ICSE 2025 EXAMINATION

Sample Question Paper - 15

Chemistry

Time: 2 Hours. **Total Marks: 80**

Maximum Marks: 80
Time allowed: Two hours
Answers to this paper must be written on the paper provided separately.
You will not be allowed to write during 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) The element belonging to the third period and 17th group of the periodic table is:
   (a) Carbon
   (b) Bromine
   (c) Phosphorus
   (d) Berylium

(ii) The one which will NOT conduct electricity:
   (a) Molten NaCl
   (b) NaCl dissolved in water
   (c) Solid NaCl
   (d) Both molten and solid NaCl

(iii) The pH of ferric chloride solution is:
   (a) More than 7
   (b) Less than 7
   (c) Equal to 7
   (d) None of these

(iv) The electrolysis of acidified water is an example of:

(a) Reduction

(b) Oxidation

(c) Redox reaction

(d) Synthesis

(v) **Assertion (A)**: 1 volume of methane reacts with 2 volumes of oxygen to produce 1 volume of carbon dioxide and 2 volumes of water.

Reason (R): According to Gay-Lussac's law, volume of gases is considered to be zero.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

(vi) All metals exist as a solid at room temperature except for the metal 'X'. Name the metal 'X'.

(a) Gold

(b) Tungsten

(c) Mercury

(d) Potassium

(vii) An example of a basic salt is:

(a) Na_2SO_4

(b) $NaHSO_4$

(c) NaCl

(d) Pb(OH)Cl

(viii) The rusting of iron is an example of:

(a) Oxidation reaction

(b) Reduction reaction

(c) Redox reaction

(d) Decomposition reaction

(ix) Alkenes are normally called as:

(a) Ethanal

(b) Paraffins

(c) Olefins

(d) Acetylene

(x) In the periodic table, alkaline earth metals are placed in the group:

(a) 1

(b) 2

(c) 3 to 12

(d) 18

(xi) **Assertion (A)**: Iron (II) sulphate forms dirty green ppt. with ammonium hydroxide.
Reason (R): $FeSO_4$ reacts with ammonium hydroxide to form insoluble $Fe(OH)_3$.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

(xii) The salt solutions containing ferric ions are of:

(a) Blue colour
(b) Black colour
(c) Yellow colour
(d) Colourless

(xiii) Molecular formula of an organic compound is $C_2H_4O_2$. The empirical formula of the same compound is:

(a) CHO
(b) CH_2O
(c) $C_2H_4O_2$
(d) $C_4H_8O_4$

(xiv) The major impurity present in pig iron is:

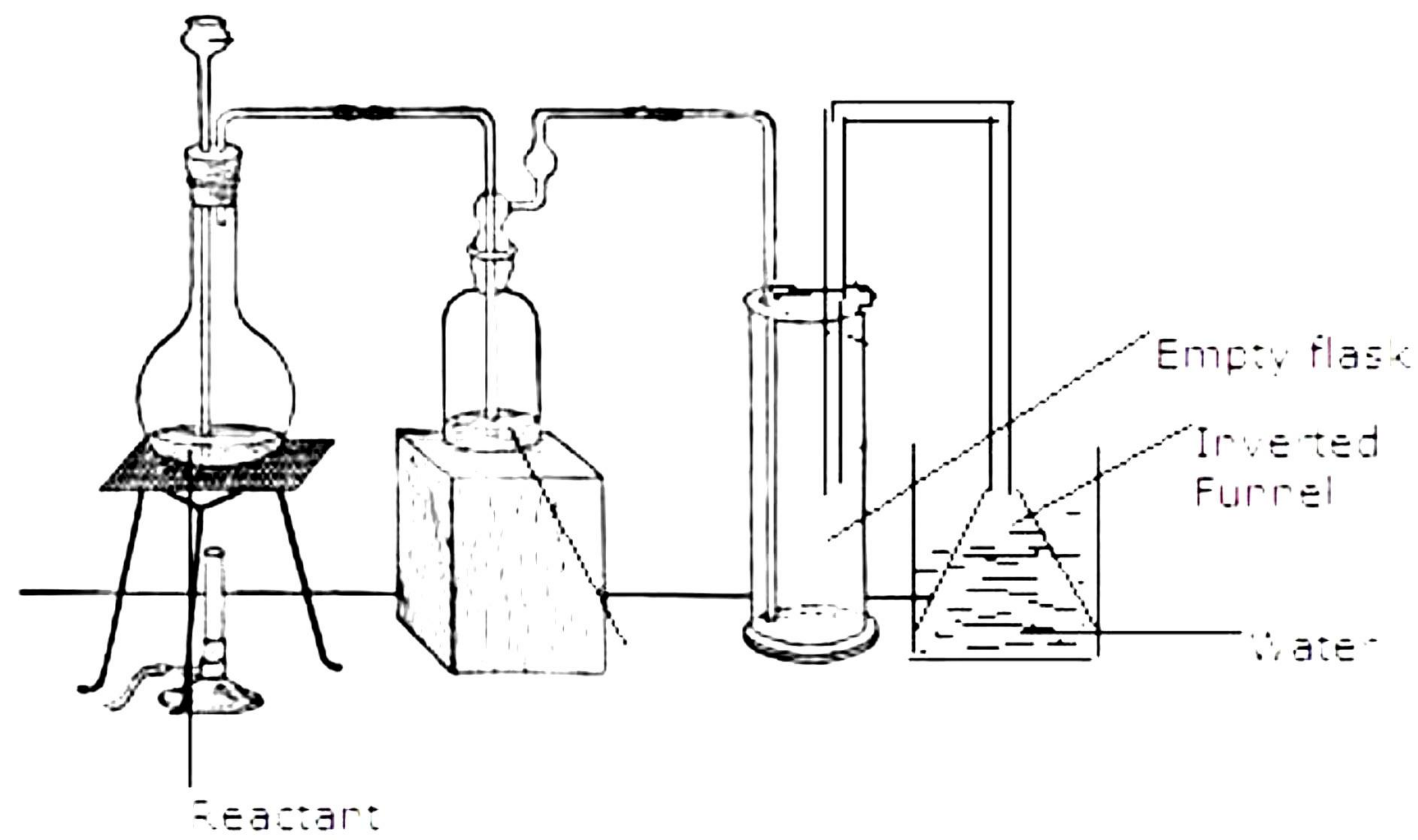
(a) Carbon
(b) Sodium
(c) Calcium
(d) Phosphorus

(xv) The salt solution which does not react with ammonium hydroxide is:

(a) Calcium nitrate
(b) Zinc nitrate
(c) Lead nitrate
(d) Copper nitrate

Question 2

(i) Study the figure given below and answer the questions which follow: [5]



(a) Name the acid prepared by this method.
(b) Name the reactants used.
(c) Why empty flask is used?
(d) What drying agent is used? Why is this dying agent chosen?
(e) What is the role of the inverted funnel in the arrangement?

(ii) Match the following: [5]

Name	Uses
Boric acid	Flavoured drinks
Nitric acid	Eye-wash
Carbonic acid	Explosive
Sodium hydroxide	Drying agent
Calcium oxide	Manufacture of soap

(iii) Fill in the blanks: [5]

(a) Powdered sodium chloride (common salt) does not conduct an electric current, but it does so when ___ or when ____.
(b) Molten lead bromide conducts electricity. It is called an Electrolyte. It is composed of lead ions and bromide ions. The lead ions are ___charged and are called____. The bromide ions are ____ charged and are called _____.
(c) Substances which conduct electricity in the solid state are generally _____.
(d) The electron releasing tendency of zinc is ____than that of copper.
(e) A solution of HCl gas in water conducts electricity because ____, but a solution of HCl gas in toluene does not conduct an electric current because____.

(iv) Name the type of elements, which have their [5]

(a) outermost shell complete

(b) outermost shell incomplete

(c) two outermost shells incomplete

(d) one electron short of octet

(e) Two electrons in the outermost orbit.

