

# ICSE 2026 EXAMINATION

## Sample Question Paper - 2

### Chemistry

Time Allowed: 2 hours

Maximum Marks: 80

#### General Instructions:

- 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 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

1. **Question 1 Choose one correct answer to the questions from the given options:** [15]
- (a) Element with atomic number 38 belongs to [1]
- |                              |                               |
|------------------------------|-------------------------------|
| a) II A group and 5th period | b) II A group and 2nd period  |
| c) V A group and 2nd period  | d) III A group and 5th period |
- (b) Amongst the following, select the element with highest ionisation enthalpy. [1]
- |              |              |
|--------------|--------------|
| a) Potassium | b) Sodium    |
| c) Magnesium | d) Beryllium |
- (c) The property which is characteristic of an electrovalent compound is that [1]
- |                             |                                |
|-----------------------------|--------------------------------|
| a) it is easily vaporised   | b) it has a high melting point |
| c) it is a weak electrolyte | d) it often exists as a liquid |
- (d) The acid present in the sting of bees is \_\_\_\_\_. [1]
- |                |                |
|----------------|----------------|
| a) Uric acid   | b) Formic acid |
| c) Lactic acid | d) Malic acid  |
- (e) Which gas is evolved when acids react with metal carbonates? [1]
- |                    |                    |
|--------------------|--------------------|
| a) CO <sub>2</sub> | b) O <sub>2</sub>  |
| c) H <sub>2</sub>  | d) NH <sub>3</sub> |
- (f) The salt which given a pale green precipitate with sodium hydroxide solution and a white precipitate with barium chloride solution is: [1]
- |                        |                        |
|------------------------|------------------------|
| a) Iron (III) chloride | b) Iron (II) sulphate  |
| c) Iron (II) chloride  | d) Iron (III) sulphate |

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## 2. Question 2

[25]

(a) Ammonia is manufactured by Haber's process.

[5]

i. Under what conditions do the reactants combine to form ammonia? Give a balanced equation for the reaction.

ii. In what ratio by volume, are the above gases used?

iii. What is the function of:

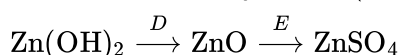
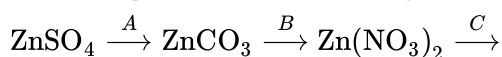
a. Finely divided iron,

b. Molybdenum in the above process?

iv. Mention two possible ways by which ammonia produced is removed from unchanged gases.

(b) Give the equations for the following conversions A to E.

[5]



(c) Complete the following by choosing the correct answers from the bracket:

i. Metals form \_\_\_\_\_ chlorides. (Covalent/ionic)

[1]

ii. \_\_\_\_\_ can conduct electricity in aqueous solutions due to the presence of ions. (bases, acids, alkalis)

[1]

iii. 1 mole of He = \_\_\_\_\_ g of helium.

[1]

iv. We can expect that pure water \_\_\_\_\_ normally conduct electricity.

[1]

v. \_\_\_\_\_ and HNO<sub>3</sub> acid can be prepared by using sulphuric acid.

[1]

(d) Identify the following:

i. Identify and name the following:

[1]

Series of compounds having similar structural formulae, same functional group and similar chemical properties.

ii. Identify and name the following:

[1]

The gas obtained by dehydration of ethanol.

iii. Identify and name the following:

[1]

The particle that move when electric current is passed through metal wire.

iv. Identify and name the following:

[1]

A strong but non-volatile mineral acid.

v. Fill in the blanks:

[1]

The similarities in the properties of a group of elements is because they have the similar \_\_\_\_\_. (electronic configuration/number of outer most shell electrons or valence electrons,/atomic numbers.)

(e) i. Acetylene burns in air according to the reaction  $2\text{C}_2\text{H}_2 + 5\text{O}_2 \rightarrow 4\text{CO}_2 + 2\text{H}_2\text{O}$  at 100°C.

