ICSE 2024 EXAMINATION

CHEMISTRY

SAMPLE PAPER - 3

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) Ionisation potential increases over a period from left to right because the :

(a) Atomic radius increases and nuclear charge increases
(b) Atomic radius decreases and nuclear charge decreases
(c) Atomic radius increases and nuclear charge decreases
(d) Atomic radius decreases and nuclear charge increases

(ii) A compound X consists of only molecules. Hence X will have :

(a) A crystalline hard structure
(b) A low melting point and low boiling point
(c) An ionic bond
(d) A strong force of attraction between its molecules.

(iii) When fused lead bromide is electrolysed we observe :

(a) a silver grey deposit at anode and a reddish brown deposit at cathode
(b) a silver grey deposit at cathode and a reddish brown deposit at anode
(c) a silver grey deposit at cathode and reddish brown fumes at anode
(d) silver grey fumes at anode and reddish brown fumes at cathode.

(iv) The main ore used for the extraction of aluminium is :

(a) Haematite (b) Calamine (c) Bauxite (d) Cryolite

(v) Heating an ore in a limited supply of air or in the absence of air at a temperature just below its melting point is known as :

(a) smelting (b) ore dressing (c) calcination (d) bessemerisation

(vi) If an element A belongs to Period 3 and Group II then it will have,

(a) 3 shells and 2 valence electrons (b) 2 shells and 3 valence electrons
(c) 3 shells and 3 valence electrons (d) 2 shells and 2 valence electrons

(vii) The molecule containing a triple co-valent bond is :

(a) ammonia (b) methane (c) water (d) nitrogen

(viii) The electrolyte used for electroplating an article with silver is :

(a) silver nitrate solution (b) silver cyanide solution

(c) sodium argentocyanide solution (d) nickel sulphate solution

(ix) Aluminium powder is used in thermite welding because,

(a) it is a strong reducing agent (b) it is a strong oxidising agent

(c) it is corrosion resistant (d) it is a good conductor of heat.

(x) The I.U.P.A.C. name of acetylene is ,

(a) propane (b) propyne (c) ethene (d) ethyne

(xi) Among the elements given below, the element with the least electronegativity is :

(a) Lithium (b) Carbon (c) Boron (d) Fluorine

(xii) Identify the statement which does ***not*** describe the property of alkenes :

(a) They are unsaturated hydrocarbons

(b) They decolorise bromine water

(c) They can undergo addition as well as substitution reactions

(d) They undergo combustion with oxygen forming carbon dioxide and water.

(xiii) This is **not** alloy of copper :

(a) Brass (b) Bronze (c) Solder (d) Duralumin

(xiv) Bonding in this molecule can be understood to involve coordinate bonding

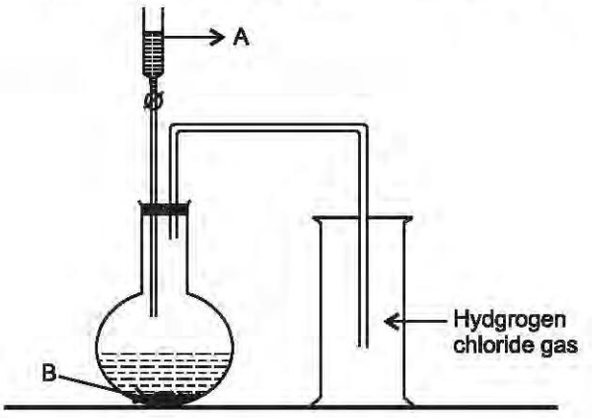
(a) Carbon tetrachloride (b) Hydrogen (c) Hydrogen chloride (d) Ammonium chloride

(xv) The molecular formula of an organic compound is $H_4C_2O_4$. Then its empirical formula is

(a) HCO_2 (b) $H_2C_2O_2$ (c) H_2CO (d) H_2CO_2

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 salts given in column A with their **method of preparation** given in Column B. [5]

Column A	Column B
(a) $Pb(NO_3)_2$ from PbO	1. Simple displacement
(b) $MgCl_2$ from Mg	2. Titration
(c) $FeCl_3$ from Fe	3. Neutralization
(d) $NaNO_3$ from NaOH	4. Precipitation
(e) $ZnCO_3$ from $ZnSO_4$	5. Combination