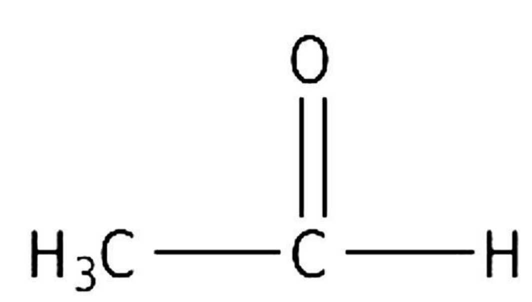
(v) [5]

(a) Draw the structural formula for the following:

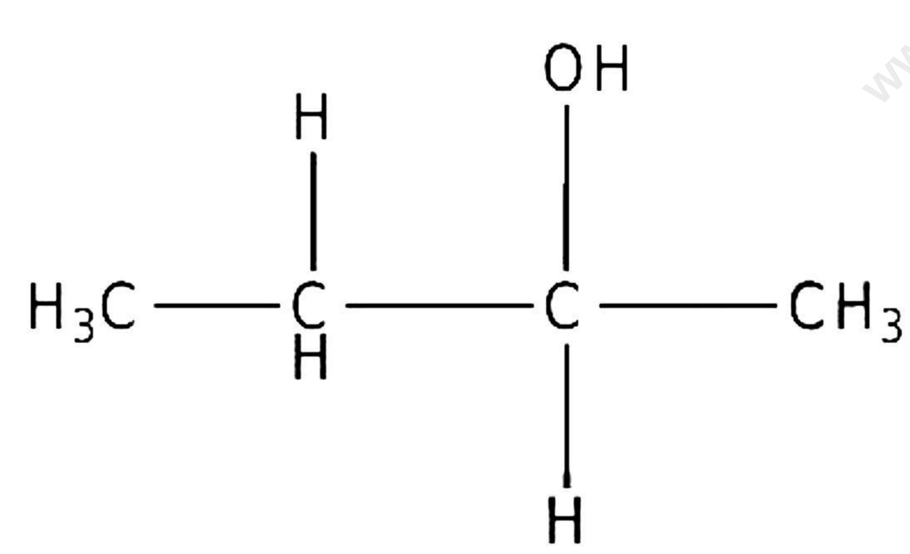
1. Pent-2-one
2. Acetic acid
3. But-2-ene

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

1.



2.



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 lime water milky but has no effect on acidified potassium dichromate solution.

(ii) State what you would observe when [2]

(a) Washing soda crystals are exposed to the atmosphere

(b) Ferric chloride salt is exposed to the atmosphere.

(iii) [3]

(a) The vapour density of a gas is 8. What would be the volume occupied by 24.0 g of the gas at STP?

(b) Define gram atomic mass. What is the gram atomic mass of oxygen atom.

(iv) X is an element in the form of a powder. X burns in oxygen and the product is soluble in water. The solution is tested with litmus. Write down the only word which will correctly complete each of the following sentences: [3]

(a) If X is a metal, then litmus will turn _____.

(b) If X is a non-metal, then litmus will turn _____.

(c) If X is a reactive metal, then _____ will be evolved when X reacts with dilute sulphuric acid.

Question 4

(i) Write balanced chemical equations for the following: [2]

(a) Action of water on calcium carbide

(b) Heating of ethanol at 170°C in the presence of conc. sulphuric acid

(ii) An element L consists of molecules. [2]

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

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

(iii) [3]

(a) Name the solution used to react with bauxite as a first step in obtaining pure aluminium oxide in Bayer's process.

(b) Write the equation for the reaction where aluminium oxide for the electrolytic extraction of aluminium is obtained by heating aluminium hydroxide.

(c) Name the compound added to pure alumina to lower the fusion temperature during the electrolytic reduction of alumina.

(iv) [3]

(a) Write whether following statements are true or false.

1. Zinc sulphate on reacting with sodium hydroxide forms chalky white ppt. which is insoluble in excess of sodium hydroxide solution.
2. Fountain experiment of hydrogen chloride gas gives blue fountain.

