ICSE 2025 EXAMINATION

Sample Question Paper - 9

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 [ ].

S

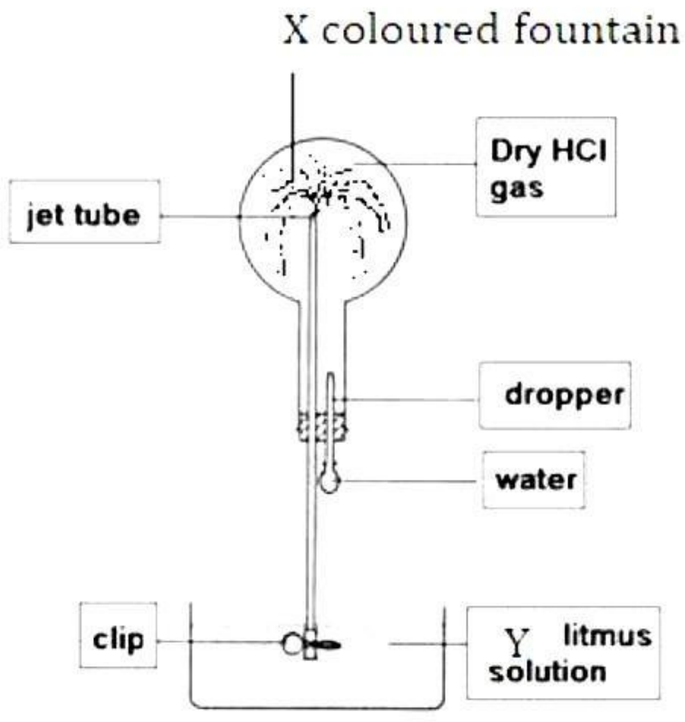
ECTION-A

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

Question 1

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

(i) Manisha wanted to check the nature of hydrogen chloride gas. She arranged the set up as shown in the below illustration. What must be X and Y?



(a) X – Blue, Y - Red
(b) X – Red, Y - Blue
(c) X – Blue, Y - Blue
(d) X – Red, Y - Red

(ii) If an element has a low ionization energy then it is likely to be:
(a) Metalloid
(b) Non-metal
(c) Metal
(d) All of the above

(iii) The pair of metals that are extracted only by electrolysis is:
(a) Na, Pb
(b) Ca, Cu
(c) Ag, K
(d) Na, Ca

(iv) An alloy which does not contain copper is:
(a) Magnalium
(b) Bronze
(c) Brass
(d) Bell metal

(v) **Assertion (A):** The reaction of nitric acid with copper carbonate releases nitrogen dioxide gas.
Reason (R): Nitric acid reacts with carbonates and bicarbonates to give salt, water and carbon dioxide.
(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 the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

(vi) The one which cannot conduct electricity is:
(a) Molten NaCl
(b) Solid NaCl
(c) NaCl dissolved in water
(d) Both molten and solid NaCl

(vii) The metal which does not react with cold or hot water:
(a) Mg
(b) K
(c) Ca
(d) Zn

(viii) Gay Lussac's law is applicable:
(a) Only to gases
(b) Only to solids
(c) Only to liquids
(d) To both liquids and solids

(ix) Large amount of impure HCl is produced as a byproduct in:
(a) Chlorinated ethanes
(b) Chlorinated fluorocarbons
(c) Reaction of sodium chloride with sulphuric acid
(d) Option (a) and (b)

(x) Ammonia reacts with carbon dioxide at high temperature and pressure to give:
   (a) Nitric acid
   (b) Urea
   (c) Carbonic acid
   (d) Nitrogen dioxide

(xi) **Assertion (A):** Caustic soda absorbs moisture easily.
Reason (R): During dry conditions, deliquescence is maximised.
   (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 compound formed when zinc reacts with sodium hydroxide is:
   (a) Sodium zincate and water
   (b) Zinc hydroxide and sodium
   (c) Sodium zincate and hydrogen gas
   (d) Sodium zinc-oxide and hydrogen gas