[2]

Calculate the volume of air required to completely burn 50 cc of acetylene. (Air contains 20% oxygen by volume)

ii. Draw the electron dot diagram for the compounds given below. Represent the electron by (·)

[3]

and (×) in the diagram. [Atomic No.: Ca = 20, O = 8, Cl = 17, H = 1]

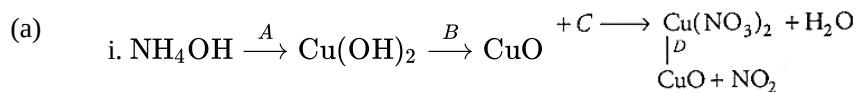
i. Calcium oxide

- ii. Chlorine molecule
- iii. Water molecule

### Section B

Attempt any 4 questions

#### 3. Question 3 [10]



Identify A, B, C and D in the above reaction sequence.

ii. Name two drying agents of ammonia.

#### (b) Write the products and balance the equation.

- i. Sodium thiosulphate is reacted with dilute hydrochloric acid [1]
- ii. Zinc oxide is treated with sodium hydroxide solution [1]

#### (c) Arrange the following as per the instruction given in the brackets:

- i. Na, Li, K (Increasing Ionisation Energy) [1]
- ii. Cl, At, Br, I (increasing order of atomic radii) [1]
- iii. Li, K, Na, H (In the decreasing order of their ionization potential) [1]

#### (d) Fill in the blanks by selecting the appropriate word from the given choice:

- i. The name of carboxylic acid is derived by the combination of \_\_\_\_\_ group and the \_\_\_\_\_ group. [1]
- ii. The liquid which is a major component of vinegar is \_\_\_\_\_ (ethyne/ethanoic acid/ethane) [1]
- iii. The number of molecules present in 35.5 g of chlorine is \_\_\_\_\_  $\times 10^{23}$ . (3.01/6.02) [1]

#### 4. Question 4 [10]

- (a) i. What do you understand by a lone pair of electrons? [2]  
 ii. Draw the electron dot diagram of Hydronium ion. (H = 1, O = 8)

#### (b) Calculate the percentage of phosphorus in fertilizer super phosphate $\text{Ca}(\text{H}_2\text{PO}_4)_2$ . [2]

[H = 1, O = 16, P = 31, Ca = 40]

#### (c) Give the chemical formula of: [3]

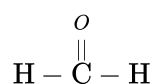
- i. Bauxite
- ii. Cryolite
- iii. Sodium aluminate

#### (d) Explain the following:

- i. Aluminium is used in flash bulbs. [1]
- ii. Anhydrous hydrogen chloride gas and anhydrous liquified hydrogen chloride are not acids. [1]
- iii. Inert gases do not form ions. [1]

#### 5. Question 5 [10]

- (a) i. The catalyst used in the conversion of ethyne to ethane. Identify the substance. [1]  
 ii. Write the IUPAC name of the given compounds: [1]



#### (b) An element L consists of molecules: [2]

- i. What type of bonding is present in the particle that make up L?
- ii. 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) **Give balanced chemical equation for the following:**

- i. Ferric hydroxide reacts with nitric acid [1]
- ii. Dehydration of concentrated sulphuric acid with sugar crystals [1]
- iii. Dilute nitric acid and copper carbonate [1]

(d) **State one relevant observation for each of the following reactions:**

- i. Dilute hydrochloric acid is added to sodium carbonate crystals. [1]
- ii. Ammonium hydroxide solution is added to zinc nitrate solution in minimum quantities and then in excess. [1]
- iii. In the electrolyte during the electrolysis of copper sulphate solutions with inert electrodes. [1]

6. **Question 6** [10]

- (a) Lithium, sodium and potassium were put in one group on the basis of their similar properties. [2]
  - i. Why are these elements show similar properties?
  - ii. What is the common name of this group?
- (b) Find the number of moles and molecules present in 7.1 g of Cl<sub>2</sub>. (At. Wt. Cl = 35.5) [2]
- (c) Which of the following represents the correct IUPAC name for the compounds concerned? [3]
  - i. 2,2-dimethylpentane or 2-dimethylpentane
  - ii. 2,4,7-trimethyloctane or 2,5,7-trimethyl octane
  - iii. 2-chloro-4-methylpentane or 4-chloro-2-methylpentane
- (d) How will you distinguish between following pairs of compounds using NH<sub>4</sub>OH. [3]
  - i. Copper sulphate and iron(II) sulphate.
  - ii. Zinc nitrate and lead nitrate.
  - iii. Iron(II) sulphate and Iron (III) sulphate.

