

ICSE EXAMINATION PAPER - 2024

CHEMISTRY

Class-10th

(Solved)

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 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 [].

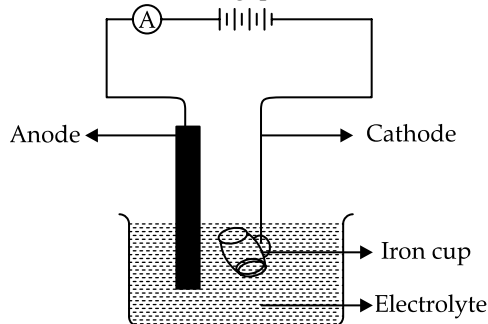
SECTION – A (40 Marks)

(Attempt all questions from this Section)

- Question-1** [16] Choose the correct answers to the questions from the given options.
(Do not copy the questions, write the correct answers only.)
- (i) Unsaturated hydrocarbons undergo:
(a) Addition reaction (b) Substitution reaction
(c) Oxidation reaction (d) Redox reaction
- (ii) In the 2nd period, Neon has maximum Ionisation Potential because:
(a) It has unstable electronic configuration.
(b) It easily accepts electrons.
(c) It easily loses electrons.
(d) The outer most shell is completely filled.
- (iii) Copper, Zinc, and Tin are the metals alloyed to form:
(a) Duralumin (b) Brass
(c) Bronze (d) Solder
- (iv) The metal hydroxide which reacts with both acids and alkalis to form salt and water is:
(a) Calcium hydroxide
(b) Magnesium hydroxide
(c) Aluminium hydroxide
(d) Ferric hydroxide
- (v) Reaction of an alcohol with a carboxylic acid in the presence of concentrated H_2SO_4 is termed as:
(a) Halogenation (b) Esterification
(c) Hydrogenation (d) Dehydrohalogenation
- (vi) Conversion of Ethanol to Ethene by the action of concentrated sulphuric acid involves:
(a) Dehydration (b) Dehydrogenation
(c) Dehydrohalogenation (d) Hydrolysis
- (vii) The oxidising agent in the equation, $\text{S} + 2\text{H}_2\text{SO}_4 \rightarrow 3\text{SO}_2 + 2\text{H}_2\text{O}$ is:
(a) Sulphur (b) Sulphuric acid
(c) Sulphur dioxide (d) Water
- (viii) Electron Affinity is maximum in:
(a) Mg (b) Ar
(c) Li (d) Br
- (ix) The compound that is **not** a constituent of the electrolytic mixture used in the Hall-Heroult's process is:
(a) Al_2O_3 (b) NaAlO_2
(c) Na_3AlF_6 (d) CaF_2
- (x) On passing ammonia gas over heated copper oxide for some time, a reddish-brown residue is left behind. What property of ammonia is demonstrated here?
(a) Basic property
(b) Oxidising property
(c) Reducing property
(d) Acidic property
- (xi) Rotten egg smell is due to the liberation of:
(a) HCl gas (b) H_2S gas
(c) Cl_2 gas (d) SO_2 gas
- (xii) Ammonia gas is collected by downward displacement of air since ammonia is:
(a) very slightly soluble in water.
(b) heavier than air.
(c) lighter than air.
(d) insoluble in water.
- (xiii) Which of the following would occupy 22.4 litres at S.T.P?
1. 32 g of oxygen gas
2. 2 moles of hydrogen gas
3. 6.022×10^{23} molecules of ammonia
(a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1, 2 and 3
[Atomic weights: O = 16, H = 1, N = 14]
- (xiv) In the molecule of water, oxygen atom has:
(a) One shared pair of electrons.
(b) Three shared pair of electrons.
(c) Two lone pairs of electrons.
(d) One lone pair of electrons.
- (xv) A mineral from which the metal can be extracted economically and conveniently is known as:
(a) Matrix (b) Ore
(c) Flux (d) Alloy

Question-2

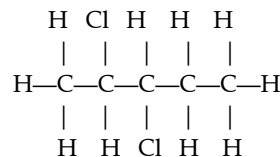
- (i) The following sketch represents the electroplating of an Iron cup with Nickel metal. Study the diagram and answer the following questions. [5]