(b) Meenal added copper filings to conc. HNO_3. Write balanced chemical; reaction for the same.

Question 5

(i) Name the most common ore of zinc and Iron. Name the processes by which the named ores are concentrated. [2]

(ii) [2]

(a) Name the product formed at the anode during the electrolysis of acidified water using platinum electrodes.

(b) Name the metallic ions that should be present in the electrolyte when an article made of copper is to be electroplated with silver.

(iii) What happens when:

(a) Methane reacts with chlorine in presence of sunlight.

(b) Preparation of ethyl chloride from ethane

(c) Ethylene reacts with bromine.

(iv) Give the preparation of the following salt: [3]

(a) Zinc sulphate

(b) Ferrous sulphide

(c) Barium sulphate

Question 6

(i) Give equations for the reactions occurring at the cathode and anode during the electrolysis of acidulated water with inert electrodes. [2]

(ii) Propane burns in air according to the following equation: [2]

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

What volume of propane is consumed on using 1000 cm^3 of air, considering only 20% of air contains oxygen?

(iii) Which element from the following has the highest ionisation energy? [3]

(a) P, Na, Cl

(b) F, O, Ne

(c) Ne, He, Ar

Explain your choice.

(iv) Give the name and the balanced equation of hydrolysis of each of the following salt and write type of the salt based on equation: [3]

(a) $FeCl_3$

(b) CH_3COONa

(c) NaCl

Question 7

(i)

(a) Calculate the percentage of nitrogen and oxygen in ammonium nitrate [Relative molecular mass of ammonium nitrate is 80, H = 1, N = 14, O = 16].

(b) Define Gay Lussac's law. [3]

(ii) Three electrolytic cells, A, B and C are connected in separate circuits. Electrolytic cell A contains sodium chloride solution. When the circuit is completed, a bulb in the circuit glows brightly. Electrolytic cell B contains acetic acid solution, and here, the bulb in the circuit glows dimly. The electrolytic cell C contains sugar solution, and the bulb does not glow. Give reason for each of these observations. [3]

(iii) 0.48 grams of a hydrocarbon with vapour density 29 when burnt completely in oxygen produce 896 ml of carbon dioxide at S.T.P. From the given information, calculate the, [4]

(a) Mass of carbon dioxide formed.

(b) Mass of element carbon in carbon dioxide.

(c) Empirical formula of hydrocarbon.

(d) Molecular formula of hydrocarbon.

Question 8

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

$MgCl_2$

(ii) The percentage composition of a gas is Nitrogen 82.35% and Hydrogen 17.64%.

Find the empirical formula of the gas. [N = 14, H = 1] [2]

Given:

N = 82.35%

H =17.64%

Element	% composition	Atomic mass	Atomic ratio	Simplest ratio
H	17.64	1	17.64	3
N	82.35	14	5.8	1

So, the empirical formula is NH_3.

(iii) Answer the following questions with respect to the electrolytic process in the extraction of aluminium: [3]

(a) Identify the components of the electrolyte other than pure alumina and the role played by each.

(b) Explain why powdered coke is sprinkled over the electrolytic mixture.

(iv) An element X has atomic number 17. Answer the following questions. [3]

(a) State the period and group to which it belongs.

(b) Is it a metal or Non Metal?

(c) Write the formula between Y and calcium.

Solution

SECTION A

Solution 1

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

Solution 2

(i)

(a) Hydrochloric acid is prepared by this method.

(b) The reactants are sodium chloride and Sulphuric acid.

(c) The empty flask acts as Anti-Suction device. In case the back suction occurs the water will collect in it and will not reach the generating flask.

(d) The drying agent is Conc. Sulphuric acid. Sulphuric acid is chosen as drying agent because it does not react with HCl.

(e) The Inverted funnel :

- Prevents or minimizes back suction of water.
- Provides a large surface area for absorption of HCl gas.

(ii)

Name	Uses
Boric acid	Eye-wash
Nitric acid	Explosive
Carbonic acid	Flavoured drinks
Sodium hydroxide	Manufacture of soap
Calcium oxide	Drying agent

(iii)

(a) Powdered sodium chloride (common salt) does not conduct an electric current, but it does so when dissolved in water or when melted.