7. **Question 7** [10]

- (a) What are the terms defined in (i) and (ii) below? [2]
  - i. A bond formed by a shared pair of electrons, each bonding atom contributing one electron to the pair.
  - ii. A bond formed by a shared paired of electrons with both electrons coming from the same atom.
- (b) Calculate the volume of 320 g of SO<sub>2</sub> at STP. [2]
 

[Atomic mass of S = 32 and O = 16]
- (c)
  - i. What is the physical state of lead bromide if it is electrolyzed? [3]
  - ii. What particles are present in pure lead bromide?
  - iii. Write the equations for the reactions which take place at the electrode during the electrolysis of lead bromide.
- (d) A compound X (having vinegar like smell) when treated with ethanol in the presence of the acid Z, gives a compound Y which has a fruity smell. The reaction is: [3]
 
$$\text{C}_2\text{H}_5\text{OH} + \text{X} \xrightarrow{\text{Z}} \text{Y} + \text{H}_2\text{O}$$
  - i. Identify Y and Z.

ii. Write the structural formula of X.

iii. Name the above reaction.

8. **Question 8** [10]

(a) Draw the appropriate structural formula of carbon tetrachloride and state the type of bond present in it. [2]

(b) From the equation: [2]



Calculate

i. The mass of carbon oxidised by 49 g of sulphuric acid (C = 12, relative molecular mass of sulphuric acid = 98)

ii. The volume of sulphur dioxide measured at STP liberated at the same time. (Volume occupied by 1 mole of a gas at STP is  $22.4 \text{ dm}^3$ )

(c) The pH values of three solutions A, B and C are given in the table. [3]

Answer the following questions:

Solution	pH value
A	12
B	2
C	7

i. Which solution will have no effect on litmus solution?

ii. Which solution will liberate  $\text{CO}_2$  when reacted with sodium carbonate?

iii. Which solution will turn red litmus solution blue?

(d) i. Calculate the percentage of nitrogen in ammonium nitrate ( $\text{NH}_4\text{NO}_3$ ). [H = 1, N = 14, O = 16] [3]

ii. Under what conditions do nitrogen and hydrogen combine to form ammonia?

iii. State one large scale use of ammonia.

# Solution

## Section A

1. Question 1 Choose one correct answer to the questions from the given options:

- (i) **(a)** II A group and 5th period

**Explanation:**

Given atomic number ( $Z$ ) = 38, has 5 shells and 2 electrons in its outermost shell, i.e., has electronic configuration 2, 8, 18, 8, 2

Thus member of 5th period and II(A) group.

- (ii) **(d)** Beryllium

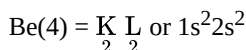
**Explanation:**

i. Ionisation enthalpy  $\propto$  effective nuclear charge and  $\propto \frac{1}{\text{atomic size}}$

ii. Atomic size decreases in period and increases in group.

iii. Elements with fully-filled/half filled outermost sub-shell configuration are more stable.

Hence, ionisation enthalpy of beryllium (Be) is highest, as it has full-filled outermost electronic configuration



- (iii) **(b)** it has a high melting point

**Explanation:**

it has a high melting point

- (iv) **(b)** Formic acid

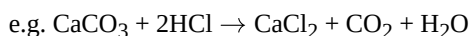
**Explanation:**

Formic acid

- (v) **(a)**  $\text{CO}_2$

**Explanation:**

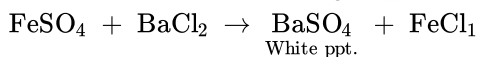
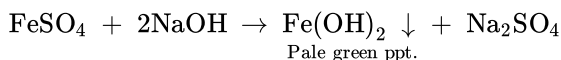
When metal carbonates react with acids, they evolve  $\text{CO}_2$



- (vi) **(b)** Iron (II) sulphate

**Explanation:**

Iron (II) sulphate gives a pale green precipitate with sodium hydroxide solution and a white precipitate with barium chloride solution.



- (vii) **(d)** 10

**Explanation:**

10

- (viii) **(b)** 9 moles

**Explanation:**

9 moles

- (ix) **(a)** Option (ii)

**Explanation:**

Oxidation always occurs at anode and reduction always occurs at cathode.

Thus, we can not differentiate an electrochemical cell and an electrolytes cell by chemical reactions occurring at electrodes.