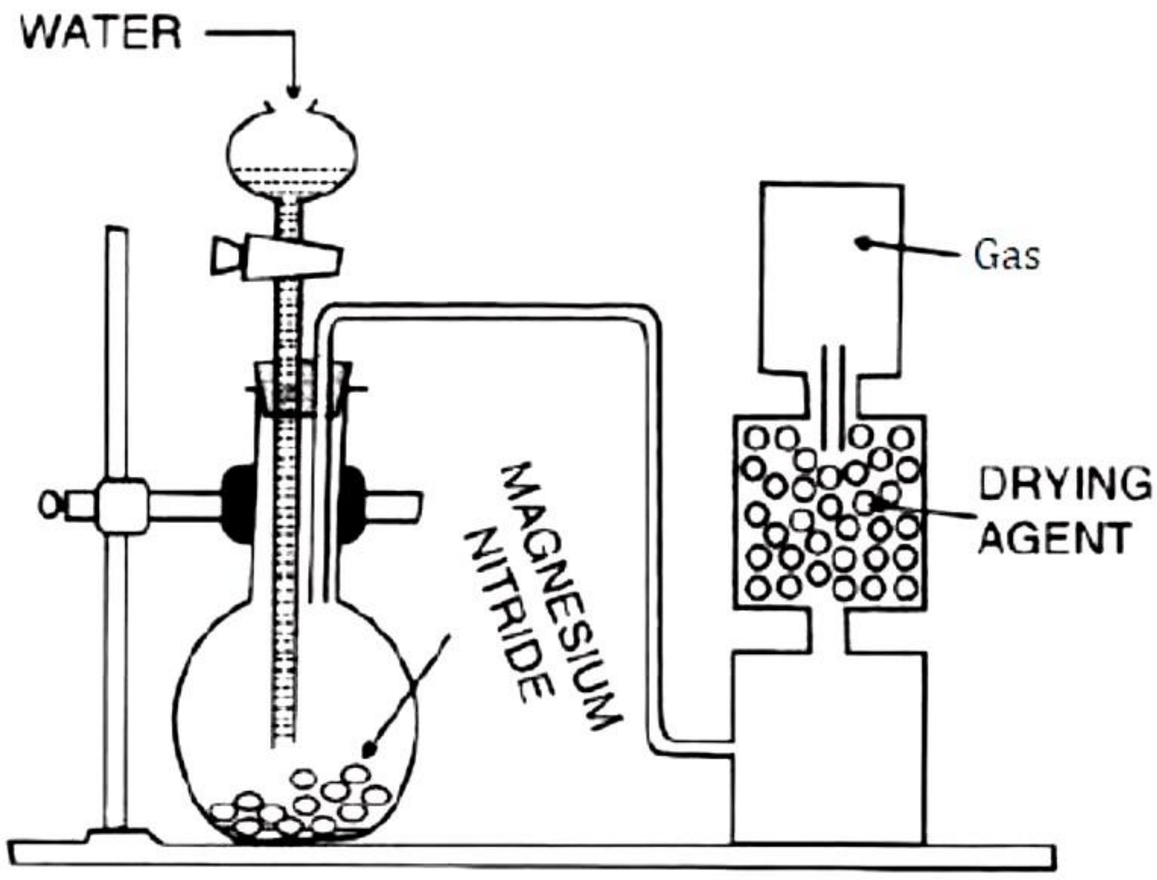
(xiii) The one from the following which is commonly known as paraffin is:
   (a) Alkanal
   (b) Alkyne
   (c) Alkene
   (d) Alkane

(xiv) Dilute acids does not produce carbon dioxide on being treated with:
   (a) Marble
   (b) Baking soda
   (c) Limestone
   (d) Lime

(xv) The pair of elements from the one listed below that will undergo ionic bond formation:
   (a) Na and Cl
   (b) C and O
   (c) C and Cl
   (d) H and Cl

Question 2

(i) The diagram shows an experiment set up for the laboratory preparation of a pungent choking gas. The gas is alkaline in nature [5]



(a) Name the gas collected in the gas jar.
(b) Write a balanced chemical equation for the above preparation.
(c) How the gas being collected?
(d) Name the drying agent in this experiment?
(e) Write an experiment to identify presence of NH_3 in the gas jar.

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

Column A	**Column B**
(a) Phosphoric acid	(i) Loss of electrons
(b) Nitric acid	(ii) Gain of electrons
(c) Liquid ammonia	(iii) Strong electrolyte
(d) Oxidation	(iv) Non-electrolyte
(e) Reduction	(v) Weak electrolyte

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

(a) There are _____ groups and _____ periods in the modern form of the periodic table.