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

(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) The basicity of acetic acid is _____. (3, 1, 4)

(d) Conversion of ethene to ethane is an example of _____. (hydration/hydrogenation)

(e) The product formed when ethene gas reacts with water in the presence of sulphuric acid is _____. (Ethanol/ethanal/ethanoic acid)

(iv) Identify the following : [5]

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

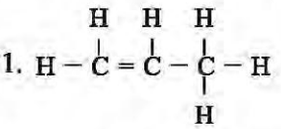
(b) An alkane whose molecular mass is 58. (H = 1; C = 12)

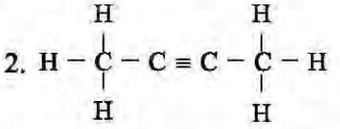
(c) A solid which when kept in the open, forms a solution after sometime.

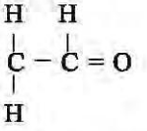
(d) An alloy used in electrical fittings.

(e) The process by which certain ores, specially, carbonates are converted to oxides in the absence of air.

(v) (a) Write the IUPAC names of each of the following : [5]

1. 

2. 

3. 

(b) **Rewrite** the following sentences by using the correct symbol > **(greater than)** or < **(less than)** in the blanks given :

1. The ionization potential of Potassium is _____ that of Sodium.
2. The electronegativity of Iodine is _____ that of Chlorine.

Section B

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

Question 3

(i) Identify the anion present in each of the following compounds : [2]

(a) A salt **M** on treatment with concentrated sulphuric acid produces a gas which fumes in moist air and gives dense fumes with ammonia.

(b) A salt **D** on treatment with dilute sulphuric acid produces a gas which turns limewater milky but has no effect on acidified potassium dichromate solution.

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

(a) $Cu(NO_3)_2 \xrightarrow{Heat}$

(b) $Pb(NO_3)_2 + H_2S \xrightarrow{Heat}$

(iii) Arrange the following according to the instructions given in brackets : [3]

(a) Li, K, Na, H (In the decreasing order of their ionization potential)

(b) F, B, N, O (In the increasing order of electron affinity)

(c) Ethane, methane, ethene, ethyne. (In the increasing order of the molecular weight)

(iv) Fill up the blanks with the correct choice given in brackets. [3]

(a) Ionic or electrovalent compounds do not conduct electricity in their _____ state. (fused/solid)

(b) Electrolysis of aqueous sodium chloride solution will form _____ at the cathode. (hydrogen gas/sodium metal)

(c) Dry hydrogen chloride gas can be collected by _____ displacement of air. (downward/upward)

Question 4

(i) Answer the following questions based on the extraction of aluminium from alumina by Hall-Heroult's process : [2]

(a) Why is powdered coke sprinkled on top of the electrolyte?

(b) Name the electrode, from which aluminium is collected.

(ii) Give two tests for HCl gas. [2]

(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) Explain the following : [3]

(a) The electrolysis of acidulated water is considered to be an example of catalysis.

(b) Almost 90% of all known compounds are organic in nature.

(c) It is dangerous to burn methane in an insufficient supply of air.

Question 5

(i) 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.

(ii) Identify the cations of the following case : [2]

(a) NaOH solution when added to solution (A) gives a reddish brown precipitate.

(b) Cation that does not form a precipitate with ammonium hydroxide but forms one with sodium hydroxide.

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

(a) Preparation of methane from iodomethane.

(b) Action of concentrated sulphuric acid on Sulphur.

(c) Laboratory preparation of ammonia from ammonium chloride.

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

(a) Action of Sodium hydroxide solution on ferrous sulphate solution.

(b) Burning of ammonia in air.

(c) Action of concentrated Sulphuric acid on hydrated copper sulphate.

