ICSE 2024 EXAMINATION

CHEMISTRY

SAMPLE PAPER - 2

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) This metal is a liquid at room temperature.
(a) Potassium (b) Zinc (c) Gold (d) Mercury

(ii) Hydroxide of this metal is soluble in sodium hydroxide solution.
(a) Magnesium (b) Lead (c) Silver (d) Copper

(iii) In the periodic table alkali metals are placed in the group _____.
(a) 1 (b) 11 (c) 17 (d) 18

(iv) Hydrogen chloride gas being highly soluble in water is dried by :
(a) Anhydrous calcium chloride (b) Phosphorous penta oxide
(c) Quick lime (d) Concentrated sulphuric acid

(v) The brown ring test is used for detection of :
(a) CO_3^{2-} (b) NO_3^- (c) SO_3^{2-} (d) Cl^-

(vi) When dilute sulphuric acid reacts with iron sulphide, the gas evolved is _____.
(a) Hydrogen sulphide (b) Sulphur dioxide (c) Sulphur trioxide (d) Vapour of sulphuric acid

(vii) The functional group present in acetic acid is :
(a) Ketonic $>C=O$ (b) Hydroxyl –OH (c) Aldehydic —CHO (d) Carboxyl —COOH

(viii) The unsaturated hydrocarbons undergo :
(a) A substitution reaction (b) An oxidation reaction
(c) An addition reaction (d) None of these

(ix) The number of C-H bonds in ethane molecule are :
(a) Four (b) Six (c) Eight (d) Ten

(x) Which of the following properties do not match with elements of the halogen family?
(a) They have seven electrons in their valence shell (b) They are highly reactive chemically
(c) They are metallic in nature (d) They are diatomic in their molecular form

(xi) The organic compound obtained as the end product of fermentation of sugar solution is
(a) Methanol (b) Ethanol (c) Ethane (d) Methanoic acid

(xii) The inert electrode used in the electrolysis of acidified water is:

(a) Nickel (b) Platinum (c) Copper (d) Silver

(xiii) A compound with low boiling point is:

(a) Sodium chloride (b) Calcium chloride (c) Potassium chloride (d) Carbon tetrachloride

(xiv) The acid which can produce carbon from cane sugar, is :

(a) Concentrated Hydrochloric acid (b) Concentrated Nitric acid

(c) Concentrated sulphuric acid (d) Concentrated Acetic acid

(xv) The organic compound having a triple carbon-carbon covalent bond, is :

(a) C_3H_4 (b) C_3H_6 (c) C_3H_8 (d) C_4H_{10}

Question 2

(i) Hydrogen gas is burnt in a gas **P**. When another gas **R** is formed. Gas **R** gives dense white fumes with ammonia liquor. [5]

(a) Name the gases P and R.

(b) Write relevant equations for

(1) the formation of gas R. (2) the formation of dense white fumes.

(c) Fill in the blanks space :

The gas R fumes strongly in moist air, because it is highly _____ in water.

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

Column A	Column B
(a) Acid salt	1. Sodium potassium carbonate
(b) Mixed salt	2. Alum
(c) Complex salt	3. Sodium carbonate
(d) Double salt	4. Sodium zincate
(e) Normal salt	5. Sodium hydrogen carbonate

(iii) Fill in the blanks using the correct options :

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

(b) Group 18 elements have _____ valence electrons (4/8) with the exception of _____ (He/Ne) with _____ electrons (2/8) in valence shell.

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

(iv) Identify the following : [5]

(a) An acidic gas which gives dense white fumes with NH_3 .

(b) An alkane whose molecular mass is 58. (H = 1; C = 12)

(c) A solid which when kept in the open, forms a solution after sometime.

(d) An alloy used in electrical fittings.

(e) The process of heating an ore to a high temperature in the presence of air.

(v) (a) Draw the structure of a compound with **three** carbon atoms in the following cases : [5]

1. An alkane with carbon to carbon single bond.
2. An alcohol containing three carbon atoms.
3. An unsaturated hydrocarbon with a double bond between any two carbon atoms.

(b) Methane, methene, methanoic acid and methanol.

From the list of compounds given above name :

1. A compound which is not possible.
2. A compound used to denaturing ethanol.

Section B

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

Question 3

(i) Identify the following : [2]

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

(b) The acid that is a dehydrating as well as a drying agent.