(b) The most electropositive elements belong to _____ group.

(c) Most _____ elements belong to seventeenth group.

(d) Energy released when an electron is added to a neutral gaseous atom is called _____.

(e) Lanthanides are present in _____ group and _____ period.

(iv) Name the following: [5]

(a) A basic salt

(b) An acidic salt

(c) A normal salt

(d) A dibasic acid

(e) A diacidic base

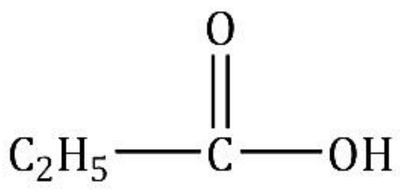
(v) [5]

(a) Draw the structural formula for the following:

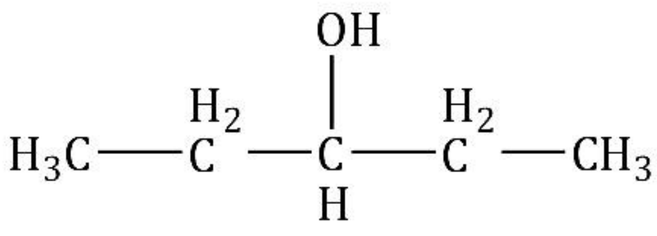
1. Isopentane
2. Ethanal
3. Ethanol

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

1.



2.



SECTION-B

(Attempt any four questions)

Question 3

(i) Nisha added dil HCl to two test tubes A and B containing: [2]

(a) Zinc sulphide

(b) Calcium hydrogen carbonate

Write balanced chemical equations for both these reactions.

Nisha tried to smell the gas released in the above reactions. Which reaction would give rotten egg smell?

(ii) Write two ores each of iron and zinc. [2]

(iii) Give equations for the reactions occurring at the cathode and anode during the electrolysis of [3]

(a) Acidulated water with inert electrodes

(b) Acidified copper sulphate solution with platinum electrode

(c) Molten lead bromide with inert electrodes

(iv) Write balanced chemical equations for the reactions:

(a) Reaction of nitric acid with Sulphur

(b) Reaction of cold dilute nitric acid with copper

(c) Magnesium strip is put in dilute hydrochloric acid

Question 4

(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)

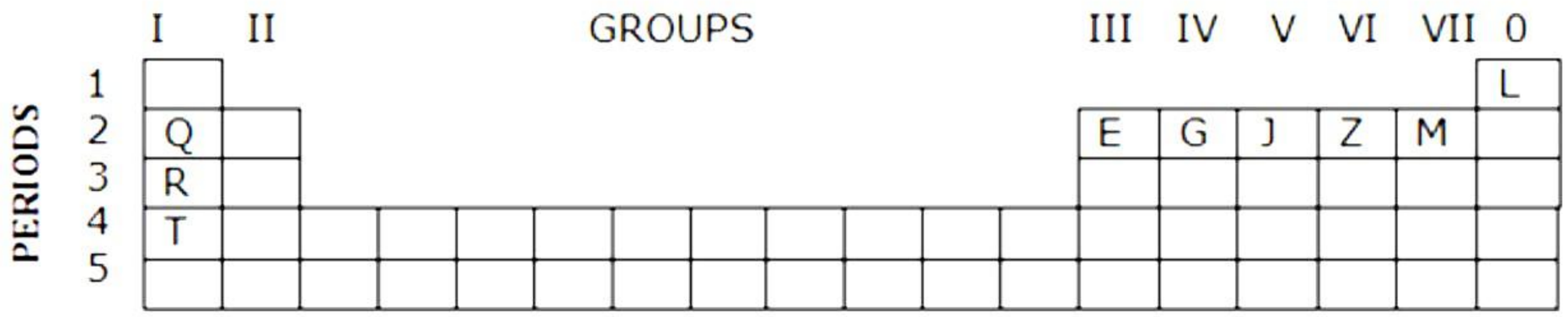
(a) Copy and complete the following table:

	Anode	Electrolyte
Purification of copper		

(b) Write the equation occurring at the anode and cathode.