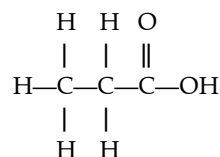
- (a) During electroplating the iron cup is placed at the cathode. Why?
- (b) Name the ion that must be present in the electrolyte.
- (c) State one condition that is necessary to ensure that the deposit is smooth, firm and even.
- (d) Write the reaction taking place at the cathode.
- (e) What change would you observe at the anode?
- (ii) Match the column A with Column B: [5]
- | | |
|-------------------|----------------------|
| (a) Water | 1. Lithium |
| (b) Alkali metal | 2. Iodine |
| (c) Halogen | 3. Covalent compound |
| (d) Calcium oxide | 4. Acetic acid |
| (e) Weak acid | 5. Ionic compound |
| | 6. Sulphuric acid |
- (iii) Complete the following sentence by choosing the correct answer from the brackets: [5]
- (a) The salt that can be prepared by Direct Combination is [FeCl₃/FeCl₂]
- (b) The metallic oxide which can be reduced by using common reducing agents is [Fe₂O₃/Al₂O₃]
- (c) The metal nitrate which on thermal decomposition forms a black residue is [zinc nitrate/copper nitrate]
- (d) During the electrolysis of copper sulphate solution, if is used as electrode, the colour of the electrolyte does not fade. [copper/platinum]
- (e) The process of heating the concentrated ore in a limited supply or absence of air is [roasting/calcination]
- (iv) State the **terms** for the following: [5]
- (a) The group obtained by removing one hydrogen atom from the parent alkane.
- (b) Two metal plates or wires through which the current enters and leaves the electrolytic cell.
- (c) The amount of substance which contains the same number of units as the number of atoms in carbon-12.
- (d) The tendency of an atom to pull a shared pair of electrons towards itself in a compound.

- (e) The formula which represents the simplest ratio between the atoms of elements present in a compound.

- (v) (a) Give the IUPAC names of the organic compounds represented by the structural formulae given below: [5]
- 1.



2.



- (b) Draw the structural diagram for the following organic compounds:
- 3-methyl pentane
 - propyne
 - methanal

SECTION – B (40 Marks)

(Attempt **any four** questions from this Section)

Question-3

- (i) Rewrite the following statements by adding the correct word as shown in the example: [2]

<p><i>Example:</i></p> <p>Given Statement: Ammonia changes moist red litmus to blue.</p> <p>Correct statement: Aqueous ammonia changes moist red litmus to blue.</p>

- (a) Sulphuric acid acts as a dehydrating agent.
- (b) Ammonia reacts with chlorine to give ammonium chloride and nitrogen.
- (ii) Identify **only** the **anion** present in the following compound: [2]
- (a) The compound on heating produces a colourless, odourless gas which turns lime water milky and has no effect on acidified potassium dichromate solution.
- (b) The solution of the compound which on treating with concentrated sulphuric acid and freshly prepared ferrous sulphate solution produces a brown ring.
- (iii) Mohan has three solutions **P**, **Q** and **R** having a pH of 13, 5 and 2 respectively. Which of the above solutions is **P**, **Q** or **R**: [3]
- (a) will react with Magnesium to liberate hydrogen gas?
- (b) will liberate ammonia gas when it reacts with ammonium chloride?
- (c) will contain molecules as well as ions?

- (iv) The following table is related to an industrial process of an acid. [3]

Name of the process	Reactant	Catalyst	Final Product
(a)	$\text{SO}_2 + \text{O}_2$	(b)	(c)

Identify (a), (b) and (c).

Question-4

- (i) Define the following terms: [2]
 (a) Molar volume
 (b) Normal salt
- (ii) Draw the electron dot structure of: [2]
 (a) Methane molecule
 (b) Nitrogen molecule
 [Atomic number: N = 7, C = 6, H = 1]
- (iii) Complete and balance the following equation: [3]
 (a) $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow$
 (a) $\text{C}_2\text{H}_5\text{COONa} + \text{NaOH} \xrightarrow{\text{CaO}}$
 (c) $\text{C}_2\text{H}_4\text{Br}_2 + \text{alcoholic KOH} \xrightarrow{\Delta}$
- (iv) Choose the organic compound from the list given below to answer the following question: [3]

Ethene	Ethanoic acid	Ethanol	Methanal
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- (a) The compound which does **not** have double bond in its structure.
 (b) The compound which in its pure form turns into an ice like solid on cooling.
 (c) The compound which is used for artificial ripening of fruits.