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

(a) $Mg_3N_2(s) + H_2O(l) \longrightarrow$ (b) $NH_3(g) + O_2(g) \xrightarrow{Pt;\ 800°C}$

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

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

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

(c) Br, F, Cl [Decreasing order of atomic radius]

(iv) Choose the correct word/phrase from within the brackets to complete the following sentences: [3]

(a) The catalyst commonly used for conversion of ethene to ethane is _____. (nickel/iron/cobalt)

(b) When acetaldehyde is oxidised with acidified potassium dichromate, it forms _____.
(ester/ethanol/acetic acid)

(c) Ethanoic acid reacts with ethanol in presence of concentrated H_2SO_4 so as to form a compound and water. The chemical reaction which takes place is called _____. (dehydration/ hydrogenation/esterification)

Question 4

(i) (a) Name the chief ore of aluminium and the process of concentration of ore. [2]

(b) Name one alloy of aluminium.

(ii) Name the following : [2]

(a) The process in which loss of electron takes place at anode.

(b) A reducing electrode.

(iii) Write a balanced chemical equation for each of the following reactions : [3]

(a) Reduction of copper(II) oxide by hydrogen.

(b) Action of dilute sulphuric acid on sodium hydroxide.

(c) Action of dilute sulphuric acid on zinc sulphide.

(iv) Explain the following : [3]

(a) Sodium chloride will conduct electricity only in fused or aqueous solution state.

(b) In the electroplating of an article with silver, the electrolyte sodium argento-cyanide solution is preferred over silver nitrate solution.

(c) Although copper is a good conductor of electricity, it is a non-electrolyte.

Question 5

(i) (a) Name the acid which on mixing with lead nitrate solution produces a white precipitate which is insoluble even on heating. [2]

(b) Name the acid, which on mixing with silver nitrate solution produces a white precipitate which is soluble in excess ammonium hydroxide.

(ii) Name the probable cation : [2]

(a) On mixing solution X with ammonium hydroxide solution, a dirty white precipitate is formed which dissolves in excess of ammonium hydroxide solution to form a clear solution.

(b) On mixing solution Y with ammonium hydroxide solution, a pale blue precipitate is formed which dissolves in excess of ammonium hydroxide solution to form a clear inky solution.

(iii) State one relevant observation for each of the following reactions : [3]

(a) Concentrated Nitric acid is added to Copper turnings.

(b) Mixture of Ammonium Chloride and Sodium Hydroxide is heated.

(c) NaOH solution is added to calcium nitrate solution.

(iv) (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.

Question 6

(i) Name the following : [2]

(a) A metal oxide that can be reduced by hydrogen.

(b) An alloy of lead and tin that is used in electrical circuits.

(ii) Oxygen oxidises ethyne to carbon dioxide and water as shown by the equation : [2]

$$2C_2H_2 + 5O_2 \longrightarrow 4CO_2 + 2H_2O$$

What volume of ethyne gas at s.t.p. is required to produce 8.4 dm^3 of carbon dioxide at s.t.p.?

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

(iii) State the conditions required for the following reactions to take place : [3]

(a) Preparation of ethyne from ethylene dibromide.

(b) Catalytic oxidation of ammonia to nitric oxide.

(c) Any two conditions for the conversion of sulphur dioxide to sulphur trioxide.

(iv) Give one equation each to show the following properties of sulphuric acid : [3]

(a) Dehydrating property. (b) Acidic nature. (c) As a non-volatile acid.

Question 7

(i) A compound gave the 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) Name the following : [2]

(a) The functional group present in acetic acid.

(b) The functional group present in ethyl alcohol.

(iii) (a) State the volume occupied by 40 gm of methane at STP, if its vapour density (V.D.) is 8. [3]

(b) Calculate the number of moles present in 160 gm of NaOH.

[Atomic Mass : Na = 23, H = 1, O = 16]

(iv) The pH values of three solutions A, B and C are given in the table. Answer the following questions: [3]

Solution	*pH value*
A	*12*
B	*2*
C	*7*

(a) Which solution will have no effect on litmus solution?

(b) Which solution will liberate CO_2 when reacted with sodium carbonate?

(c) Which solution will turn red litmus solution blue?