Question 6

(i) State the type of bonding in the following molecules : [2]

(a) Water

(b) Calcium oxide

(ii) Calcium carbide is used for the artificial ripening of fruits. Actually the fruit ripens because of the heat evolved while calcium carbide reacts with moisture. During this reaction calcium hydroxide and acetylene gas is formed. If 200 cm^3 of acetylene is formed from a certain mass of calcium carbide, find the volume of oxygen required and carbon dioxide formed during the complete combustion. The combustion reaction can be represented as below. [2]

$$2C_2H_2(g) + 5O_2(g) \rightarrow 4CO_2(g) + 2H_2O(g)$$

(iii) Calculate : [3]

(a) The volume occupied by 80 g of carbon dioxide at STP.

(b) Calculate the number of molecules in 4.4 gm of CO_2. [Atomic mass of C = 12, O = 16]

(iv) How conc sulphuric acid acts as dehydrating agent? Support your answer by three chemical reactions. [3]

Question 7

(i) A gaseous hydrocarbon contains 82.76% of carbon. Given that its vapour density is 29, find its **molecular formula**. [C=12, H=1] [2]

(ii) Identify the following : [2]

(a) The type of reactions alkanes undergo.

(b) The type of reactions alkenes undergo.

(iii) (a) Copy and complete the following table : [3]

	Anode	Electrolyte
Purification of copper		

(b) Write the equation taking place at the anode.

(iv) Choose the most appropriate answer from the following list of oxides which fit the **description**. Each answer may be used only once :

$[SO_2, Al_2O_3, MgO, CO, Na_2O]$

(a) A basic oxide.

(b) An oxide which dissolves in water forming an acid.

(c) An amphoteric oxide. [3]

Question 8

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

(a) Nitrogen molecule [N = 7]

(b) Sodium chloride [Na = 11, Cl = 17]

(ii) Give a chemical test to distinguish between the following pairs of chemicals : [2]

(a) Lead nitrate solution and Zinc nitrate solution

(b) Sodium chloride solution and Sodium nitrate solution.

(iii) An element ***L*** consists of molecules and ***M*** consists of ions. [3]

(a) What type of bonding is present in the particles that make up ***L***?

(b) When ***L*** is heated with iron metal, it forms a compound ***FeL***. What chemical term would you use to describe the change undergone by ***L***?

(c) Identify M.

(iv) The following table represents the elements and the atomic number. With reference to this, answer the following using only the alphabets given in the table. [3]

Element	Atomic number
P	13
Q	7
R	10

(a) Which element combines with hydrogen to form a basic gas?

(b) Which element has an electron affinity zero?

(c) Name the element, which forms an ionic compound with chlorine.

◆ ◆ ◆

SOLUTION

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) Ionisation potential increases over a period from left to right because the :
- (a) Atomic radius increases and nuclear charge increases
- (b) Atomic radius decreases and nuclear charge decreases
- (c) Atomic radius increases and nuclear charge decreases
- (d) Atomic radius decreases and nuclear charge increases

(ii) A compound X consists of only molecules. Hence X will have :
- (a) A crystalline hard structure
- (b) A low melting point and low boiling point
- (c) An ionic bond
- (d) A strong force of attraction between its molecules.

(iii) When fused lead bromide is electrolysed we observe :
- (a) a silver grey deposit at anode and a reddish brown deposit at cathode
- (b) a silver grey deposit at cathode and a reddish brown deposit at anode
- (c) a silver grey deposit at cathode and reddish brown fumes at anode
- (d) silver grey fumes at anode and reddish brown fumes at cathode.

(iv) The main ore used for the extraction of aluminium is :
- (a) Haematite
- (b) Calamine
- (c) Bauxite
- (d) Cryolite

(v) Heating an ore in a limited supply of air or in the absence of air at a temperature just below its melting point is known as :
- (a) smelting
- (b) ore dressing
- (c) calcination
- (d) bessemerisation

(vi) If an element A belongs to Period 3 and Group II then it will have,
- (a) 3 shells and 2 valence electrons
- (b) 2 shells and 3 valence electrons
- (c) 3 shells and 3 valence electrons
- (d) 2 shells and 2 valence electrons

(vii) The molecule containing a triple co-valent bond is :
- (a) ammonia
- (b) methane
- (c) water
- (d) nitrogen

(viii) The electrolyte used for electroplating an article with silver is :

(a) silver nitrate solution (b) silver cyanide solution

(c) sodium argentocyanide solution (d) nickel sulphate solution

(ix) Aluminium powder is used in thermite welding because,

(a) it is a strong reducing agent (b) it is a strong oxidising agent

(c) it is corrosion resistant (d) it is a good conductor of heat.