Question-5

- (i) Name the **main metal** used in making of alloys given below: [2]
 (a) Duralumin
 (b) Stainless steel
- (ii) Differentiate between the following pairs based on the criteria given: [2]
 (a) Sulphuric acid and Nitric acid (*using barium chloride solution*)
 (b) Unsaturated and Saturated hydrocarbons (*type of bond present*)
- (iii) Calcium carbonate reacts with dilute hydrochloric acid as given below: [3]
 $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
 (a) What is the mass of 5 moles of calcium carbonate? (*Relative molecular mass of calcium carbonate is 100*)
 (b) How many moles of HCl will react with 5 moles of calcium carbonate?
 (c) What is the volume of carbon dioxide liberated at S.T.P. at the same time?
- (iv) Identify the gas evolved in each of the following reactions: [3]
 (a) Methane undergoes complete combustion.
 (b) Copper carbonate is heated.
 (c) MnO_2 reacts with concentrated HCl.

Question-6

- (i) $\text{X} - \text{HCl} \rightleftharpoons \text{H}^+ + \text{Cl}^-$ (*in solution state*)
 $\text{Y} - \text{PbBr}_2 \rightleftharpoons \text{Pb}^{2+} + 2\text{Br}^-$ (*in molten state*)
 From the above reactions X or Y, identify the reaction which exhibits: [2]
 (a) electrolytic dissociation
 (b) ionisation
- (ii) Give reasons for the following: [2]
 (a) Inert gases do not form ions.
 (b) Covalent compounds have a low melting and boiling point.
- (iii) Arrange the following as per the instructions given in the brackets: [3]
 (a) Carbon, Fluorine, Beryllium (*decreasing order of atomic size*)
 (b) Sulphuric acid, phosphoric acid, Acetic acid (*increasing order of number of replaceable H atoms per molecule*)
 (c) Potassium, Lithium, Sodium (*increasing order of ionisation potential*)
- (iv) Identify the following: [3]
 (a) An element in period 1 which can be placed in both group 1 and group 17 of the periodic Table.
 (b) The element having electronic configuration 2, 8, 6.
 (c) The most electronegative element of period 3.

Question-7

- (i) Rita was given an unknown salt for identification. She prepared a solution of the salt and divided it into two parts. [2]
 • To the first part of the salt solution, she added a few drops of ammonium hydroxide and obtained a reddish-brown precipitate.
 • To the second part of the salt solution, she added a few drops of silver nitrate solution and obtained a white precipitate.
 Name:
 (a) the cation present and
 (b) the anion present in the salt given for identification.
- (ii) Fill in the blanks by choosing the correct answer from the bracket: [2]
 (a) Carbon tetrachloride is a [*polar/non-polar*] covalent molecule.
 (b) During electrolysis of acidulated water, the gas liberated at the anode is [*oxygen/hydrogen*].
- (iii) Ammonia burns in oxygen as shown below. [3]
 $4\text{NH}_3 + 3\text{O}_2 \rightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$
 If 240 cc of ammonia is burn in 300 cc of oxygen, find out the composition of the resultant gaseous mixture at room temperature.
- (iv) The following table shows the electronic configuration of the atoms A, B, C and D. [3]

Element	A	B	C	D
Electronic configuration	2, 8, 8, 2	2, 6	2, 8, 7	2, 4

(a) Write the formula of the compound formed between:

1. A and B
2. D and C

(b) Which of the above elements will exhibit catenation?

Question-8

(i) Choose the correct answer from the list given below: [2]

Zinc blende, C_2H_2 , Calamine, Haematite

(a) The ore which can be concentrated by magnetic separation.

(b) Empirical formula of Ethyne.

(ii) Give balanced equation for the following reactions: [2]

(a) Copper reacts with concentrated Nitric acid.

(b) Aluminium nitride is treated with warm water.

(iii) Match the salts underlined in column A with the most suitable method of preparation given in column B [3]

Column A

(a) $ZnCl_2$ from Zn

(b) KNO_3 from KOH

(c) $CaCO_3$ from $CaCl_2$

Column B

1. Precipitation

2. Direct combination

3. Displacement reaction

4. Neutralisation

(iv) Hydrogen chloride gas is prepared in the laboratory by the action of concentrated sulphuric acid on sodium chloride. [3]

(a) Give balanced chemical equation for the above reaction.

(b) State the method of collection of the gas formed above.

(c) What is property of sulphuric acid that makes it a suitable reagent for the reaction.

ANSWERS

Answer-1

(i) **Option (a) is correct.**

Explanation: Unsaturated hydrocarbons such as alkenes and alkynes, undergo addition reactions because being highly reactive, the unsaturated bonds are broken with the addition of new atoms or groups to form the saturated molecule.