Question 8

(i) Draw the electron dot diagram for the compounds given below. Represent the electrons by (.) and (×) in the diagram. [Atomic No. : Ca = 20, O = 8, Cl = 17, H = 1] [2]

(a) Calcium oxide (b) Chlorine molecule

(ii) Identify the **gas evolved** and give the **chemical test** in each of the following cases : [2]

(a) Dilute hydrochloric acid reacts with sodium sulphite.

(b) Dilute hydrochloric acid reacts with iron (II) sulphide.

(iii) A metal article is to be electroplated with silver. The electrolyte selected is sodium argentocyanide.

(a) What kind of salt is sodium argentocyanide? [3]

(b) Why is it preferred to silver nitrate as an electrolyte?

(c) State one condition to ensure that the deposit is smooth, firm and long lasting.

(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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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) This metal is a liquid at room temperature.
(a) Potassium (b) Zinc (c) Gold (d) Mercury

(ii) Hydroxide of this metal is soluble in sodium hydroxide solution.
(a) Magnesium (b) Lead (c) Silver (d) Copper

(iii) In the periodic table alkali metals are placed in the group _____ .
(a) 1 (b) 11 (c) 17 (d) 18

(iv) Hydrogen chloride gas being highly soluble in water is dried by :
(a) Anhydrous calcium chloride (b) Phosphorous penta oxide
(c) Quick lime (d) Concentrated sulphuric acid

(v) The brown ring test is used for detection of :
(a) CO_3^{2-} (b) NO_3^- (c) SO_3^{2-} (d) Cl^-

(vi) When dilute sulphuric acid reacts with iron sulphide, the gas evolved is _____ .
(a) Hydrogen sulphide (b) Sulphur dioxide (c) Sulphur trioxide (d) Vapour of sulphuric acid

(vii) The functional group present in acetic acid is :
(a) Ketonic $>C = O$ (b) Hydroxyl –OH (c) Aldehydic —CHO (d) Carboxyl —COOH

(viii) The unsaturated hydrocarbons undergo :
(a) A substitution reaction (b) An oxidation reaction
(c) An addition reaction (d) None of these

(ix) The number of C-H bonds in ethane molecule are :
(a) Four (b) Six (c) Eight (d) Ten

(x) Which of the following properties do not match with elements of the halogen family?
(a) They have seven electrons in their valence shell (b) They are highly reactive chemically
(c) They are metallic in nature (d) They are diatomic in their molecular form

(xi) The organic compound obtained as the end product of fermentation of sugar solution is
(a) Methanol (b) Ethanol (c) Ethane (d) Methanoic acid

(xii) The inert electrode used in the electrolysis of acidified water is:

(a) Nickel (b) Platinum (c) Copper (d) Silver

(xiii) A compound with low boiling point is:

(a) Sodium chloride (b) Calcium chloride (c) Potassium chloride (d) Carbon tetrachloride

(xiv) The acid which can produce carbon from cane sugar, is :

(a) Concentrated Hydrochloric acid (b) Concentrated Nitric acid

(c) Concentrated sulphuric acid (d) Concentrated Acetic acid

(xv) The organic compound having a triple carbon-carbon covalent bond, is :

(a) C_3H_4 (b) C_3H_6 (c) C_3H_8 (d) C_4H_{10}

ANSWERS

(i) (d) **(ii)** (b) **(iii)** (a) **(iv)** (d) **(v)** (b) **(vi)** (a) **(vii)** (d) **(viii)** (c)

(ix) (b) **(x)** (c) **(xi)** (b) **(xii)** (b) **(xiii)** (d) **(xiv)** (c) **(xv)** (a)

Question 2

(i) Hydrogen gas is burnt in a gas **P**. When another gas **R** is formed. Gas **R** gives dense white fumes with ammonia liquor. [5]

(a) Name the gases P and R.

(b) Write relevant equations for

(1) the formation of gas R. (2) the formation of dense white fumes.

(c) Fill in the blanks space :

The gas R fumes strongly in moist air, because it is highly _____ in water.

Ans. (a) The gas P is chlorine.

The gas R is hydrogen chloride.

(b) (1) $H_2(g) + Cl_2(g) \xrightarrow{\text{Sunlight}} 2HCl(g)$

(2) $NH_3(g) + HCl(g) \longrightarrow NH_4Cl(s)$

(c) **soluble**

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

Column A	Column B
(a) Acid salt	1. Sodium potassium carbonate
(b) Mixed salt	2. Alum
(c) Complex salt	3. Sodium carbonate
(d) Double salt	4. Sodium zincate
(e) Normal salt	5. Sodium hydrogen carbonate

Ans.