(iii) An organic compound with vapour density = 94 contains C = 12.67%, H = 2.13% and Br = 85.11%. Find the molecular formula. [Atomic mass: C = 12, H = 1, Br = 80] [3]

(iv) Use the letters only written in the periodic table given below to answer the questions which follow. [3]



(a) State the number of valence electrons in atom J.

(b) Which element shown forms ions with a single negative charge?

(c) Which metallic element is more reactive than R?

Question 5

(i) Element X is a metal with a valency 2 and element Y is a non-metal with a valency 3.[2]

(a) Write an equation to show how Y forms an ion.

(b) If Y is a diatomic gas, then write an equation for the direct combination of X and Y to form a compound.

(ii) Calculate: [2]

(a) Define Gay Lussac's law.

(b) If gas 'X' has relative molecular mass as 44, then what is its vapour density?

(iii) Give equations for the reactions occurring when: [3]

(a) Sodium hydroxide added to copper sulphates solution.

(b) Ammonium hydroxide is slowly added to copper sulphate solution first a little and then in excess.

(c) Sodium hydroxide is slowly added to iron (III) chloride solution.

(iv) Name all the particles present in [3]

(a) Lead bromide solution

(b) Molten sodium chloride

(c) Sodium chloride solution

Question 6

(i) [2]

(a) Define coordinate bonding.

(b) Give structure of ammonium compound.

(ii) Correct the following statements regarding the variation of periodic properties across the group and the period: [2]

(a) Valency of an element with atomic number 3 is 3.

(b) Inert gases have high electron affinity.

(iii) Answer the following: [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) Identify the cation in each of the following case: [3]

(a) Sodium hydroxide solution added to the solution 'A' gives reddish brown precipitate.

(b) Ammonium hydroxide solution when added to solution 'B' gives white precipitate which dissolves in excess.

(c) Sodium hydroxide solution when added to solution 'C' gives bluish white precipitate which is insoluble in excess.

Question 7

(i) A gas occupied 360 cm^3 at 87 °C and 380 mm Hg pressure. Suppose, the mass of gas is 0.546 g, then find its relative molecular mass. [2]

(ii) Write reaction for: [2]

(a) Meenal added sodium hydroxide to zinc oxide.

(b) Jayesh added ammonium hydroxide to zinc sulphate

(iii) [4]

(a) Concentrated sulphuric acid reacts with non-metal to form their respective oxides. When concentrated Sulphuric Acid (H_2SO_4) reacts with Carbon, it will give Carbon dioxide gas, Water (H_2O) and sulphur dioxide gas as a product which is represented by following balanced chemical equation:

$C + 2H_2SO_4 \rightarrow CO_2 + 2H_2O + 2SO_2$

From the equation calculate:

A. The mass of carbon oxidised by 49 g of sulphuric acid.

B. The volume of sulphur dioxide measured at STP, liberated at the same time.

(b)

A. A certain compound has the following percentage composition by mass: carbon 14.4 %, hydrogen 1.2 %, and chlorine 84.5 %. Determine the empirical formula of this compound. Work correct to 1 decimal place. (H = 1, C = 12, Cl = 35.5).

B. If the relative molecular mass of this compound is 168, then what would be its molecular formula?

Question 8

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

CaO

(ii) What will you observe when sulphuric acid reacts with [2]

(a) Iron sulphide

(b) Ammonia

(iii) Write balanced chemical equations for: [3]

(a) Butane is burnt in oxygen

(b) Preparation of ethylene from ethyl alcohol

(c) Conversion of ethane to acetic acid

(iv) An element Y has atomic number 19. Answer the following questions. [3]

(a) State the period & group to which it belongs:

(b) Is it a metal or Non Metal?

(c) Write the formula between Y and hydroxyl group.

Solution

SECTION A

Solution 1

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

Solution 2

(i)

(a) Ammonia (NH_3)

(b) $Mg_3N_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2NH_3 \uparrow$

(c) The ammonia gas collected by holding the jar with its mouth downwards over delivery tube i.e. downward displacement of air.

(d) Quicklime.

(e) Fountain experiment.
Being basic, ammonia gas changes red litmus solution blue.

(ii)

Column A	Column B
(a) Phosphoric acid	(v) Weak electrolyte
(b) Nitric acid	(iii) Strong electrolyte
(c) Liquid ammonia	(iv) Non-electrolyte
(d) Oxidation	(i) Loss of electrons
(e) Reduction	(ii) Gain of electrons

(iii)

(a) There are 18 groups and 7 periods in the modern form of the periodic table.

