ICSE QUESTION PAPER

Class X

Chemistry

(2015)

Time: 2 hrs **Max. Marks: 80**

Answers to this Paper must be written on the paper provided separately.
You will not be allowed 10 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 I is compulsory. Attempt any four questions from **section II**.
The intended marks for questions or parts of questions are given in brackets [ ]

SECTION I (40 Marks)

Attempt all questions from this Section

Question 1

(a) Select from the list **the gas** that matches the description given in each case:
[ammonia, ethane, hydrogen chloride, hydrogen sulphide, ethyne]

(i) This gas is used as a reducing agent in reducing copper oxide to copper.
(ii) This gas produces dense white fumes with ammonia gas.
(iii) This gas is used for welding purposes.
(iv) This gas is also a saturated hydrocarbon.
(v) This gas has a characteristic rotten egg smell. [5]

(b) Choose the **most appropriate** answer for each of the following:

(i) Among the elements given below, the element with the least electronegativity is:
(A) Lithium
(B) Carbon
(C) Boron
(D) Fluorine

(ii) Identify the statement which does **not** describe the property of alkenes:
(A) They are unsaturated hydrocarbons
(B) They decolourise bromine water
(C) They can undergo addition as well as substitution reactions
(D) They undergo combustion with oxygen forming carbon dioxide and water.

(iii) This is **not** an alloy of copper:
(A) Brass
(B) Bronze
(C) Solder
(D) Duralumin.

(iv) Bonding in this molecule can be understood to involve coordinate bonding.
  (A) Carbon tetrachloride
  (B) Hydrogen
  (C) Hydrogen chloride
  (D) Ammonium chloride

(v) Which of the following would weigh the least?
  (A) 2 gram atoms of Nitrogen.
  (B) 1mole of Silver
  (C) 22.4 litres of oxygen gas at 1 atmospheric pressure and 273K
  (D) 6.02×10^{23} atoms of carbon.

[Atomic masses: Ag=108, N=14, O=16, C=12] [5]

(c) Complete the following calculations. Show working for complete credit:

(i) Calculate the mass of Calcium that will contain the same number of atom as are present in 3.2 gm of Sulphur.
[Atomic masses: S=32, Ca=40] [2]

(ii) If 6 litres of hydrogen and 4 litres of chlorine are mixed and exploded and if water is added to the gases formed, find the volume of the residual gas. [2]

(iii) If the empirical formula of a compound is CH and it has a vapour density of 13, find the molecular formula of the compound. [1]

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

(i) When crystals of copper nitrate are heated in a test tube.

(ii) When the gaseous product obtained by dehydration of ethyl alcohol is passed through bromine water.

(iii) When hydrogen sulphide gas is passed through lead acetate solution.

(iv) When ammonia gas is burnt in an atmosphere of excess oxygen.

(v) At the Anode when aqueous copper sulphate solution is electrolysed using copper electrodes. [5]

(e) Identify **the acid** which matches the following description (i) to (v):

(i) The acid which is used in the preparation of a non-volatile acid.

(ii) The acid which produces sugar charcoal from sugar.

(iii) The acid which is prepared by catalytic oxidation of ammonia.

(iv) The acid on mixing with lead nitrate solution produces a white precipitate which is insoluble even on heating.

(v) The acid on mixing with silver nitrate solution produces a white precipitate which is soluble in excess ammonium hydroxide. [5]

(f) Give **appropriate scientific reasons** for the following statements:

(i) Zinc oxide can be reduced to zinc by using carbon monoxide, but aluminium oxide cannot be reduced by a reducing agent

(ii) Carbon tetrachloride does not conduct electricity.

(iii) During electrolysis of molten lead bromide graphite anode is preferred to other electrodes.

(iv) The electrical conductivity of acetic acid is less in comparison to the electrical conductivity of dilute sulphuric acid at a given concentration.

(v) Electrolysis is of molten lead bromide is considered to be a redox reaction. [5]

(g)

(i) Give **balanced <u>chemical</u> equations** for the following conversions A, B and C:

$$Fe \xrightarrow{A} FeCl_3 \xrightarrow{B} FeCO_3 \xrightarrow{C} Fe(NO_3)_2$$ [3]

(ii) Differentiate between the terms **strong electrolyte** and **weak electrolyte**. [2]
(stating any two differences)

(h) Answer the following questions:

(i) Explain the bonding in methane molecule using electron dot structure. [2]

(ii) The metal of Group 2 from top to bottom arc Be, Mg, Ca, Sr, and Ba.

(1) Which one of these elements will form ions most readily and why?