(x) The I.U.P.A.C. name of acetylene is ,

(a) propane (b) propyne (c) ethene (d) ethyne

(xi) Among the elements given below, the element with the least electronegativity is :

(a) Lithium (b) Carbon (c) Boron (d) Fluorine

(xii) Identify the statement which does ***not*** describe the property of alkenes :

(a) They are unsaturated hydrocarbons

(b) They decolorise bromine water

(c) They can undergo addition as well as substitution reactions

(d) They undergo combustion with oxygen forming carbon dioxide and water.

(xiii) This is **not** alloy of copper :

(a) Brass (b) Bronze (c) Solder (d) Duralumin

(xiv) Bonding in this molecule can be understood to involve coordinate bonding

(a) Carbon tetrachloride (b) Hydrogen (c) Hydrogen chloride (d) Ammonium chloride

(xv) The molecular formula of an organic compound is $H_4C_2O_4$. Then its empirical formula is

(a) HCO_2 (b) $H_2C_2O_2$ (c) H_2CO (d) H_2CO_2

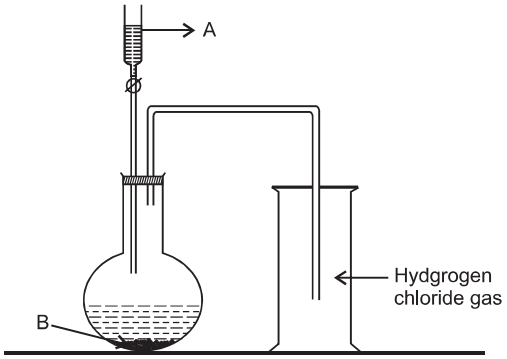
ANSWERS

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

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

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 salts given in column A with their **method of preparation** given in Column B. [5]

Column A	Column B
(a) $Pb(NO_3)_2$ from PbO	1. Simple displacement
(b) $MgCl_2$ from Mg	2. Titration
(c) $FeCl_3$ from Fe	3. Neutralization
(d) $NaNO_3$ from NaOH	4. Precipitation
(e) $ZnCO_3$ from $ZnSO_4$	5. Combination

Ans. (a) $Pb(NO_3)_2$ from PbO — 2. Titration

(b) $MgCl_2$ from Mg — 1. Simple displacement

(c) $FeCl_3$ from Fe — 5. Combination

(d) $NaNO_3$ from NaOH — 3. Neutralisation

(e) $ZnCO_3$ from $ZnSO_4$ — 4. Precipitation

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

(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) The basicity of acetic acid is _____. (3, 1, 4)

(d) Conversion of ethene to ethane is an example of _____. (hydration/hydrogenation)

(e) The product formed when ethene gas reacts with water in the presence of sulphuric acid is _____. (Ethanol/ethanal/ethanoic acid)

Ans. (a) Nickel (b) Acetic Acid (c) 1 (d) Hydrogenation (e) Ethanol

(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)

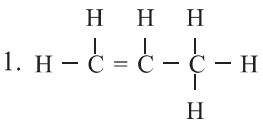
(c) A solid which when kept in the open, forms a solution after sometime.

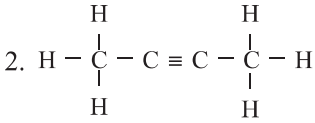
(d) An alloy used in electrical fittings.

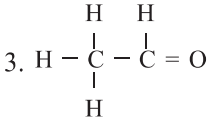
(e) The process by which certain ores, specially, carbonates are converted to oxides in the absence of air.

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

(v) (a) Write the IUPAC names of each of the following : [5]

1. 

2. 

3. 

(b) **Rewrite** the following sentences by using the correct symbol > **(greater than)** or < **(less than)** in the blanks given :

1. The ionization potential of Potassium is _____ that of Sodium.
2. The electronegativity of Iodine is _____ that of Chlorine.

Ans. (a) 1. Propene 2. 2-Butyne 3. Ethanal.

(b) 1. The ionization potential of potassium is < **(less than)** that of sodium.

