate solution reacts with an alkali to form white gelatin like precipitate of zinc hydroxide, which is soluble in excess of alkali.

(iii) Draw a neat and well labelled diagram for the silver plating on a brass article. [3]

Ans.



(iv) There are three elements E, F, G with atomic numbers 19, 8 and 17 respectively. [3]

(a) Classify the elements as metals and non-metals.

(b) Give the molecular formula of the compound formed between E and G and state the type of chemical bond in this compound.

Ans. (a) E (2, 8, 8, 1) is a metal.

F (2, 6) is a non-metal.

G (2, 8, 7) is a non-metal.

(b) The chemical compound of E and G is E^+G^-. An electrovalent (ionic) bond is formed between E and G.

V V V