Column A	Column B
(a) Acid salt	5. Sodium hydrogen carbonate
(b) Mixed salt	1. Sodium potassium carbonate
(c) Complex salt	4. Sodium zincate
(d) Double salt	2. Alum
(e) Normal salt	3. Sodium carbonate

(iii) Fill in the blanks using the correct options :

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

(b) Group 18 elements have _____ valence electrons (4/8) with the exception of _____ (He/Ne) with _____ electrons (2/8) in valence shell.

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

Ans. (a) low (b) 1. 8 2. He 3. 2 (c) alkaline earth

(iv) Identify the following : [5]

(a) An acidic gas which gives dense white fumes with NH_3 .

(b) An alkane whose molecular mass is 58. (H = 1; C = 12)

(c) A solid which when kept in the open, forms a solution after sometime.

(d) An alloy used in electrical fittings.

(e) The process of heating an ore to a high temperature in the presence of air.

Ans. (a) HCl gas (b) Butane (c) Anhydrous calcium chloride (d) Brass (e) Roasting

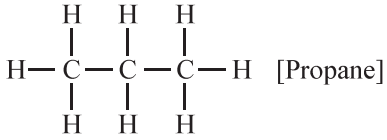
(v) (a) Draw the structure of a compound with **three** carbon atoms in the following cases : [5]

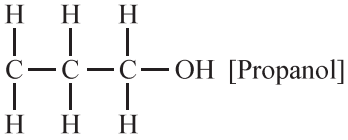
1. An alkane with carbon to carbon single bond.
2. An alcohol containing three carbon atoms.
3. An unsaturated hydrocarbon with a double bond between any two carbon atoms.

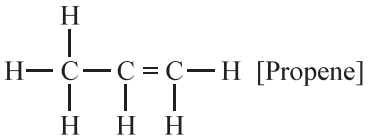
(b) Methane, methene, methanoic acid and methanol.

From the list of compounds given above name :

1. A compound which is not possible.
2. A compound used to denaturing ethanol.

Ans. (a) 1.  [Propane]

2.  [Propanol]

3.  [Propene]

(b) (i) The compound **methene** is not possible.

(ii) The compound **methanol** is used for denaturing ethanol.

Section B

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

Question 3

(i) Identify the following : [2]

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

(b) The acid that is a dehydrating as well as a drying agent.

Ans. (a) Cathode (b) Conc. sulphuric acid

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

(a) $Mg_3N_2(s) + H_2O(l) \longrightarrow$ (b) $NH_3(g) + O_2(g) \xrightarrow{Pt;\ 800°C}$

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

(b) $4NH_3(g) + 5O_2(g) \xrightarrow{Pt;\ 800°C} 4NO(g) + 6H_2O(g)$

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

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

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

(c) Br, F, Cl [Decreasing order of atomic radius]

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

(iv) Choose the correct word/phrase from within the brackets to complete the following sentences: [3]

(a) The catalyst commonly used for conversion of ethene to ethane is _____. (nickel/iron/cobalt)

(b) When acetaldehyde is oxidised with acidified potassium dichromate, it forms _____. (ester/ethanol/acetic acid)

(c) Ethanoic acid reacts with ethanol in presence of concentrated H_2SO_4 so as to form a compound and water. The chemical reaction which takes place is called _____. (dehydration/ hydrogenation/esterification)

Ans. (a) Nickel (b) Acetic acid (c) Esterification

Question 4

(i) (a) Name the chief ore of aluminium and the process of concentration of ore. [2]

(b) Name one alloy of aluminium.

Ans. (a) The chief ore of aluminium — Bauxite ($Al_2O_3.2H_2O$)
Process of concentration of ore — Hall's process or Baeyer's process.

(b) Alloy of aluminium — Duralumin

(ii) Name the following : [2]

(a) The process in which loss of electron takes place at anode.

(b) A reducing electrode.

Ans. (a) Oxidation (b) Anode

(iii) Write a balanced chemical equation for each of the following reactions : [3]

(a) Reduction of copper(II) oxide by hydrogen.

(b) Action of dilute sulphuric acid on sodium hydroxide.

(c) Action of dilute sulphuric acid on zinc sulphide.