2. The electronegativity of Iodine is < **(less than)** that of chlorine.

Section B

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

Question 3

(i) Identify the anion present in each of the following compounds : [2]

(a) A salt **M** on treatment with concentrated sulphuric acid produces a gas which fumes in moist air and gives dense fumes with ammonia.

(b) A salt **D** on treatment with dilute sulphuric acid produces a gas which turns limewater milky but has no effect on acidified potassium dichromate solution.

Ans. (a) M has chloride (Cl^-) anion.

(b) D has carbonate $\left(CO_3^{2-}\right)$ or bicarbonate $\left(HCO_3^{-1}\right)$ anion.

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

(a) $Cu(NO_3)_2 \xrightarrow{Heat}$

(b) $Pb(NO_3)_2 + H_2S \xrightarrow{Heat}$

Ans. (a) $2Cu(NO_3)_2 \xrightarrow{Heat} 2CuO + 4NO_2 + O_2$

(b) $Pb(NO_3)_2 + H_2S \longrightarrow 2HNO_3 + PbS$

(iii) Arrange the following according to the instructions given in brackets : [3]

(a) Li, K, Na, H (In the decreasing order of their ionization potential)

(b) F, B, N, O (In the increasing order of electron affinity)

(c) Ethane, methane, ethene, ethyne. (In the increasing order of the molecular weight)

Ans. (a) H > Li > Na > K (b) N < B < O < F

(c) Methane < Ethyne < Ethene < Ethane

(iv) Fill up the blanks with the correct choice given in brackets. [3]

(a) Ionic or electrovalent compounds do not conduct electricity in their _____ state. (fused/solid)

(b) Electrolysis of aqueous sodium chloride solution will form _____ at the cathode. (hydrogen gas/sodium metal)

(c) Dry hydrogen chloride gas can be collected by _____ displacement of air. (downward/upward)

Ans. (a) Solid (b) hydrogen gas (c) upward

Question 4

(i) Answer the following questions based on the extraction of aluminium from alumina by Hall-Heroult's process : [2]

(a) Why is powdered coke sprinkled on top of the electrolyte?

(b) Name the electrode, from which aluminium is collected.

Ans. (a) Powdered coke prevents the burning of carbon anodes, which are projecting out of the electrolyte on account of the high temperature. It also prevents heat loss from the molten electrolyte which helps in maintaining temperature.

(b) Cathode (Gas carbon lining)

(ii) Give two tests for HCl gas. [2]

Ans. 1. It forms dense while fumes when glass rod dipped in ammonia solution is held near it.

2. It forms curdy white precipitate when passed through a solution of silver nitrate.

(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) Explain the following : [3]

(a) The electrolysis of acidulated water is considered to be an example of catalysis.

(b) Almost 90% of all known compounds are organic in nature.

(c) It is dangerous to burn methane in an insufficient supply of air.

Ans. (a) The amount of acid in the water does not change. Furthermore, it does not take part in electrochemical reaction, but makes the water a good conductor of electricity.

(b) Carbon atom has four valence electrons and is highly versatile. It can share four pairs of electrons with other atoms of carbon or other elements to form straight chains, branched chains or long chains so as to form very large number of compounds. Thus 90% of compounds are organic.

(c) In insufficient supply of air methane burns to form carbon monoxide gas, which is highly poisonous and hence, can cause death.

Question 5

(i) 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.

(ii) Identify the cations of the following case : [2]

(a) NaOH solution when added to solution (A) gives a reddish brown precipitate.

(b) Cation that does not form a precipitate with ammonium hydroxide but forms one with sodium hydroxide.

Ans. (a) Ferric (Fe^{3+}) ion. (b) Magnesium (Mg^{2+}) ion.

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

(a) Preparation of methane from iodomethane.

(b) Action of concentrated sulphuric acid on Sulphur.

(c) Laboratory preparation of ammonia from ammonium chloride.

Ans. (a) $CH_3I + 2(H) \xrightarrow{Zn/Cu\ couple} CH_4 + HI$

(b) $S + 2H_2SO_4\ (Conc) \xrightarrow{heat} 2H_2O + 3SO_2$

(c) $2NH_4Cl + Ca(OH_2) \xrightarrow{CaO} CaCl_2 + 2H_2O + 2NH_3$

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

(a) Action of Sodium hydroxide solution on ferrous sulphate solution.