- (x) **(b)** Calcium

**Explanation:**

Calcium

- (xi) **(a)** Oxidising agent

**Explanation:**

Oxidising agent

- (xii) **(c)** a colourless liquid

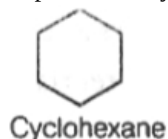
**Explanation:**

a colourless liquid

- (xiii) **(d)** cyclohexane

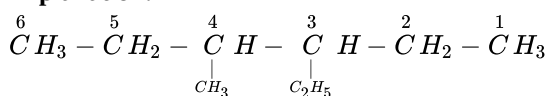
**Explanation:**

Cyclohexane is an example of alicyclic compound. An alicyclic compound is an organic compound that is both aliphatic and cyclic.



- (xiv) **(d)** 3-ethyl-4-methylhexane

**Explanation:**

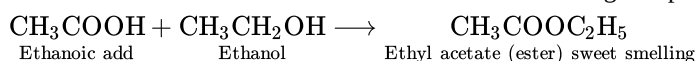


IUPAC name: 3-ethyl-4-methylhexane

- (xv) **(c)** It reacts with ethanol to form a sweet smelling compound

**Explanation:**

Ethanoic acid reacts with ethanol to form a sweet smelling compound (ester).



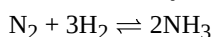
## 2. Question 2

- (i) i. Temperature - 450 - 500°C

Pressure - 200-900 atm.

Catalyst - finely divided iron

Promoter - Molybdenum



- ii. In the ratio 1:3 by volume

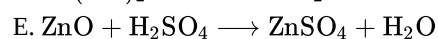
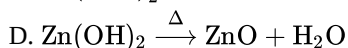
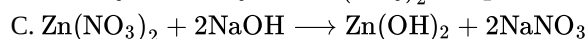
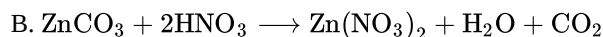
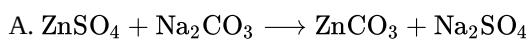
- iii. a. Catalyst

b. Promoter

- iv. a. By liquefaction

b. By dissolving in water.

- (ii) The equations for the following conversions A to E



- (iii) Complete the following by choosing the correct answers from the bracket:

- i. 1. ionic

- ii. 1. acids

- iii. 1. 4

2. Four

- iv. 1. will not

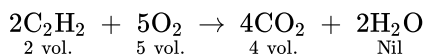
- v. 1. HCl

- (iv) Identify the following:



- i. 1. Homologous series
- ii. 1. Ethene
- iii. 1. Electron
- iv. 1. Sulphuric acid
- v. 1. electronic configuration

(v) i. The given equation is:



2 volumes of  $\text{C}_2\text{H}_2$  requires oxygen = 5 volumes

$$50 \text{ cc volumes of } \text{C}_2\text{H}_2 \text{ requires} = \frac{5 \times 50}{2} = 125 \text{ cc}$$

Since, air contains 20% by volume of  $\text{O}_2$

Volume of air required for the combustion of

$$50 \text{ cc of } \text{C}_2\text{H}_2 = \frac{125 \times 100}{20} = 625 \text{ cc.}$$

ii. Electronic configuration of elements:

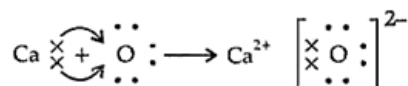
$$_{20}\text{Ca} = 2, 8, 8, 2$$

$$_8\text{O} = 2, 6$$

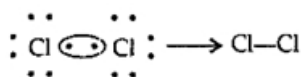
$$_{17}\text{Cl} = 2, 8, 7$$

$$_1\text{H} = 1$$

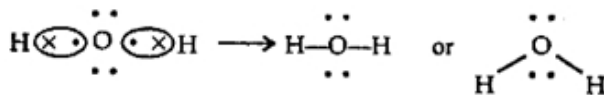
i. Calcium oxide ( $\text{CaO}$ )



ii. Chlorine molecule ( $\text{Cl}_2$ )