(b) The most electropositive elements belong to the first group.

(c) Most electronegative elements belong to seventeenth group.

(d) Energy released when an electron is added to a neutral gaseous atom is called electron affinity.

(e) Lanthanides are present in third group and sixth period.

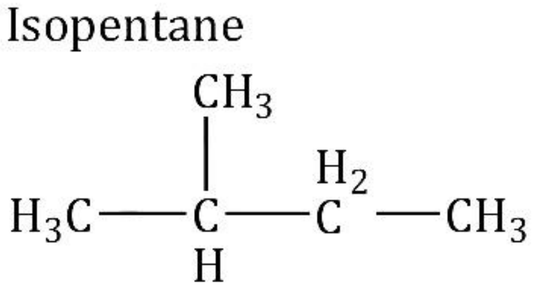
(iv)

(a) A basic salt: Lead chloride
(b) An acidic salt: Sodium hydrogen sulphate
(c) A normal salt: NaCl
(d) A dibasic acid: H_3PO_3
(e) A diacidic base: $Ca(OH)_2$

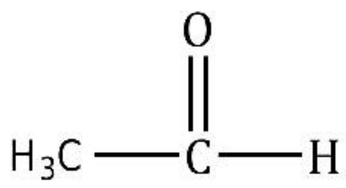
(v)

(a)

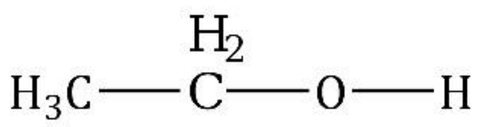
1. Isopentane



2. Ethanal



3. Ethanol



(b)

1. Propanoic acid
2. Pentan-3-ol

SECTION-B

(Attempt any four questions)

Solution 3

(i)

(a) $ZnS + 2HCl \rightarrow ZnCl_2 + H_2S$

H_2S gas would give rotten egg smell.

(b) $Ca(HCO_3)_2 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

(ii) Common ores of iron and zinc.

Ore of Fe	**Chemical name**	**Formula**
Red haematite	Anhydrous ferric oxide	Fe_2O_3
Brown haematite	Hydrated ferric oxide	$2\ Fe_2O_3.3H_2O$
Ore of Zn	**Chemical name**	**Formula**
Zinc blende	Zinc sulphide	ZnS
Zincite	Zinc oxide	ZnO

(iii)

(a) Acidulated water with inert electrodes.

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)

(b) Acidified copper sulphate solution with platinum electrode.

Reaction at the cathode: $Cu^{2+} + 2e^- \longrightarrow Cu$

Reaction at the anode: $4OH - 4e^- \longrightarrow 4OH$

$2OH + 2OH \longrightarrow 2H_2O + O_2$

(c) Molten lead bromide with inert electrode

Reaction at the cathode: $Pb^{2+} + 2e^- \longrightarrow Pb$

Reaction at the anode: $Br^- - e^- \longrightarrow Br$

$Br + Br \longrightarrow Br_2$

(iv)

(a) $S + 6HNO_3 \rightarrow H_2SO_4 + 2H_2O + 4NO_2$

(b) $3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 4H_2O + 2NO$

(c) $Mg + 2HCl \rightarrow MgCl_2 + H2$

Solution 4

(i)

(a) Sulphur dioxide

Freshly prepared $K_2Cr_2O_7$ paper changes from orange to green.

(b) Hydrogen sulphide

The gas released has a rotten egg smell.

(ii)

(a)

	Anode	Electrolyte
Purification of copper	Impure copper	Solution of copper sulphate and dilute sulphuric acid

(b) At the anode:

$Cu - 2e^- \rightarrow Cu^{2+}$

At the cathode:

$Cu^{2+} + 2e^- \rightarrow Cu$

(iii)

Element	Relative atomic mass	% compound	Relative number of atoms	Simple Ratio	Simple whole Number Ratio
H	1	2.13	2.13/1	2.13	2
C	12	12.67	12.67/12	1.05	1
Br	80	85.11	85.11/80	1.06	1

Empirical formula = CH_2Br

n (Empirical formula mass of CH_2Br) = Molecular mass ($2 \times VD$)

$n(12 + 2 + 80) = 94 \times 2$

$n = 2$

Molecular formula = Empirical formula × 2

$= (CH_2Br) \times 2$

$= C_2H_4Br_2$

(iv)

(a) Atom J is a Group 5 element and a group is determined by the number of electrons present in the outermost shell.

