ICSE 2025 EXAMINATION

Sample Question Paper - 10

Chemistry

Time: 2 hrs. **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 pair which have both members from the same group of the periodic table is:
- (a) Mg, Ca
- (b) Mg, Na
- (c) Zn, Cu
- (d) Mg, Fe

(ii) Elements of which group are called halogens:
- (a) Group 15
- (b) Group 16
- (c) Group 17
- (d) Group 18

(iii) The number of covalent bonds formed between carbon and hydrogen in methane is:
- (a) 7
- (b) 4
- (c) 1
- (d) 6

(iv) The example of the polar covalent molecule is:
- (a) H_2O
- (b) O_2
- (c) Cl_2
- (d) H_2

(v) **Assertion (A):** The reaction between manganese dioxide and hydrochloric acid is a redox reaction.

Reason (R): Manganese dioxide gets reduced to manganese chloride by the action of hydrochloric acid.

(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) Nitrogen oxide is a:

(a) Greenish yellow gas
(b) Colouless and odorless has
(c) Reddish brown coloured gas
(d) White fumes

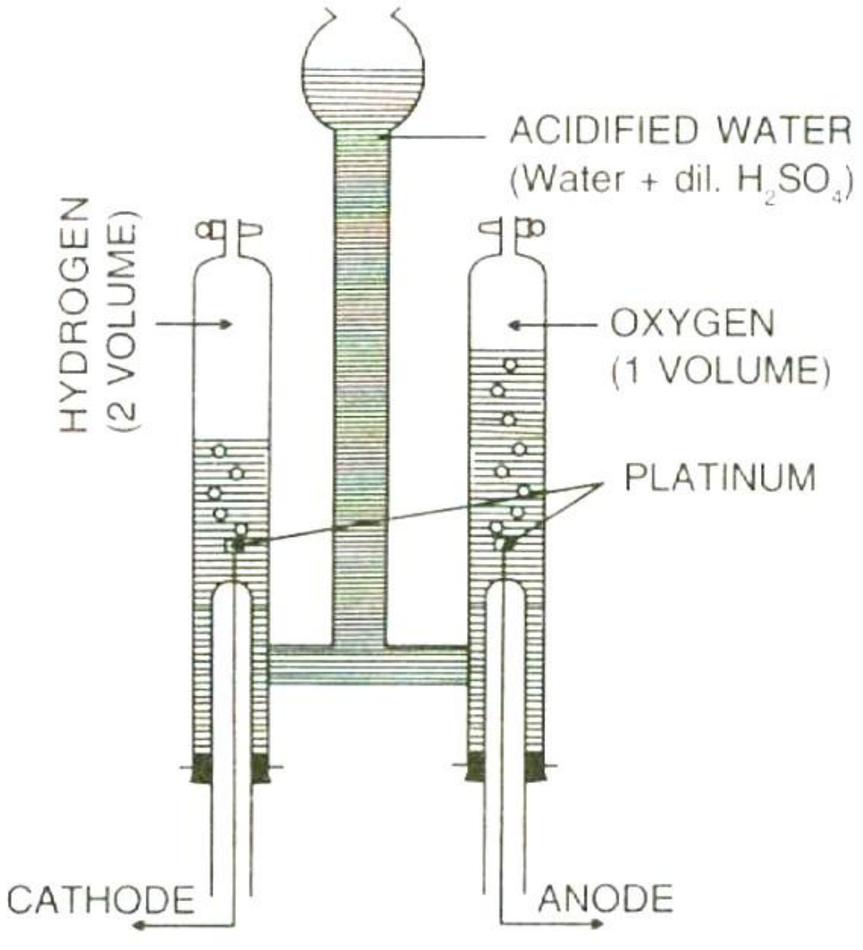
(vii) The metal oxide which can react with acid as well as alkali is:

(a) Silver oxide
(b) Copper (II) oxide
(c) Aluminium oxide
(d) Calcium oxide

(viii) Gay-Lussac's law is applicable to:

(a) Molten solids
(b) Liquids and gases
(c) Only gases
(d) Only liquids

(ix) Below given illustration depicts an example of:



(a) Reduction
(b) Oxidation
(c) Redox reaction
(d) Synthesis

(x) Name the reddish brown gas released at the cathode when molten lead bromide is:
(a) Oxygen
(b) Bromine
(c) Hydrogen
(d) Lead oxide

(xi) **Assertion (A):** Na^+ is bigger in size than Na atom.
Reason (R): Cation is always smaller than the parent atom, from which it is formed.
(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

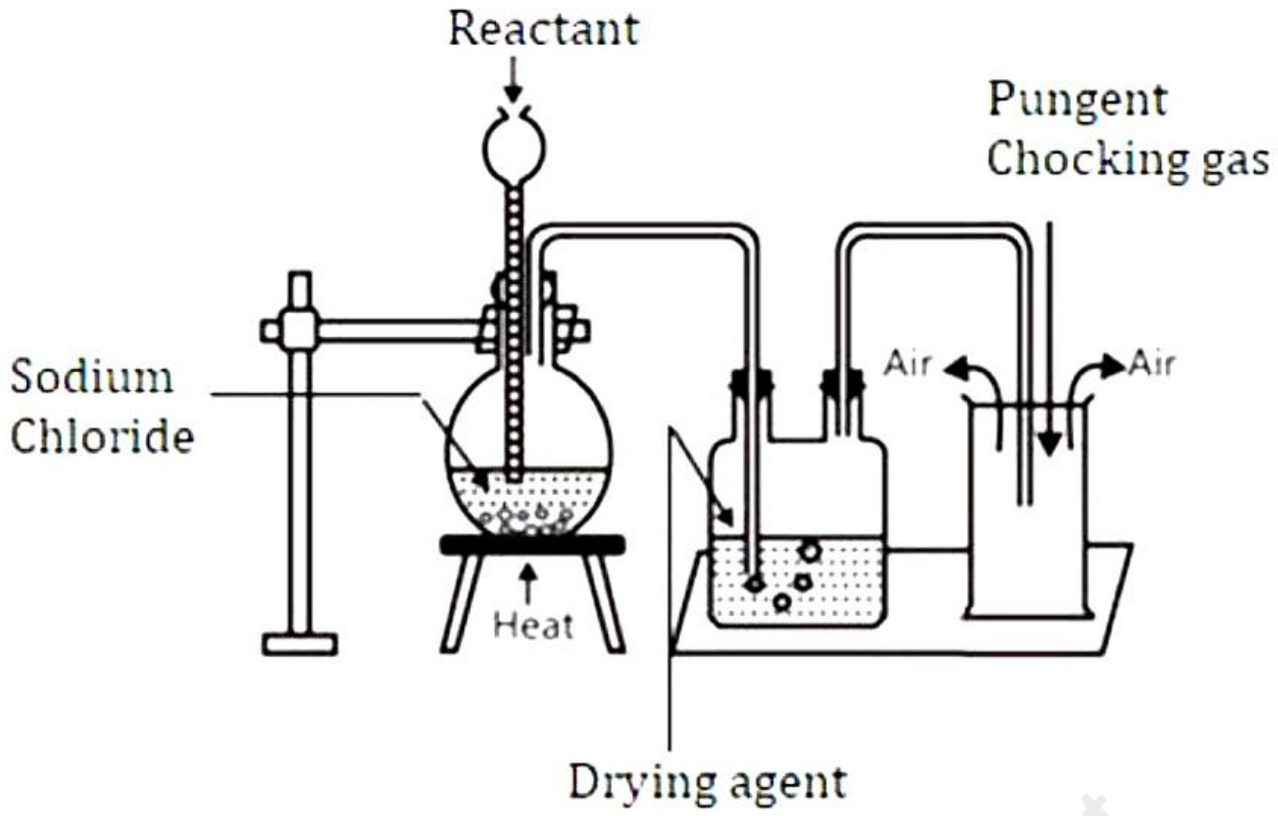
(xiii) The naturally occurring compounds of metals which are generally mixed with other matter such as soil, sand, limestone and rocks are known as:
(a) Minerals
(b) Alloys
(c) Ores
(d) Alloys and ores