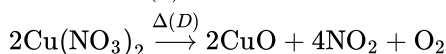
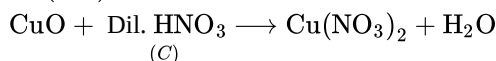
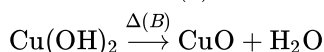
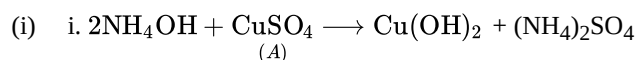


iii. Water molecule ( $\text{H}_2\text{O}$ )



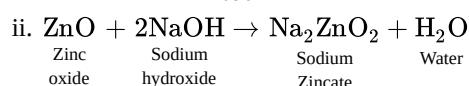
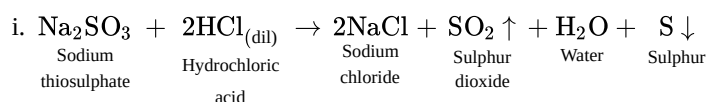
### Section B

### 3. Question 3



ii. Quick lime or calcium oxide ( $\text{CaO}$ ).

(ii) Write the products and balance the equation.



(iii) Arrange the following as per the instruction given in the brackets:

i.  $\text{K} < \text{Na} < \text{Li}$

ii.  $\text{Cl} < \text{Br} < \text{I} < \text{At}$

Because atomic radii decreases along a period and increases on moving down the group.

iii.  $\text{H}, \text{Li}, \text{Na}, \text{K}$

(iv) Fill in the blanks by selecting the appropriate word from the given choice:

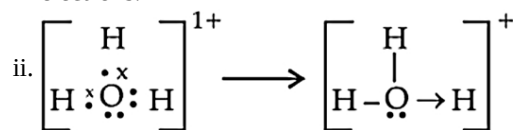
i. 1. carbonyl, hydroxyl

ii. 1. ethanoic acid

iii. 1. 3.01

#### 4. Question 4

- (i) i. The pair of electrons which is not yet shared with other atoms in a covalent molecule is known as lone pair of electrons.



- (ii) Molecular mass of  $\text{Ca}(\text{H}_2\text{PO}_4)_2$

$$= 40 \times 1 + 4 \times 1 + 31 \times 2 + 16 \times 8$$

$$= 40 + 4 + 62 + 128 = 234 \text{ amu.}$$

$$\text{Percentage of Phosphorus} = \frac{62}{234} \times 100 = 26.5 \%$$

- (iii) i.  $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$

ii.  $\text{Na}_3\text{AlF}_6$

iii.  $\text{NaAlO}_2$

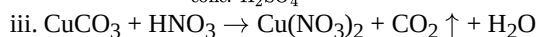
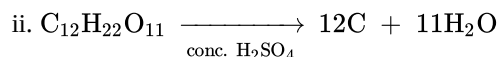
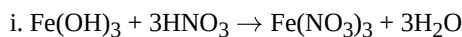
- (iv) Explain the following:

- Aluminium burns in oxygen producing intense white light. This property makes it suitable for flash bulbs.
- This is because neither of them forms hydrogen ions or hydronium ions ( $\text{H}_3\text{O}^+$ ) due to the absence of water molecules.
- Inert gases have stable electronic configuration or have 8 electrons in the valence shell (last shell)/do not lose or gain electrons to form ions/complete outermost or valence shell.

#### 5. Question 5

- (i) i. Nickel (Raney)  
ii. Methanal
- (ii) i. Covalent bonding since L consists of molecules.  
ii. L is getting reduced.

- (iii) Give balanced chemical equation for the following:



- (iv) State one relevant observation for each of the following reactions:

- Brisk effervescence with the evolution of a colourless, odourless gas which when passed through lime water, it turns milky.
- Initially a white ppt. is formed which disappears (dissolves) in excess of ammonium hydroxide.
- The colour of the electrolyte fades i.e., from blue it changes to colourless.

#### 6. Question 6

- (i) i. Same number of valence electrons and valency.  
ii. Alkali metals.