(b) Burning of ammonia in air.

(c) Action of concentrated Sulphuric acid on hydrated copper sulphate.

Ans. (a) A dirty green precipitate is formed which is insoluble in excess of sodium hydroxide solution.

(b) Ammonia gas burns with a pale blue flame forming nitrogen and water vapour.

(c) Blue coloured copper sulphate crystals crumble with a hissing sound and change to white powdery mass.

Question 6

(i) State the type of bonding in the following molecules : [2]

(a) Water (b) Calcium oxide

Ans. (a) Water ⟶ Covalent bond

(b) Calcium oxide ⟶ Ionic bond or electrovalent bond

(ii) Calcium carbide is used for the artificial ripening of fruits. Actually the fruit ripens because of the heat evolved while calcium carbide reacts with moisture. During this reaction calcium hydroxide and acetylene gas is formed. If 200 cm^3 of acetylene is formed from a certain mass of calcium carbide, find the volume of oxygen required and carbon dioxide formed during the complete combustion. The combustion reaction can be represented as below. [2]

$$2C_2H_2(g) + 5O_2(g) \rightarrow 4CO_2(g) + 2H_2O(g)$$

Ans.

$$2C_2H_2(g) + 5O_2(g) \longrightarrow 4CO_2(g) + 2H_2O(g)$$

By Gay Lussac's law: 2 Vol. : 5 Vol. : 4 Vol.

1 Vol. : $\frac{5}{2}$ Vol. : $\frac{4}{2}$ Vol.

$\therefore$ 200 cm^3 : $\frac{5}{2} \times 200$ cm^3 : $\frac{4}{2} \times 200$ cm^3

200 cm^3 : 500 cm^3 : 400 cm^3

$\therefore$ Volume of oxygen required = 500 cm^3

Volume of carbon dioxide formed = 400 cm^3

(iii) Calculate : [3]

(a) The volume occupied by 80 g of carbon dioxide at STP.

(b) Calculate the number of molecules in 4.4 gm of CO_2. [Atomic mass of C = 12, O = 16]

Ans. (a) Gram-molecular weight of carbon dioxide = $(12 + 2 \times 16)$ g = 44 g

Now, 44 g of carbon dioxide occupies at STP = 22.4 dm^3

$\therefore$ 80 g of carbon dioxide occupies at STP = $\frac{22.4 \text{ dm}^3 \times 80 \text{ g}}{44 \text{ g}} = 40.73 \text{ dm}^3$

(b) 44 g of carbon dioxide contains number of carbon dioxide molecules = 6×10^{23}

$\therefore$ 4.4 g of carbon dioxide contains number of carbon dioxide molecules

$= \frac{6 \times 10^{23} \times 4.4 \text{ g}}{44 \text{ g}} = 6 \times 10^{22}$ molecules.

(iv) How conc sulphuric acid acts as dehydrating agent? Support your answer by three chemical reactions. [3]

Ans. (a) It dehydrates sugar to carbon

$$C_{12}H_{22}O_{11} + 11H_2SO_4(\text{conc}) \longrightarrow 12C + 11H_2SO_4.H_2O$$

(b) It dehydrates ethyl alcohol to ethene

$$C_2H_5OH + H_2SO_4(\text{conc}) \longrightarrow C_2H_4 + H_2SO_4.H_2O$$

(c) It dehydrates copper sulphate crystals.

$$CuSO_4.5H_2O + 5H_2SO_4(\text{conc}) \longrightarrow CuSO_4 + 5H_2SO_4.H_2O$$

Question 7

(i) A gaseous hydrocarbon contains 82.76% of carbon. Given that its vapour density is 29, find its **molecular formula**. [C=12, H=1] [2]

Ans.

Element	Percentage At. Weight	Atomic weight	Relative number of moles	Simple ratio of atoms
C	82.7	12	82.7 ÷ 12 = 6.9	6.9 ÷ 6.9 = 1 or 2
H	17.3	1	17.3 ÷ 1 = 17.3	17.3 ÷ 6.9 = 2.5 or 5

$\therefore$ Empirical formula of compound = C_2H_5.