Ans. (a) $CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$

(b) $NaOH + H_2SO_4$ (dil.) $\longrightarrow NaHSO_4 + H_2O$

OR

$2NaOH + H_2SO_4$ (dil.) $\longrightarrow Na_2SO_4 + 2H_2O$

(c) $ZnS + H_2SO_4$ (dil.) $\longrightarrow ZnSO_4 + H_2S$

(iv) Explain the following : [3]

(a) Sodium chloride will conduct electricity only in fused or aqueous solution state.

(b) In the electroplating of an article with silver, the electrolyte sodium argento-cyanide solution is preferred over silver nitrate solution.

(c) Although copper is a good conductor of electricity, it is a non-electrolyte.

Ans. (a) It is because the ions can migrate towards opposite electrodes only, if they are free to move, i.e., they are either in fused state or solution form.

(b) It is because silver nitrate has a tendency to hydrolyse, but not the silver argentocyanide. Furthermore silver nitrate solution is corrosive to metals like copper used for electroplating.

(c) In an electrolyte the conduction of electricity takes place due to migration of cations and anions. As no cations or anions are present in copper therefore it is not an electrolyte.

Question 5

(i) (a) Name the acid which on mixing with lead nitrate solution produces a white precipitate which is insoluble even on heating. [2]

(b) Name the acid, which on mixing with silver nitrate solution produces a white precipitate which is soluble in excess ammonium hydroxide.

Ans. (a) Dilute sulphuric acid

(b) Dilute hydrochloric acid

(ii) Name the probable cation : [2]

(a) On mixing solution X with ammonium hydroxide solution, a dirty white precipitate is formed which dissolves in excess of ammonium hydroxide solution to form a clear solution.

(b) On mixing solution Y with ammonium hydroxide solution, a pale blue precipitate is formed which dissolves in excess of ammonium hydroxide solution to form a clear inky solution.

Ans. (a) Cation X is zinc (Zn^{2+}) ion

(b) Cation Y is copper(II) (Cu^{2+}) ion

(iii) State one relevant observation for each of the following reactions : [3]

(a) Concentrated Nitric acid is added to Copper turnings.

(b) Mixture of Ammonium Chloride and Sodium Hydroxide is heated.

(c) NaOH solution is added to calcium nitrate solution.

Ans. (a) A reddish brown coloured nitrogen dioxide gas is formed.

(b) A colourless and pungent smell of ammonia gas is formed, which fumes strongly in air.

(c) A white precipitate of calcium hydroxide is formed.

(iv) (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.

Question 6

(i) Name the following : [2]

(a) A metal oxide that can be reduced by hydrogen.

(b) An alloy of lead and tin that is used in electrical circuits.

Ans. (a) Copper oxide (CuO) (b) Fusible alloy (solder)

(ii) Oxygen oxidises ethyne to carbon dioxide and water as shown by the equation : [2]

$$2C_2H_2 + 5O_2 \longrightarrow 4CO_2 + 2H_2O$$

What volume of ethyne gas at s.t.p. is required to produce 8.4 dm^3 of carbon dioxide at s.t.p.?

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

Ans. $2C_2H_2 + 5O_2 \longrightarrow 4CO_2 + 2H_2O$.

2 vols. 4 vols. [*By Gay Lussac's law*]

4 volumes of carbon dioxide at s.t.p. requires ethyne = 2 volumes

$\therefore$ 8.4 dm^3 of carbon dioxide at s.t.p. requires ethyne

$$= \frac{2 \times 8.4}{4} \text{ dm}^3 = \mathbf{4.2\ dm^3}.$$

(iii) State the conditions required for the following reactions to take place : [3]

(a) Preparation of ethyne from ethylene dibromide.

(b) Catalytic oxidation of ammonia to nitric oxide.

(c) Any two conditions for the conversion of sulphur dioxide to sulphur trioxide.

Ans. (a) Zinc dust is added to a mixture of 95% ethyl alcohol and 5% of ethylene dibromide. The mixture is gently warmed when ethyne gas is liberated

$$\begin{matrix} CHBr \\ \| \\ CHBr \end{matrix} + Zn \xrightarrow[\text{warm}]{\text{95\% alcohol}} \begin{matrix} CH \\ \| \\ CH \end{matrix} + ZnBr_2.$$

(b) The mixture of ammonia gas and oxygen gas are passed over heated platinum when nitric oxide is formed.

$$4NH_3 + 5O_2 \xrightarrow{Ni - 900°C} 4NO + 6H_2O.$$

(c) (1) The mixture of SO_2 gas and O_2 gas must be pure and dry and in the ratio of 2 : 1 by volume.