(ii) **Option (d) is correct.**

Explanation: Due to the stable configuration and the octet rule (outermost shell is completely filled with eight electrons), the electrons are tightly held by the nucleus in the 2nd period element Neon (Ne), and it requires a significant amount of energy to remove an electron from the outer shell.

(iii) **Option (d) is correct.**

Explanation: There are two types of solders which are commonly used. First one is soft solder which is an alloy of tin(Sn) and lead(Pb). The other one is a hard solder which is an alloy of Copper(Cu) and Zinc(Zn).

(iv) **Option (c) is correct.**

Explanation: Amphoteric hydroxides react with both alkalis and acids. Aluminium hydroxide is an amphoteric in nature.

(v) **Option (b) is correct.**

Explanation: The reaction of an alcohol with a carboxylic acid in the presence of sulphuric acid (H_2SO_4) is called an esterification reaction.

(vi) **Option (a) is correct.**

Explanation: Elimination of the water molecule usually from an alcohol is known as dehydration reaction.

(vii) **Option (b) is correct.**

Explanation: The oxidation state of the Sulphur atom in the ground state changes from 0 to +4. Thus, sulphuric acid oxidises the ground state of the sulphur atom and hence acts as an oxidising agent.

(viii) **Option (d) is correct.**

Explanation: Bromine has a relatively high electron affinity compared to the other elements because it is a halogen and tends to gain one electron to achieve a stable electronic configuration.

(ix) **Option (b) is correct.**

Explanation: NaAlO_2 is not the compound used in the electrolytic mixture of Hall-Heroult's process.

(x) **Option (c) is correct.**

Explanation: When ammonia gas (NH_3) is passed over heated copper oxide (CuO) and a brown color residue is left, it indicates the reducing property of ammonia.

(xi) **Option (b) is correct.**

Explanation: The rotten egg smell is due to the liberation of hydrogen sulphide gas (H_2S).

(xii) **Option (c) is correct.**

Explanation: Ammonia gas is collected by the downward displacement of air because ammonia is lighter than air.

(xiii) **Option (b) is correct.**

Explanation: Since, 1 mole of any gas at STP has volume 22.4 L. So, 32 g of oxygen which is equal to the mass of 1 mole of O_2 gas. Therefore, 32 g of O_2 has volume at STP is 22.4 L.

Since, 6.023×10^{23} molecule of any gas contain 1 mole of gas. Hence, 6.023×10^{23} molecules of ammonia has volume 22.4 L.

(xiv) **Option (c) is correct.**

Explanation: Oxygen has six electrons in its valence shell. So, it shares two electrons with the two hydrogen atoms to form the H_2O molecule and the remaining four electrons do not take part in bonding is called lone pair of electrons. Therefore, in water molecule oxygen has two bond pairs and two lone pairs of electrons.

(xv) **Option (b) is correct.**

Explanation: Ores are naturally occurring minerals that contain a high concentration of the desired metal or metals, along with other elements and compounds, to make their extraction economically viable.

Answer-2.

(i) (a) The metal which is to be electroplated should always be at cathode in electroplating. Therefore, the metal ion (Ni^{2+}) in it gets reduced at the cathode and forms a layer on it.

(b) Cation: Ni^{2+} and anion depend upon the electrolyte taken.

(c) The passage of low current for long time is a necessary condition to ensure the deposit is smooth, even and firm.

(d) $\text{Ni}^{2+} + 2e^- \rightarrow \text{Ni}$

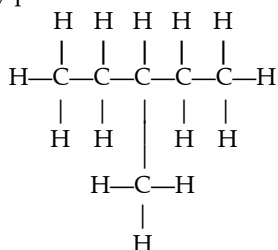
(e) Negatively charge ions (depends upon the electrolyte) move toward the anode but do not discharged due to nature of the electrode. But Ni losses two electrons converted into Ni^{2+} in the solution. That results anode electrode get thinner and iron cup becomes thicker over the time of electrolysis.

- (ii) Column A Column B
- (a) Water 3. Covalent compound
- (b) Alkali metal 1. Lithium
- (c) Halogen 2. Iodine
- (d) Calcium oxide 5. Ionic compound
- (e) Weak acid 3. Acetic acid

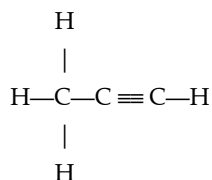
- (iii) (a) FeCl_3
- (b) Al_2O_3
- (c) Copper nitrate
- (d) Copper
- (e) Calcination

- (iv) (a) Alkyl group
- (b) Electrodes (cathode and anode)
- (c) Mole
- (d) Electronegativity
- (e) Empirical formula

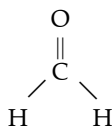
- (v) (a) 1. 2, 3-dichloropentane
2. Propanoic acid
- (b) 1. 3-methylpentane



2. Propyne



3. Methanal



Answer-3.