(b) Molten lead bromide conducts electricity .It is called an electrolyte. It is composed of lead ions and bromide ions. The lead ions are positively charged and are called cations. The bromide ions are negatively charged and are called anions.

(c) Substances which conduct electricity in the solid state are generally metals.

(d) The electron releasing tendency of zinc is more than that of copper.

(e) A solution of HCl gas in water conducts electricity because it ionises, but a solution of HCl gas in toluene does not conduct an electric current because it does not ionise in toluene.

(iv)

(a) Noble gases

(b) Representative elements

(c) Transition elements

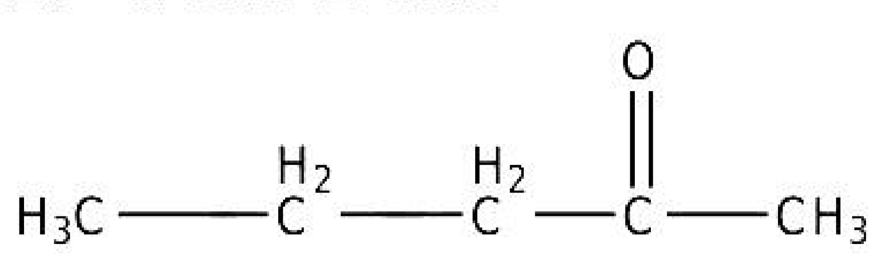
(d) Halogens

(e) Alkaline earth metals

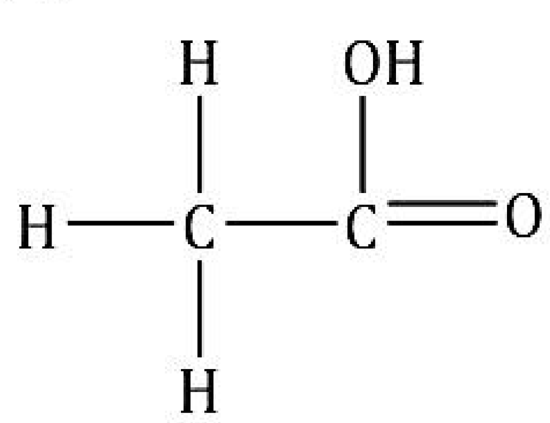
(v)

(a)

1. Pent-2-one

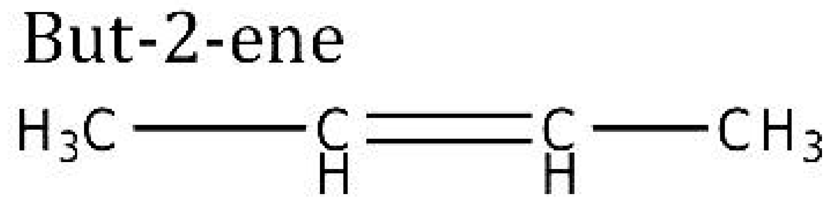


2.