(xiv) Hydrogen chloride gas gives a white precipitate with:
(a) Silver nitrate and lead nitrate
(b) Ammonium nitrate and potassium nitrate
(c) Sodium nitrate and aluminium nitrate
(d) Both B and C

(xv) Carbon dioxide evolves when HCl acid is added to
(a) Sodium sulphite
(b) Calcium hydroxide
(c) Calcium carbonate
(d) Iron (II) sulphide

Question 2

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



(a) Name of the gas collected in the gas jar.
(b) What is the reactant other than sodium chloride? Write a balanced chemical equation for the above preparation.
(c) How the gas being collected?
(d) Name the drying agent in this experiment.
(e) How will you find that the gas jar is full of gas?

(ii) The table below compares some properties of metals and non-metals. Write down the missing words from (i) to (v):

Metals	Non-metals
(a) _____	(a) Poor conductors of heat
(b) Malleable	(b) _____
(c) Form cations	(c) _____
(d) _____	(d) Form acidic oxides
(e) _____	(e) Oxidising agents

(iii) Fill in the blanks: [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 seventeen 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) The type of electricity used during electrolysis.

(b) The electrode connected to the negative terminal of battery.

(c) The process by which a particle gains or loses electrons.

(d) The process by which an electrovalent compound breaks up into mobile ions.

(e) An acid used in the electrolysis of water.

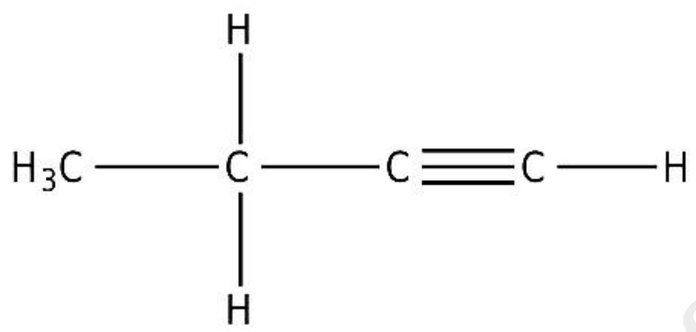
(v) [5]

(a) Draw the structural formula for the following:

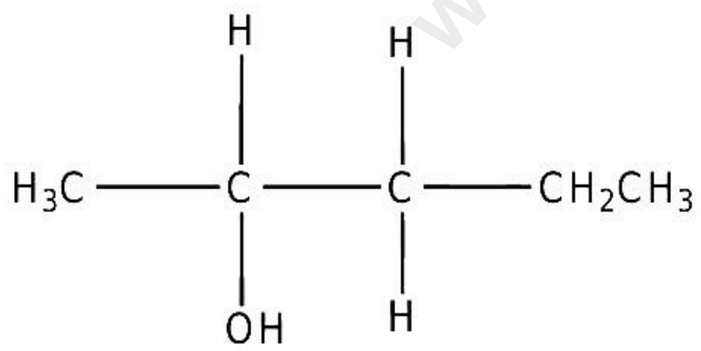
1. Propene
2. Ethanal
3. Methanoic Acid

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

1.



2.



SECTION-B

(Attempt any four questions)

Question 3

(i) Write a balanced equation for the preparation of each of the following salts. [2]

(a) Copper sulphate from copper carbonate.

(b) Zinc carbonate from zinc sulphate.

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

(a) $Al + NaOH + H_2O \rightarrow$

(b) $P_4 + HNO_3 \longrightarrow$

(iii) Write the difference between: [3]

(a) Ionic compounds and polar covalent compounds

(b) Ionic compounds and covalent compounds

(c) Polar covalent compounds and non-polar covalent compounds

(iv) [3]

(a) State whether the following statements are TRUE and FALSE. Justify your answer.