- (i) (a) Concentrated sulphuric acid acts as a dehydrating agent.

(b) Ammonia reacts with chlorine to give hydrogen chloride and nitrogen.

- (ii) (a) Anion is Carbonate. When metal carbonates are heated, a colourless and an odourless gas is evolved. This gas is carbon dioxide (CO_2).

When CO_2 is passed through lime water, it turns lime water milky. Also, this gas doesn't show any effect when passed through the solution of acidified potassium dichromate.

(b) A brown-coloured ring is generally formed at the junction of the test tube containing the mixture of ferrous sulphate and sulphuric acid. This ring indicates the presence of nitrates ion in the given solution.

- (iii) (a) Among the solutions P, Q and R, the solution with pH 2 that is R will react with magnesium to liberate Hydrogen gas as metal when reacts with acid gives hydrogen gas.

(b) Ammonia gas will be liberated from ammonium salts like ammonium chloride on addition of an alkaline solution. Therefore, solution P is used.

(c) A solution which contains both molecules and ions is nearly neutral with pH 7. Solution Q, with a pH of 5, is closest to such the pH value of 7.

- (iv) (a) Contact process.

(b) Vanadium oxide (V_2O_5).

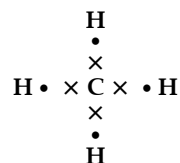
(c) Sulphur trioxide (SO_3).

Answer-4.

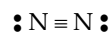
(i) (a) **Molar volume** -Molar volume refers to the volume occupied by one mole of a substance under specific conditions of temperature and pressure.

(b) **Normal salt** -A normal salt is a term used to describe a salt that is formed when a metal or a metal-like group of elements replaces replaceable hydrogen atoms in an acid molecule through a neutralisation reaction.

- (ii) (a) Methane molecule



(b) Nitrogen molecule



- (iii) (a) $\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}$

(b) $\text{C}_2\text{H}_5\text{COONa} + \text{NaOH} \rightarrow \text{Na}_2\text{CO}_3 + \text{C}_2\text{H}_6$

(c) $\text{CH}_2\text{Br}-\text{CH}_2\text{Br} + \text{alc. } 2\text{KOH} \rightarrow \text{HC}\equiv\text{CH} + 2\text{KBr} + 2\text{H}_2\text{O}$

- (iv) (a) Ethanol (C₂H₅OH)
 (b) Ethanoic acid
 (c) Ethene

Answer 5.

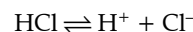
- (i) (a) Duralumin is an alloy of aluminium (Al), copper (Cu), manganese (Mn) and magnesium (Mg).
 (b) Stainless steel is an alloy of iron (Fe), and chromium (Cr).
- (ii) (a) Sulphuric acid on reaction with barium chloride will give white precipitate whereas nitric acid will not give any precipitate on reaction with barium chloride.
 (b) Saturated hydrocarbons consist of only single covalent bonds between two carbons while unsaturated hydrocarbons consist of at least one or more double or triple carbon-carbon bonds in the compounds.
- (iii) (a) Molar mass of CaCO₃ = 100 g/mol
 Now, to find the mass of 5 moles of CaCO₃, use the formula:
 Mass = Number of moles × Molar mass

$$\text{Mass} = 5 \text{ mol} \times 100 \frac{\text{g}}{\text{mol}} = 500 \text{ g}$$
 Therefore, the mass of 5 moles of CaCO₃ is 500 grams.
 (b) According to the balanced equation, 1 mole of calcium carbonate (CaCO₃) reacts with 2 moles of hydrochloric acid (HCl).
 Therefore, if you have 5 moles of calcium carbonate, you would need 5 mol × 2 = 10 moles of hydrochloric acid for a complete reaction.
 (c) According to the equation, 1 mole of calcium carbonate produces 1 mole of carbon dioxide (CO₂). Therefore, 5 moles of calcium carbonate would produce 5 moles of carbon dioxide.
 At STP, 1 mole of any gas occupies 22.4 liters.
 So, 5 moles of CO₂ occupy
 Mass = Number of moles × Molar volume at STP

$$\text{Mass} = 5 \text{ mol} \times 22.4 \text{ L} = 112.0 \text{ L}$$
- (iv) (a) Methane on complete combustion gives carbon dioxide gas and water.
 (b) Thermal decomposition of copper carbonate gives cupric oxide and carbon dioxide gas.
 (c) The chlorine gas is released when MnO₂ reacts with HCl.