- (ii) Molecular mass of  $\text{Cl}_2 = 2 \times 35.5 = 71$

$$\text{No. of moles} = \frac{\text{Mass of substance}}{\text{Mass of one mole}}$$

$$= \frac{7.1}{71} = 0.1 \text{ moles of } \text{Cl}_2$$

$$71 \text{ g of chlorine has } 6.023 \times 10^{23} \text{ molecules}$$

$$7.1 \text{ g of chlorine will have} = \frac{6.023 \times 10^{23}}{71} \times 7.1$$

$$= 6.023 \times 10^{22} \text{ molecules}$$

- (iii) i. IUPAC name - 2,2-dimethyl pentane (because for the two alkyl groups on the same carbon, its locant is repeated twice)  
ii. IUPAC name - 2,4, 7-trimethyloctane (because 2,4 , 7-locant set is lower than 2, 5, 7).

iii. IUPAC name - 2-chloro-4-methylpentane (alphabetical order of substituents)

(iv) i.	<b>Copper sulphate</b>	<b>Iron (II) sulphate</b>
	A pale blue precipitate is formed which dissolves in excess of $\text{NH}_4\text{OH}$ to give deep blue or inky blue solution.	A dirty green precipitate of $\text{Fe}(\text{OH})_2$ which is insoluble in excess of $\text{NH}_4\text{OH}$ .
ii.	<b>Zinc nitrate</b>	<b>Lead nitrate</b>
	A gelatinous white precipitate of $\text{Zn}(\text{OH})_2$ is obtained, which is soluble in excess of $\text{NH}_4\text{OH}$ .	A chalky white ppt. of $\text{Pb}(\text{OH})_2$ is obtained which is insoluble in excess of $\text{NH}_4\text{OH}$ .
iii.	<b>Iron (II) sulphate</b>	<b>Iron (III) sulphate</b>
	A dirty green precipitate of $\text{Fe}(\text{OH})_2$ which is insoluble in excess of $\text{NH}_4\text{OH}$ .	A reddish brown ppt. of $\text{Fe}(\text{OH})_3$ is formed which is insoluble in excess of $\text{NH}_4\text{OH}$ .

#### 7. Question 7

- (i) i. Covalent bond  
ii. Coordinate bond

(ii) Molecular mass of  $\text{SO}_2 = 32 + 2 \times 16$

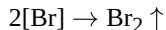
$$= 64 \text{ amu}$$

Since 64 g of  $\text{SO}_2$  occupies at 22.4 litres at STP

$$320 \text{ g of } \text{SO}_2 \text{ occupies at 22.4 litres at STP} = \frac{320 \times 22.4}{64}$$

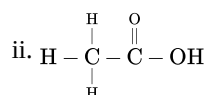
$$= 112 \text{ litres}$$

- (iii) i. Molten or fused.  
ii. Lead ions and bromide ions.  
iii. At cathode:  $\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb}$



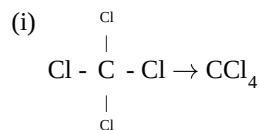
(iv) i. Y: Ethyl acetate/Ethyl ethanoate/ $\text{CH}_3\text{COOC}_2\text{H}_5$

Z : Concentrated  $\text{H}_2\text{SO}_4$



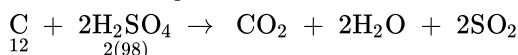
iii. Esterification

#### 8. Question 8



4 - single covalent bonds

(ii) i. The chemical equation is:



From equation 196 g of sulphuric acid oxidises 12 g of C

$$\therefore 49 \text{ g of sulphuric acid oxidises } \frac{12 \times 49}{196} = 3 \text{ g of C}$$

ii. From equation 196 g of sulphuric acid liberates

$$2 \times 22.4 \text{ L of } \text{SO}_2$$

$\therefore$  49 g of sulphuric acid will liberate

$$= \frac{2 \times 22.4 \times 49}{196} = 112 \text{ L of } \text{SO}_4$$

- (iii) i. C/pH 7  
ii. B/pH 2  
iii. A/pH 12

(iv) i. Molecular weight of  $\text{NH}_4\text{NO}_3$

$$= 14 + (4 \times 1) + 14 + (3 \times 16)$$

$$= 14 + 4 + 14 + 48$$

$$= 80$$

Percentage of nitrogen in  $\text{NH}_4\text{NO}_3$

$$= \frac{28}{80} \times 100 = 35\%$$

ii. Nitrogen and oxygen combine to form ammonia under the following conditions:

a. High pressure

b. Low temperature

c. Presence of a catalyst.

iii. **Large scale use of ammonia:** Manufacture of nitric acid by Ostwald's process.