(2) The mixture should be passed over platinised asbestos or vanadium pentaoxide, maintained at 450°C.

(iv) Give one equation each to show the following properties of sulphuric acid : [3]

(a) Dehydrating property. (b) Acidic nature. (c) As a non-volatile acid.

Ans. (a) $\underset{\text{Glucose}}{C_6H_{12}O_6} + 6H_2SO_4\ (\text{conc.}) \longrightarrow 6C + 6H_2SO_4 \cdot H_2O.$

(b) $2NaOH + H_2SO_4\ (\text{dil.}) \longrightarrow Na_2SO_4 + 2H_2O.$

(c) $2NaNO_3 + H_2SO_4\ (\text{conc.}) \xrightarrow{>200°C} Na_2SO_4 + 2HNO_3.$

Question 7

(i) A compound gave the 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

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

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

(ii) Name the following : [2]

(a) The functional group present in acetic acid.

(b) The functional group present in ethyl alcohol.

Ans. (a) —COOH (Carboxyl) (b) —OH (Hydroxyl)

(iii) (a) State the volume occupied by 40 gm of methane at STP, if its vapour density (V.D.) is 8. [3]

(b) Calculate the number of moles present in 160 gm of NaOH.

[Atomic Mass : Na = 23, H = 1, O = 16]

Ans. (a) Gram molecular weight of methane = 2 × 8 = 16 g

$\because$ At STP, 16 g of methane occupies 22.4 dm^3

$\therefore$ At STP, 40 g of methane will occupy $\frac{22.4\ dm^3}{16\ g} \times 40\ g = 5.6 \times 10\ dm^3 = 56\ dm^3$

(b) Gram molecular weight of NaOH = 23 + 16 + 1 = 40 g

The number of moles present in 160 g of NaOH = $\frac{160\ g}{40\ g} = 4$ moles.

(iv) The pH values of three solutions A, B and C are given in the table. Answer the following questions: [3]

Solution	*pH value*
A	*12*
B	*2*
C	*7*

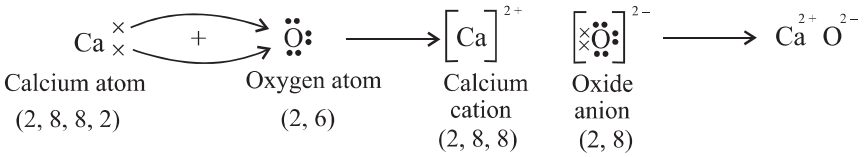
(a) Which solution will have no effect on litmus solution?
(b) Which solution will liberate CO_2 when reacted with sodium carbonate?
(c) Which solution will turn red litmus solution blue?

Ans. (a) Solution C (b) Solution B (c) Solution A

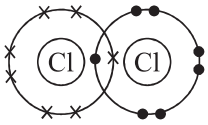
Question 8

(i) Draw the electron dot diagram for the compounds given below. Represent the electrons by (•) and (×) in the diagram. [Atomic No. : Ca = 20, O = 8, Cl = 17, H = 1] [2]
(a) Calcium oxide (b) Chlorine molecule

Ans. (a)



(b)



Chlorine molecule

(ii) Identify the **gas evolved** and give the **chemical test** in each of the following cases : [2]
(a) Dilute hydrochloric acid reacts with sodium sulphite.
(b) Dilute hydrochloric acid reacts with iron (II) sulphide.

Ans. (a) Sulphur dioxide gas is evolved. The gas turns acidified potassium dichromate paper green.
(b) Hydrogen sulphide gas is evolved. The gas turns moist lead acetate paper black.

(iii) A metal article is to be electroplated with silver. The electrolyte selected is sodium argentocyanide.
(a) What kind of salt is sodium argentocyanide? [3]
(b) Why is it preferred to silver nitrate as an electrolyte?
(c) State one condition to ensure that the deposit is smooth, firm and long lasting.

Ans. (a) Sodium argentocyanide is a **complex salt.**
(b) Sodium argentocyanide is preferred to silver nitrate as it does hydrolyse in aqueous solution.
(c) The metal to be electroplated should be absolutely free from oxides of metals, grease, etc., and low current density should be used.

(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.

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