$\therefore$ Empirical weight of compound = $2 \times 12 + 5 \times 1 = 29$

Vapour of density of compound = 29

$\therefore$ Molecular weight of compound = 2 × V.D. = $2 \times 29 = 58$.

Now, Molecular weight = n × empirical weight

$58 = n \times 29$

$\therefore \quad n = 2$

$\therefore$ Molecular formula of compound $= n \times$ Empirical formula

$= 2 \times C_2H_5 = \mathbf{C_4H_{10}}$.

(ii) Identify the following : [2]

(a) The type of reactions alkanes undergo.

(b) The type of reactions alkenes undergo.

Ans. (a) Substitution reaction. (b) Addition reaction.

(iii) (a) Copy and complete the following table : [3]

	Anode	Electrolyte
Purification of copper		

(b) Write the equation taking place at the anode.

Ans. (a) Anode — Impure copper.

Electrolyte — Acidulated copper sulphate solution.

(b) $Cu - 2e^- \longrightarrow Cu^{2+}$

(iv) Choose the most appropriate answer from the following list of oxides which fit the **description**. Each answer may be used only once :

$[SO_2, Al_2O_3, MgO, CO, Na_2O]$

(a) A basic oxide.

(b) An oxide which dissolves in water forming an acid.

(c) An amphoteric oxide. [3]

Ans. (a) Basic oxide : MgO.

(b) An oxide which dissolves in water forming an acid : SO_2.

(c) An amphoteric oxide : Al_2O_3.

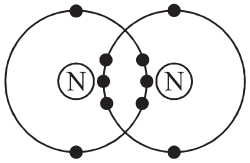
Question 8

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

(a) Nitrogen molecule [N = 7]

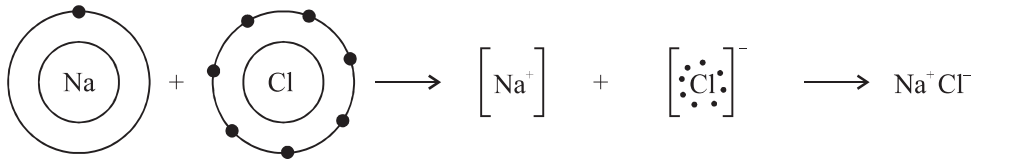
(b) Sodium chloride [Na = 11, Cl = 17]

Ans. (a)



Nitrogen molecule

(b)



Sodium atom (2, 8, 1) | Chlorine atom (2, 8, 7) | Sodium cation (2, 8) | Chlorine anion (2, 8, 8) | Sodium chloride

(ii) Give a chemical test to distinguish between the following pairs of chemicals : [2]

(a) Lead nitrate solution and Zinc nitrate solution

(b) Sodium chloride solution and Sodium nitrate solution.

Ans. (a) When lead nitrate and zinc nitrate solutions are reacted with ammonium hydroxide separately, then in case of lead nitrate a chalky-white precipitate is formed, which does not dissolve in excess of ammonium hydroxide. In case of zinc nitrate, a white gelatin like precipitate is formed, which dissolves in excess of ammonium hydroxide.

(b) Treat either of the solution with few drops of silver nitrate solution. A curdy white precipitate is formed in case of sodium chloride solution, but no visible reaction takes place in sodium nitrate solution.

(iii) An element ***L*** consists of molecules and ***M*** consists of ions. [3]

(a) What type of bonding is present in the particles that make up ***L***?

(b) When ***L*** is heated with iron metal, it forms a compound ***FeL.*** What chemical term would you use to describe the change undergone by ***L***?

(c) Identify M.

Ans. (a) The particles in 'L' bind with each other with covalent bond.

(b) L undergoes reduction. (c) M is a strong electrolyte.

(iv) The following table represents the elements and the atomic number. With reference to this, answer the following using only the alphabets given in the table. [3]

Element	Atomic number
P	13
Q	7
R	10

(a) Which element combines with hydrogen to form a basic gas?

(b) Which element has an electron affinity zero?

(c) Name the element, which forms an ionic compound with chlorine.

Ans. (a) Q (b) R (c) P

v v v