(b) Element M from Group 7 accepts one electron to form an ion with a single negative charge.

(c) T is more reactive than R.

The tendency of losing electrons increases down the group. Because chemical reactivity depends on the tendency to lose electrons, reactivity increases on going down the group.

Solution 5

(i)

(a) Y will form an anion by gaining 3 electrons.

The equation is $Y + 3e^- \rightarrow Y^{3-}$

(b) The equation for the direct combination of X and Y to form a compound is

$3X + Y_2 \rightarrow X_3Y_2$

(ii)

(a) Gay Lussac's law of combining volumes: 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.

(b) Vapour density $= \frac{\text{Molecular mass}}{2} = \frac{44}{2} = 22$

(iii)

(a) $CuSO_4 + 2NaOH \longrightarrow Cu(OH)_2 + Na_2SO_4$

(b) $CuSO_4 + 2NH_4OH \longrightarrow Cu(OH)_2 + (NH_4)SO_4$

$Cu(OH)_2 + 4NH_4OH \longrightarrow [Cu(NH_3)_4](OH)_2 + 4H_2O$

(c) $FeCl_3 + 3NaOH \longrightarrow Fe(OH)_3 + 3NaCl$

(iv)

(a) Lead bromide solution

Lead ions, bromide ions, hydroxyl ions, hydrogen ions and water molecule

(b) Molten sodium chloride

Sodium ions and chloride ions

(c) Sodium chloride solution

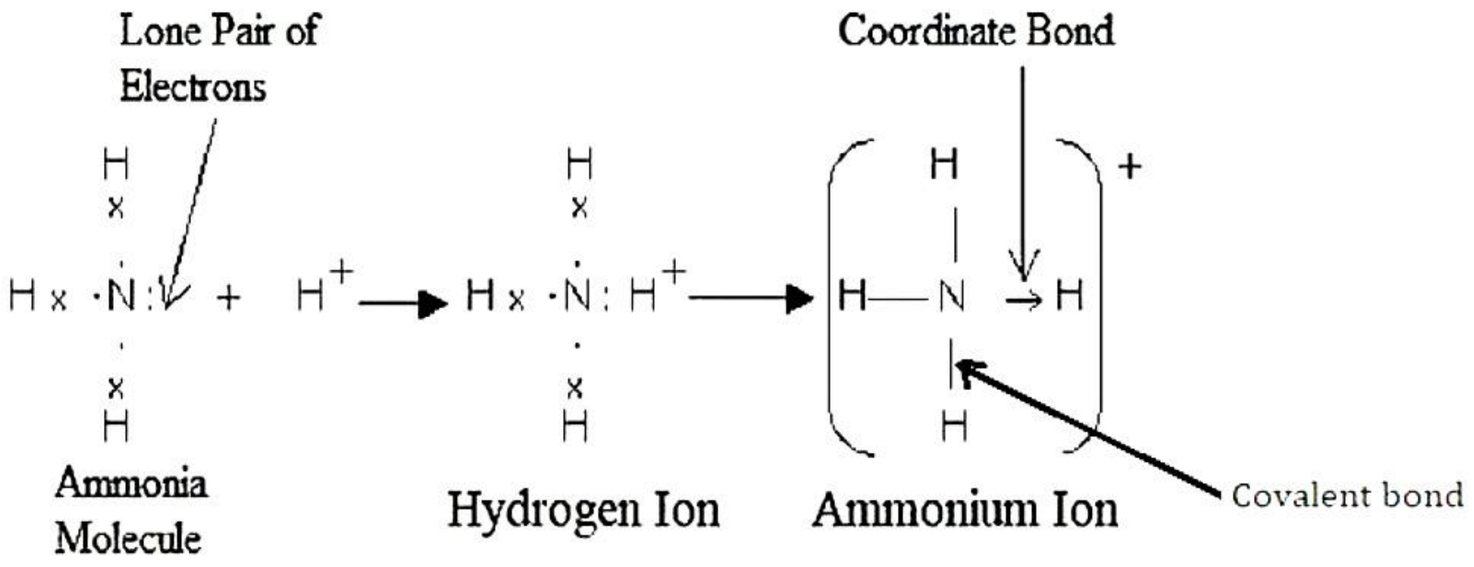
Sodium ions, chloride ions, hydrogen ions, hydroxyl ions and water molecule

Solution 6

(i)

(a) Coordinate bond: The bond formed between two atoms by sharing a pair of electrons provided entirely by one of the combining atoms but shared by both is called a coordinate bond or dative bond.