(2) State the common feature in the electronic configuration of all these elements. [3]

SECTION II (40 Marks)

Attempt any four questions from this Section

Question 2

(a) Arrange the following as per the **instructions** given in the brackets:

(i) Cs, Na, Li, K, Rb (increasing order of metallic character).

(ii) Mg, Cl, Na, S, Si (decreasing order of atomic size).

(iii) Na, K, Cl, S, Si (increasing order ionization energy)

(iv) Cl, F, Br, I (increasing order of electron affinity) [4]

(b) Choose the most appropriate answer from the following list of oxides which fit the **description**. Each answer may be used only once:
[SO_2, SiO_2, Al_2O_3, MgO, CO, Na_2O]

(i) A basic oxide.

(ii) An oxide which dissolves in water formineg an acid.

(iii) An amphoteric oxide.

(iv) A covalent oxide of a metalloid.

(c) Element X is a metal with a valency 2, Y is 3 non- metal with a valency 3.
(i) Write an equation to show how Y from an ion.
(ii) If Y is a diatomic gas, write an equation for the direct combination of X and Y to from a compound. [2]

Question 3

(a) Give balanced ***chemical equations*** for the following ***conversions***:
(i) Ethanoic acid to ethyl ethanoate.
(ii) Calcium carbide to ethyne.
(iii) Sodium ethanoate to methane. [3]

(b) Using their structural formulae identify the functional group by circling them:
(i) Dimethyl ether.
(ii) Propanone.

(c) Name the following:
(i) Process by which ethane is obtained from ethene.
(ii) A hydrocarbon which contributes towards the ***greenhouse*** effect.
(iii) Distinctive reaction that takes place when ethanol is treated with acetic acid.
(iv) The property of element by virtue of which atoms of the element can link to each other in the form of a long chain or ring structure.
(v) Reaction when an alkyl halide is treated with alcoholic potassium hydroxide. [5]

Question 4

(a) Identify the ***anion*** present in each of the following compounds:
(i) A salt **M** on treatment with concentrated sulphuric acid produces a gas which fumes in moist air and gives dense fumes with ammonia.
(ii) A salt **D** on treatment with dilute sulphuric acid produces a gas which turns lime water milky but has no effect on acidified potassium dichromate solution.
(iii) When barium chloride solution is added to salt solution **E** a white precipitate insoluble in dilute hydrochloric acid is obtained. [3]

(b) The following table shows the test a student performed on four different aqueous solutions which are **X, Y, Z** and **W**. Based on the observations provided, identify the cation present:

Chemical test	Observation	Conclusion
To solution **X**, ammonium hydroxide is added in minimum quantity first and then in excess.	A dirty white precipitate is formed which dissolves in excess to form a clear solution	(i)
To solution **Y** ammonium hydroxide is added in minimum quantity first and then in excess.	A pale blue precipitate is formed which dissolves in excess to form a clear inky blue solution.	(ii)
To solution **W** a small quantity of sodium hydroxide solution is added and then in excess.	A white precipitate is formed which remains insoluble.	(iii)
To a salt **Z** calcium hydroxide solution is added and then heated.	A pungent smelling gas turning moist red litmus paper blue is obtained.	(iv)

[4]

(c) Give balanced chemical equations for each of the following:

(i) Lab preparation of ammonia using an ammonium salt

(ii) Reaction of ammonia with excess chlorine.

(iii) Reaction of ammonia with sulphuric acid. [3]

Question 5

(a) Consider the following reaction and based on the reaction answer the questions that follow:

$$(NH_4)_2Cr_2O_7 \xrightarrow{heat} N_2(g) + 4H_2O(g) + Cr_2O_3$$

Calculate:

(i) the quantity in moles of $(NH_4)_2Cr_2O_7$ if 63gm of$(NH_4)_2Cr_2O_7$ is heated. [1]

(ii) the quantity in moles of nitrogen formed. [1]

(iii) the volume in litres or dm^3 of N_2 evolved at S.T.P. [1]

(iv) the mass in grams of Cr_2O_3 formed at the same time. [2]

(Atomic masses: H=1, Cr= 52, N=14]

(b)

(i) For each of the substance listed below, describe the role played in the extraction of aluminium.

(1) Cryolite

(2) Sodium hydroxide

(3) Graphite [3]

(ii) Explain why:

(1) In the electrolysis of alumina using the Hall Heroult's Process the electrolyte is covered with powdered coke.

(2) Iron sheets are coated with zinc during galvanization. [2]

Question 6

(a)

(i) Give balanced chemical equations for the action of sulphuric acid on each of the following:

(1) Potassium hydrogen carbonate.

(2) Sulphur.