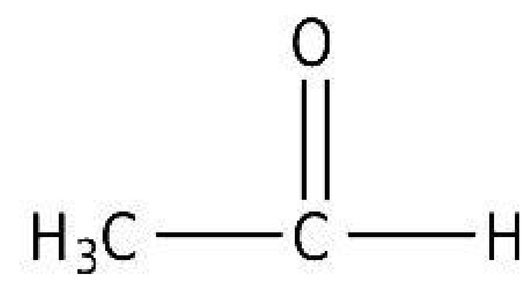
Acetic acid

3. But-2-ene

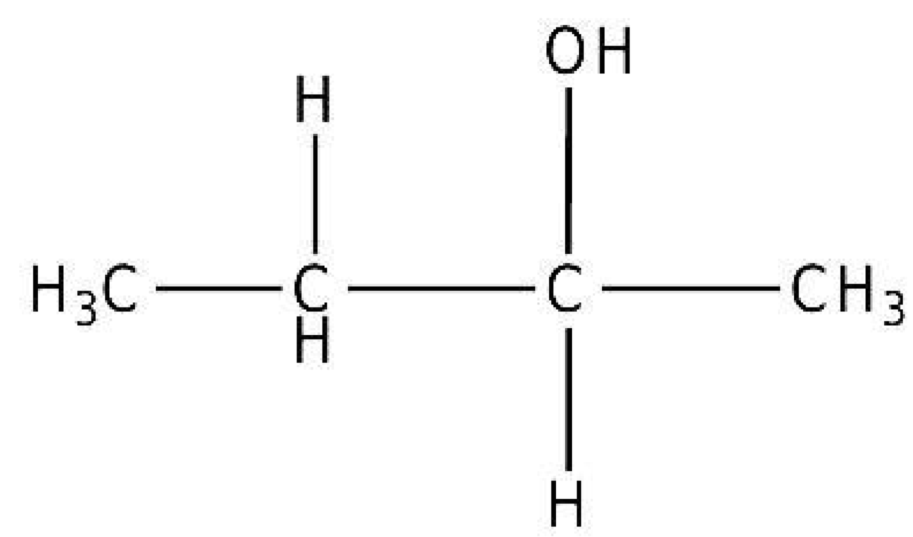


(b)

1. Ethanal



2. Butan-2-ol



SECTION-B

(Attempt any four questions)

Solution 3

(i)

(a) Cl^-

(b) CO_3^{2-}

(ii)

(a) When exposed to atmosphere, it becomes a monohydrate.

(b) It absorbs moisture from the atmosphere to create moist and ultimately dissolves in the absorbed water, forming a saturated solution.

(iii)

(a) Molecular mass = 2 × Vapour density

So, molecular mass of gas = 2 × 8 = 16 g

As we know, molecular mass or molar mass occupies 22.4 litres.

That is,
16 g of gas occupies volume = 22.4 litres

So, 24 g of gas will occupy volume

$$=\frac{22.4}{16}\times 24=33.6L$$

(b) The atomic mass of an element expressed in grams is called gram atomic mass. The atomic mass of oxygen is 16 a. m. u., therefore its gram atomic mass is 16g.

(iv)

a. If X is a metal, then litmus will turn blue.
b. If X is a non-metal, then litmus will turn red.
c. If X is a reactive metal, then hydrogen will be evolved when X reacts with dilute sulphuric acid.

Solution 4

(i)

(a) $2CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2\uparrow$

(b) $2C_2H_5OH \xrightarrow[170^oC]{conc.H_2SO_4} CH_2 = CH_2 + H_2O$

(ii)

(a) Covalent bonding is observed in atoms which are similar. Hence, covalent bonding is present in the particles which make up element L.

(b) When L is heated with iron, it forms a compound FeL.
Here, oxidation of Fe and reduction of L occur as follows:
$Fe \rightarrow Fe^{2+} + 2e^-$
$L + 2e^- \rightarrow L^{2-}$

(iii)
(a) Conc. caustic soda
(b) $2Al(OH)_3 \xrightarrow[1000^\circ C]{Heat} Al_2O_3 + 3H_2O$
(c) Cryolite

(iv)
(a)
1. False –
The correct statement is as follows:
Zinc sulphate on reacting with sodium hydroxide forms gelatinous white ppt. of zinc hydroxide which is soluble in excess of sodium hydroxide solution.
2. False –
The correct statement is as follows:
Fountain experiment of hydrogen chloride gives red fountain since, hydrogen chloride form acidic solution of hydrochloric acid in aqueous medium which turns blue litmus solution taken into red fountain.