Answer-6.

- (i) (a) The ions are formed in molten state while in the solid state the ions are packed tightly together due to the electrostatic force between them. So, $\text{PbBr}_2 \rightleftharpoons \text{Pb}^{2+} + 2\text{Br}^-$ or reaction Y will show electrolytic dissociation.
 (b) The reaction X in the solution state gives an ionisation reaction.



- (ii) (a) Inert gas do not form ions because their outermost shell is completely filled and possess a stable configuration. So they are unreactive in nature and do not form ions.
 (b) The molecules that are formed by the covalent bonds are held together by weak intramolecular forces. Thus, a very small amount of energy is required to break the bonds between two or more molecules as a result they possess low melting and boiling points.
- (iii) (a) The decreasing order of their atomic size is as follow
 Beryllium (Be) > Carbon (C) > Fluorine (F)
 (b) The increasing order of their replaceable hydrogen ions is as follow
 Acetic acid (CH₃COOH) < Sulphuric acid (H₂SO₄) < Phosphoric acid (H₃PO₄)
 (c) The increasing order of their ionisation potential is as follows
 Potassium (K) < Sodium (Na) < Lithium (Li)
- (iv) (a) Hydrogen (H)
 (b) Sulphur (S)
 (c) Chlorine (Cl)

Answer-7.

- (i) (a) Ferric chloride (FeCl₃) reacts with ammonium hydroxide to give a reddish brown precipitate. The cation part is (Fe³⁺).
 (b) Ferric chloride (FeCl₃) reacts with a silver chloride precipitate, a white precipitate of silver chloride is formed. The anion part is Chloride ions (Cl⁻).
- (ii) (a) Non-polar
 (b) Oxygen
- (iii) The balanced chemical reaction can be shown as

$$4\text{NH}_3 + 3\text{O}_2 \rightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$$
 As per the stoichiometry of the equation, 4 cc of NH₃ reacts with 3 cc of O₂.
 Thus, 240 cc of NH₃ reacts with $\frac{240 \text{ cc} \times 3}{4} = 180 \text{ cc}$ of O₂

Hence, the unused O_2 gas will be = $300 - 180 = 120$ cc of O_2

From 240 cc of NH_3 , $2N_2$ is produced.

So, 240 cc of NH_3 will produce $\frac{240 \text{ cc} \times 2}{4} = 120$ cc of

O_2

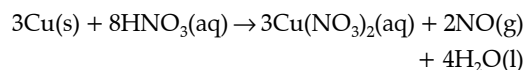
Thus, the composition mixture of the resultant mixture is 120 cc.

- (iv) (a) 1. A is Calcium (Ca) with atomic number 20 and B is oxygen with atomic number 8. The compound formed with these two elements is calcium oxide and its chemical formula is CaO .
2. C is Chlorine (Cl) with atomic number 17 and D is carbon with atomic number 6. The compound formed with these two elements is carbon tetrachloride and its chemical formula is CCl_4 .
(b) The element that will exhibit catenation is D as it is carbon atom.

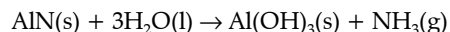
Answer-8.

- (i) (a) The ore which can be concentrated by magnetic separation is Hematite.
(b) The empirical formula of ethyne is CH .

- (ii) (a) The reaction of copper with nitric acid results in the formation of copper nitrate that can be shown as:



- (b) The reaction of aluminium nitride with warm water forms aluminium hydroxide that can be shown as:



- (iii) Column A Column B
(a) $ZnCl_2$ from Zn 3. Displacement reaction
(b) KNO_3 from KOH 4. Neutralisation
(c) $CaCO_3$ from $CaCl_2$ 1. Precipitation
(iv) (a) The chemical reaction can be shown as
 $Conc. H_2SO_4(l) + 2NaCl(s) \rightarrow Na_2SO_4(s) + 2HCl(g)$
(b) Hydrogen chloride gas is collected by downward delivery technique (upward displacement of air).
(c) The sulphuric acid acts as an oxidising agent and possesses non-volatile nature and high boiling point.