1. H_3PO_3 is tribasic acid since it has 3 hydrogen atoms.
2. Blue crystals of copper sulphate consists of water of crystallisation.

(b) Calculate the number of moles in 392 grams of sulphuric acid.

Question 4

(i) Give reaction for the preparation of: [2]

(a) Methane from sodium acetate

(b) 1,2-ethane-diol from ethene

(ii) Calculate the volume of oxygen required for the complete combustion of 20 cm^3 of propane (C_3H_8). [2]

$C_3H_8 + 5O_2 \rightarrow {}_7 3CO_2 + 4H_2O$

(iii) Name the following substances: [3]

(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) Charged particles which attract one another to form electrovalent compounds.

(iv) Write equations for the following reactions: [3]

(a) Aluminium oxide and Sodium hydroxide.

(b) Zinc and dilute sulphuric acid.

(c) Magnesium nitride and water.

Question 5

(i) [2]

(a) Define mineral.

(b) Which two chemical compounds are added to pure bauxite at the time of electrolytic reduction?

(ii) Name the following: [2]

(a) Second member of alkene series

(b) First member of alkane series

(iii) What are the terms defined in following? [3]

(a) A salt containing a metal ion surrounded by other ions or molecules.

(b) A base which is soluble in water.

(c) A substance remove moisture from other substances.

(iv) Electrons are getting added to an element 'y'. [3]

(a) Is 'y' getting oxidized or reduced?

(b) What charge will 'y' have after the addition of electrons?

(c) Which electrode will 'y' migrate during the process of electrolysis?

Question 6

(i) Name all the particles present in: [2]

(a) Molten Sodium chloride

(b) Carbon tetrachloride

(ii) Write equations for the reactions occurring when: [2]

(a) Sodium hydroxide added to copper sulphate solution.

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

(iii) The elements of one short period of the periodic table are given in the order from left to right. [3]

Li Be B C O F Ne

(a) To which period these elements belong?

(b) One element of this period is missing. Which is the missing element and where should it be placed?

(c) Which one of the above elements belongs to halogen series?

(iv) A gaseous hydrocarbon contains 82.76% of carbon. Given that its vapour density is 29, find its molecular formula. [C = 12, H = 11] [3]

Question 7

(i) A compound has the following percentage composition by mass: carbon 25.41%, hydrogen 3.17%, oxygen 33.86% and chlorine 37.56% Use this data to determine the empirical formula of the compound. (Work to two places of decimals)
(H=1; C=12; O=16; Cl=35.5) [3]

(ii) Zinc is extracted from zinc blende. The zinc blende is roasted. The solid product is mixed with coke in the blast furnace form which zinc vapours emerge. [3]

(a) What is the Zinc compound in Zinc blende?

(b) Write the equation for the roasting of Zinc blende.

(c) What is the purpose of using coke?

(iii) What volume of oxygen is required to completely burn a mixture of 224 cm^3 of methane and 112 cm^3 of hydrogen at S.T.P. to produce steam and carbon dioxide? If the steam formed is condensed to water, find the mass of water so formed. Also, calculate gram molecules of water formed. [4]

Question 8

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

NH_3

(ii) Name the following: [2]

(a) Compound with triple covalent bonds.

(b) Ion having a coordinate bond

(iii) Name the gas evolved when: [3]

(a) Calcium carbide is hydrolyzed.

(b) Aluminium carbide is hydrolyzed.

(c) Sodium hydrogen carbonate with hydrochloric acid

(iv) An element Y has atomic number 20. 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) (b)
(iv) (a)
(v) (a)
(vi) (c)
(vii) (c)
(viii) (c)
(ix) (c)
(x) (b)
(xi) (d)
(xii) (c)
(xiii) (a)
(xiv) (a)
(xv) (c)

Solution 2

(i)

(a) HCl (Hydrogen chloride gas)

(b) The reactant other than sodium chloride is conc. H_2SO_4.

$$2NaCl + H_2SO_4 \xrightarrow{<200^{\circ}C} Na_2SO_4 + HCl\uparrow$$

(c) The HCl gas is collected by upward displacement of air as it is 1.28 times heavier than air.