(b) $Cu + 4HNO_3(conc.) \longrightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$

Solution 5
(i)

Metal	Ore	Process by which it is concentrated
Zinc	Zinc blende ZnS	Froth floatation process
Iron	Haematite Fe_2O_3	Electromagnetic separation

(ii)
(a) Oxygen is the product formed at the anode.
(b) Ag^+

(iii)
(a)
$$\underset{\text{Methane}}{CH_4} + Cl_2 \xrightarrow{\text{Sunlight}} \underset{\text{Methyl chloride}}{CH_3Cl} + HCl$$
(b) $C_2H_6 + Cl_2 \longrightarrow C_2H_5Cl + HCl$
(c)
$$\underset{\text{Ethylene}}{\begin{array}{c} CH_2 \\ \| \\ CH_2 \end{array}} + Br_2 \rightarrow \underset{\text{1,2-dibrom oethane}}{\begin{array}{c} CH_2Br \\ | \\ CH_2Br \end{array}}$$

(iv)

(a) Zinc sulphate - Displacement

(b) Ferrous sulphide- Synthesis

(c) Barium sulphate- Precipitation

Solution 6

(i)

Reaction at the cathode:

$H^+ + e^- \longrightarrow H$

$H + H \longrightarrow H_2$ (Hydrogen molecule)

Reaction at the anode:

$OH^- - e^- \longrightarrow OH \times 4$

OH^- ion discharge in preference to SO_4^{2-}

$4OH \longrightarrow 2H_2O + O_2$ (Oxygen molecule)

(ii)

Given:

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

Volume of air = 1000 cm^3

Percentage of oxygen in air = 20%

From the given information,

$$\begin{array}{llll} C_3H_8 + & 5O_2 & \longrightarrow 3CO_2 + & 4H_2O \\ 1\text{ vol} & 5\text{ vols} & \quad 3\text{ vols} & 4\text{ vols} \end{array}$$

According to Gay-Lussac's law,

1 vol. of propane consumes 5 vol. of oxygen.

Volume of oxygen = 1000 cm^3 × 20% = 200 cm^3

Therefore,

Volume of propane burnt for every 200 cm^3 of oxygen,

$$= \frac{1}{5} \times 200 = 40\text{ cm}^3$$

40 cm^3 of propane is burnt.

(iii)

(a) Cl

Metals have low ionisation energy and non-metals have high ionisation energy. Also, across the period, ionisation energy tends to increase. The elements P, Na and Cl belong to the third period. Na - Group 1, P - Group 15 and Cl - Group 17.

(b) Ne

Inert gases have zero electron affinity because of their stable electronic configuration.

(c) He

Ionisation energy decreases with an increase in the atomic size, i.e. it decreases as one moves down a group. Ne, He and Ar are inert gases. He - Period 1, Ne - Period 2 and Ar - Period 3.

(iv)

(a) Iron chloride ($FeCl_3$)

$FeCl_3 + 3H_2O \rightarrow 3HCl + Fe(OH)_3$

Iron chloride is acidic salt.

(b) Sodium acetate (CH_3COONa)

$CH_3COONa + H_2O \rightarrow CH_3COOH + NaOH$

Ammonium acetate is a basic salt

(c) Sodium chloride

$NaCl(s) + H_2O \rightarrow Na+(aq)\ \ OH-(aq) + H_2O$

Sodium chloride is neutral or normal salt.

Solution 7

(i)

(a) $\% \text{ of N} = \frac{28}{80} \times 100 = 35\%$

$\% \text{ of O} = \frac{48}{80} \times 100 = 60\%$

(b) Gay-Lussac's law: When gases react, they do so in volumes which bear a simple ratio to one another, and to the volume of the gaseous product, provided that all the volumes are measured at the same temperature and pressure.

(ii)

(a) Cell A contains sodium chloride solution which is a strong electrolyte and contains only ions. So, it conducts electricity and the bulb glows brightly.

(b) Cell B contains both ions and molecules. So, there are few ions to conduct electricity and the bulb glows dimly.

(c) Cell C contains sugar solution which is a non-electrolyte and does not contain ions. So, it is a bad conductor of electricity and the bulb does not glow.

(iii)

(a) 1 mole of $CO_2 = 12 + 2 \times 16 = 44$ g.

22400 ml of CO_2 at S. T. P. weighs = 44 g

∴ 896 ml of CO_2 at S. T. P. weighs

$(44 / 22400) \times 896 = 1.76$ g

(b) 44 g of CO_2 contains 12 g carbon.