(b) Formation of ammonium compound:



(ii)

(a) Valency of an element with atomic number 3 is 1.

(b) Inert gases have zero electron affinity.

(iii)

(a) Conc. caustic soda

(b) $2Al(OH)_3 \xrightarrow[1000°C]{Heat} Al_2O_3 + 3H_2O$

(c) Cryolite

(iv)

(a) Ferric ion, Fe^{3+}

(b) Zinc ion, Zn^{2+}

(c) Copper ion, Cu^{3+}

Solution 7

(i)

$$V \times \frac{760}{273} = \frac{360 \times 380}{360}$$

$$V = \frac{360 \times 380 \times 273}{760 \times 360} = 0.546$$

$$22400\,cm^3 \text{ of the gas weight} = \frac{0.546}{136.5} \times 22400 = 89.6 \text{ a.m.u.}$$

$$\text{Relative molecular mass} = 89.6 \text{ a.m.u.}$$

(ii)

(a) $ZnO + 2NaOH \rightarrow Na_2ZnO_2 + H_2$

Sodium zincate (colourless)

(b) $ZnSO_4 + 2NH_4OH \rightarrow Zn(OH)_2 + (NH_4)_2SO_4$

White, gelatinous ppt. (colourless)

(iii)

(a)

$C + H2SO4 \rightarrow CO2 + 2H2O + 2SO2$

For CO2, 12 + 32 =

A. Molecular mass of sulphuric acid = 2(2+32+64) = 196
196 g of sulphuric acid oxidised 12 g of carbon
49 g of sulphuric acid will = 12 × 49 / 196 = 3 g

B. 196 g of sulphuric acid gives 2(22.4) = 44.8 L
∴ 49 g of sulphuric acid will give 44.8 × 49 / 196 = 11.2 L of SO2.

(b)

A.

Element	% Weight	Atomic Weight	Atomic Ratio	Simplest Ratio
C	14.4	12	14.4/12 = 1.2	1.2/1.2 = 1
H	1.2	1	1.2/1 = 1.2	1.2/1.2 = 1
Cl	84.5	35.5	84.5/35.5 = 2.3	2.3/1.2 = 2

Empirical formula = $CHCl_2$

B.

Empirical formula = $CHCl_2$

Empirical formula weight = 1× 12 + 1 × 1 + (2 × 35.5) = 12 + 1 + 70 = 83

Relative molecular mass = 168

N = Relative molecular mass / Empirical weight = 168 / 83 = 2.02 ≈ 2

Molecular formula = n × empirical formula

= 2 × $CHCl_2$

= $C_2H_2Cl_4$

Solution 8

(i) Electron dot structure of CaO:

$$Ca^{2+}\left[:\ddot{O}:\right]^{2-}$$

(ii)

(a) $FeS + H_2SO_4 \rightarrow FeSO_4 + H_2S\uparrow$

(b) $2NH_3(g) + H_2SO_4 \rightarrow (NH_4)_2SO_4$

(iii)

(a)

$$2C_4H_{10} + 13O_2 \xrightarrow{\text{heat}} 8CO_2 \uparrow + 10H_2O$$

Butane

(b)

$$C_2H_5OH \xrightarrow[170^\circ C]{\text{excess of } H_2SO_4} C_2H_4 + H_2O$$

Ethylene

(c)

$$2C_2H_6 + O_2 \xrightarrow[120\,\text{atm.}]{475K\,\text{Cu tube}} 2C_2H_5OH \xrightarrow[300^\circ C]{Pt} CH_3COOH + H_2O$$

Acetic acid

(iv)

(a) The element with atomic number 19 is nothing but Potassium.

Period = 4

Group = 1

(b) It is Metal.

(c) KOH