(d) Drying agent is Conc. H_2SO_4.

(e) When the jar is completely filled with hydrogen chloride, fumes appear above the jar's mouth. White fumes appear on exposing hydrogen chloride gas to air since it forms hydrochloric acid with atmospheric water vapour. This jar when brought near a rod dipped in ammonium hydroxide gives dense white fumes, which indicate the formation of ammonium chloride, as per the reaction given below.

$HCl + NH_4OH \rightarrow NH_4Cl + H_2O$

(ii)

Metals	Non-metals
(a) Good conductors of heat	(a) Poor conductors of heat
(b) Malleable	(b) Non-malleable
(c) Form cations	(c) Form anions
(d) Form basic oxides	(d) Form acidic oxides
(e) Reducing agents	(e) Oxidising agents

(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 seventeen 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.

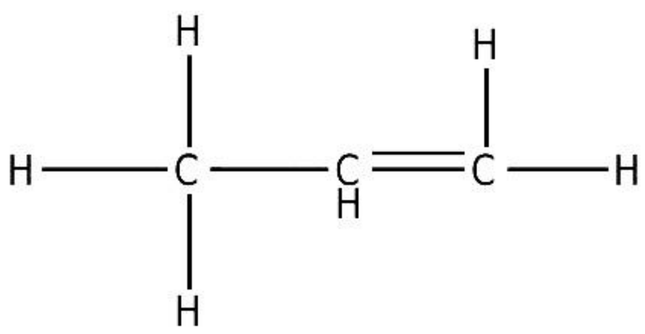
(iv)

(a) Direct current
(b) Cathode
(c) Ionisation
(d) Dissociation
(e) Sulphuric acid

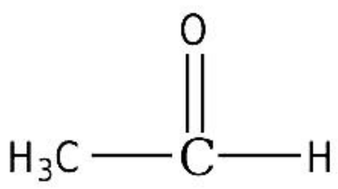
(v)

(a)

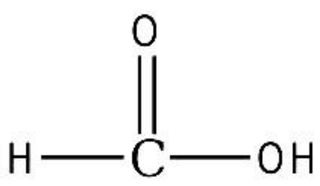
1. Propene



2. Ethanal



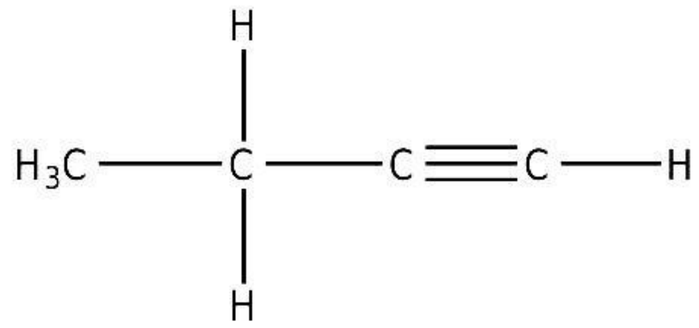
3.



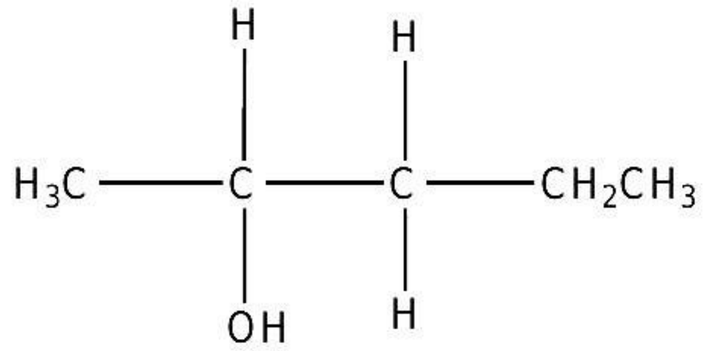
Methanoic acid

(b)