1.76 g of CO_2 contains $12/44 \times 0.88 = 0.48$ g

(c) Weight of hydrogen
= wt. of hydrocarbon – wt. of carbon
= 0.58 – 0.48 = 0.10 g

(d)

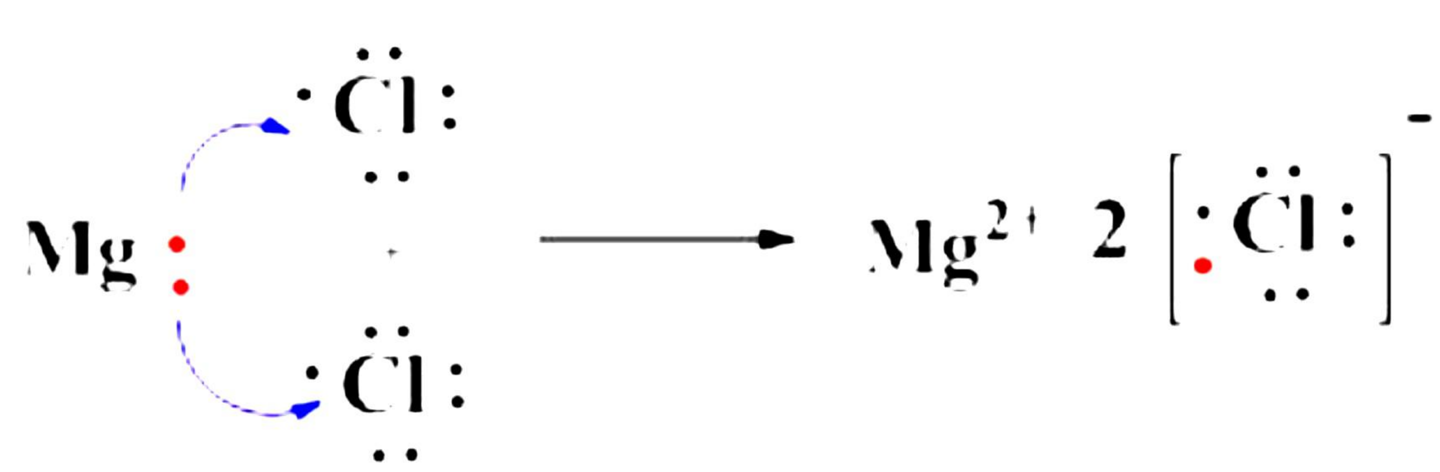
Element	**Mass**	**At. mass**	**Gram Atom**	**Ratio**	
Carbon	0.48 g	12	0.48 / 12 = 0.04	0.04 / 0.04 = 1	2
Hydrogen	0.10 g	1	0.10 / 1 = 0.10	0.10 / 0.04 = 2.5	5

Empirical formula is C_2H_5.

(e) Molecular weight = 2 × Vapour density = 2 × 29 = 58
Molecular weight = n(Empirical formula weight)
58 = n(12 × 2 + 1× 5)
58 / 29 = n
2 = n
Molecular formula = C_4H_{10}

Solution 8

(i) Formation of magnesium chloride:



(ii)
Given:
N = 82.35%
H =17.64%

Element	% composition	Atomic mass	Atomic ratio	Simplest ratio
H	17.64	1	17.64	3
N	82.35	14	5.8	1

So, the empirical formula is NH_3.

(iii)

(a) Components of electrolyte: Cryolite and fluorspar
Role played by each electrolyte is given below:

- Cryolite lowers the fusion temperature from 2050oC to 950oC and enhances conductivity.
- Fluorspar and cryolite act as a solvent for the electrolytic mixture and increases conductivity.

(b) Powdered coke is sprinkled over the surface of the electrolytic mixture for the following reasons:

- Reduces heat loss by radiation
- Prevents burning of the anode

(iv)

(a) The element with atomic number 17 is chlorine.
Period = 3
Group = 17

(b) It is non-metal.

(c) $CaCl_2$