1. But-1-yne



2. Pentan-2-ol



SECTION-B

(Attempt any four questions)

Solution 3

(i)

(a) Copper sulphate from copper carbonate

$$CuCO_3 + H_2SO_4 \longrightarrow CuSO_4 + H_2O + CO_2 \uparrow$$

(b) Zinc carbonate from zinc sulphate

$$ZnSO_4 + Na_2CO_3 \longrightarrow Na_2SO_4 + ZnCO_3 \downarrow$$

(ii)

(a) $2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2$

(b) $P_4 + 20HNO_3 \longrightarrow 4H_3PO_4 + 4H_2O + 20NO_2$

(iii)

(a) Ionic compounds are formed as a result of the transfer of one or more electrons from the atom of a metallic electropositive element to an atom of a non-metallic electronegative element.
A polar covalent compound is one in which there is an unequal distribution of electrons between the two atoms.

(b) Ionic compounds, made of ions, are usually crystalline solids with high melting and boiling points.
They are soluble in water and good conductors of electricity in the aqueous solution and molten state.
Covalent compounds, made of molecules, can exist as soft solids or liquids or gases with low melting and boiling points. They are usually insoluble in water and poor conductors of electricity.

(c) Polar covalent compounds are formed between 2 non-metal atoms which have different electro-negativities and therefore have unequal sharing of the bonded electron pair.

Non-polar compounds are formed when two identical non-metals equally share electrons between them.

(iv)

(a)

1. False
   The correct statement is, "H_3PO_3 is dibasic acid since it has 2 replaceable hydrogen atoms."
2. True
   Some salts unite with a definite quantity of water, which is known as the water of crystallization.

(b)

$$\text{Number of moles (n)} = \frac{\text{Mass of subsance in grams}}{\text{Molar mass of substance}}$$

$$\text{Molar mass of } H_2SO_4 = (2\times1)+(1\times32)+(4\times16)$$
$$= 2+32+64$$
$$= 98\,g/mol$$

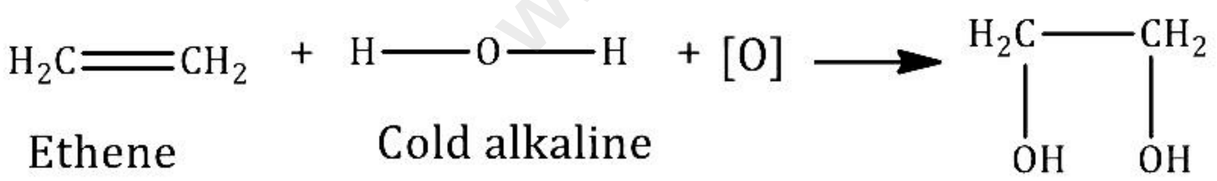
Therefore, number of moles (n) = 392/98 = 4 moles of H_2SO_4.
Hence, the number of moles in 392 grams of sulphuric acid are 4.

Solution 4

(i)

(a) $CH_3COONa + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$

(b)



Ethene

Cold alkaline $KMnO_4$ solution (oxidising agent)

1,2-Ethane-diol (Ethylene glycol)

(ii) $C_3H_3 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
Applying Gay Lussac's Law,
1 vol. : 5 vol. → 3 vol. : 4 vol.
1 vol. propane ≡ 20 cm^3
Therefore, vol. of O_2 required ≡ 5 volume
= 5 × 20 = 100 cm^3

(iii)

(a) Hydrogen chloride gas
(b) Butane
(c) Ferric chloride ($FeCl_3$)

(iv)

(a) $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

(b) $Zn + H_2SO_4 \text{ (dil.)} \rightarrow ZnSO_4 + H_2$

(c) $Mg_3N_2 + 6H_2O \xrightarrow{\Delta} 3Mg(OH)_2 + 2NH_3$

Solution 5

(i)

(a) The naturally occurring compounds of metals which are generally mixed with other matter such as soil, sand, limestone and rocks are known as minerals.

(b) Cryolite and Fluorspar

(ii)

(a) Ethene

(b) Methane

(iii)

(a) Complex salt

(b) Alkali

(c) Desiccants or desiccating agents or drying agents

(iv)

(a) Reduced

(b) Negative charge

(c) Anode

Solution 6

(i)

(a) Sodium ions, chloride ions

(b) Molecules of carbon tetrachloride

(ii)

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

(b)

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

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

(iii)

(a) Second period

(b) Nitrogen. It is placed between carbon and oxygen.

(c) Fluorine

(iv) Vapour density = 29

Element	Percentage	At. mass	Gram atom	Ration	
Carbon	82.76	12	82.76/12 = 6.9	6.9/6.9 = 1	2
Hydrogen	17.24	1	17.24/1 = 17.24	17.24/6.9 = 2.5	5

Empirical formula is C_2H_5.

Molecular weight = 2 × Vapour density

Molecular weight = n × (Empirical formula weight)

58 = n × (12 × 2 + 1 × 5)

n = 2

So, molecular formula = C_4H_{10}

Solution 7

(i)

Element	%	At. Mass	At. Ratio	Simplest ratio
C	25.41	12	$\frac{25.41}{12} = 2.11$	2
H	3.17	1	$\frac{3.17}{1} = 3.17$	3
O	33.86	16	$\frac{33.86}{16} = 2.11$	2
Cl	37.56	35.5	$\frac{37.56}{35.5} = 1.05$	1

Therefore,

The empirical formula of the compound is $C_2H_3O_2Cl$.

(ii)

(a) ZnS

(b) $2ZnS + 3O_2 \xrightarrow{800^\circ C} 2ZnO + 2SO_2$

(c) To extract zinc from zinc oxide.

(iii) For combustion of methane:

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

According to Gay-Lussac's Law, 1 volume of methane requires 2 volumes of oxygen to burn it completely, giving 1 volume of carbon dioxide and 2 volumes of steam.

Hence, 224 cm^3 of methane combustion give 224 cm^3 of carbon dioxide and 448 cm^3 of steam.

For combustion of hydrogen:

$2H_2 + O_2 \rightarrow 2H_2O$

According to Gay-Lussac's Law, 2 volumes of hydrogen requires 1 volume of oxygen for complete combustion to give 2 volumes of steam.

∴ 112 cm^3 of hydrogen will require 56 cm^3 of oxygen for complete combustion and thereby form 112 cm^3 of steam.

∴ Total volume of oxygen needed for burning CH_4 and H_2 = 448 + 56 = 504 cm^3 and total volume of steam formed = 448 + 112 = 560 cm^3,

Molecular mass of H_2O = 2 + 16 = 18 amu

22400 cm^3 of steam at S.T.P. weighs 18 g.

560 cm^3 of steam at S.T.P. weighs

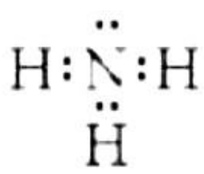
$$= \frac{18 \times 560}{22400} = 0.45\,\text{g}$$

$$\text{Gram molecules of water} = \frac{\text{Mass in grams of water}}{\text{Gram molecular mass}}$$

$$= \frac{0.45\,\text{g}}{18\,\text{g}} = 0.025 \text{ g molecules of water}$$

Solution 8

(i) Ammonia NH_3



(ii)

(a) Nitrogen (N_2)

(b) Ammonium ion (NH_4^+)

(iii)

(a) Ethyne [$CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2\uparrow$]

(b) Methane [$Al_4C_3 + 12H_2O \rightarrow 3CH_4\uparrow + 4Al(OH)_3\downarrow$]

(c) Carbon dioxide [$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2\uparrow$]

(iv)

(a) The element with atomic number 20 is nothing but Calcium.

Period = 4

Group = 2

(b) It is metal.

(c) $Ca(OH)_2$