(ii) In the contact process for the manufacture of sulphuric acid give the equations for the conversion of sulphur trioxide to sulphuric acid. [2]

(b)

(i) Copy and complete the following table:

	Anode	Electrolyte
Purification of copper		

[2]

(ii) Write the equation taking place at the anode. [1]

(c) Explain the following:

(i) Dilute nitric acid is generally considered a typical acid but not so in its reaction with metals.

(ii) Concentrated nitric add appears yellow when it is left standing in a glass bottle.

(iii) An all glass apparatus is used in the laboratory preparation of nitric acid. [3]

Question 7

(a) The following questions are pertaining to the laboratory preparation of hydrogen chloride gas:

(i) Write the equation for its preparation mentioning the condition required. [1]

(ii) Name the drying agent used and justify your choice. [2]

(iii) State a safety precaution you would take during the preparation of hydrochloric acid.

[1]

(b) An element **L** consists of molecules.

(i) What type of bonding is present in the particles 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**? [2]

(c) From the list of the following salts choose the salt that most appropriately fits the description given in the following:

[$AgCl$, $MgCl_2$, $NaHSO_4$, $PbCO_3$, $ZnCO_3$, KNO_3, $Ca(NO_3)_2$]

(i) A deliquescent salt.

(ii) An insoluble chloride.

(iii) On heating, this salt gives a yellow residue when hot and white when cold.

(iv) On heating this salt, a brown coloured gas is evolved. [4]

ICSE QUESTION PAPER
Class X Chemistry
Board Paper – 2015 (Solution)

SECTION I

1.

(a)

(i) Ammonia
(ii) Hydrogen chloride
(iii) Ethyne
(iv) Ethane
(v) Hydrogen sulphide

(b)

(i) **(A)** Lithium
Lithium is an element with the least electronegativity.
(ii) **(C)** They can undergo addition and substitution reactions.
Alkenes do not undergo substitution reaction.
(iii) **(C)** Solder
Solder is an alloy of lead and tin.
(iv) **(D)** Ammonium chloride
The bond formed between the nitrogen atom in ammonia and the chloride ion is a coordinate bond.
(v) **(A)** 2 gram atoms of Nitrogen.

(c)

(i) Given:
Mass of Sulphur = 3.2 gm
Solution:
32 g of S $\equiv 6.022 \times 10^{23}$ atoms
3.2 g of S $\equiv$?

3.2 g of S will contain = $\frac{6.022 \times 10^{23} \times 3.2}{32} = 6.022 \times 10^{22}$ atoms

40 g of Ca $\equiv 6.022 \times 10^{23}$ atoms
? $\equiv 6.022 \times 10^{22}$ atoms

Mass of Ca $\equiv \frac{6.022 \times 10^{22} \times 40}{6.022 \times 10^{23}} = 4\text{ g}$

Mass of calcium = 4 g

(ii) 6 litres of hydrogen and 4 litres of chlorine are mixed which results in the formation of 8 litres of HCl gas. When water is added, it results in the formation of hydrochloric acid. So, the amount of gas left is only 2 litres of hydrogen as chlorine acts as a limiting reagent.
Therefore, the volume of the residual gas will be 2 litres.

(iii) Given:
Empirical formula = CH
Vapour density = 13
Molecular weight = 2 × Vapour density
= 2 × 13
= 26
∴ Empirical formula of a compound with molecular mass 26 is CH.

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula}} = \frac{26}{(12 + 1)} = \frac{26}{13} = 2$$

∴ Molecular formula of the given compound is $2 \times (CH) = C_2H_2 = CH \equiv CH$.

(d)

(i) Reddish brown nitrogen dioxide gas is released and the residue left behind is black copper oxide.
(ii) The reddish brown colour of bromine solution gets decolourised.
(iii) When hydrogen sulphide gas is passed through lead acetate solution, it forms a black precipitate of lead sulphide.
(iv) It burns in oxygen with a yellowish green flame.
(v) Copper anode itself ionises to give Cu^{2+} ions.
$Cu - 2e^- \rightarrow Cu^{2+}$

(e)

(i) Sulphuric acid
(**Note: Error in the question.** The question should be
The acid which is used in the preparation of a volatile acid.
Solution: Conc. sulphuric acid is a non-volatile acid and is therefore used in the preparation of volatile acids such as HCl and HNO_3)
(ii) Conc. sulphuric acid
(iii) Nitric acid
(iv) Conc. sulphuric acid
(v) Conc. hydrochloric acid

(f)

(i) The metals in the middle of the activity series like zinc are moderately reactive, and carbon is a good reducing agent because of which zinc oxide gets easily reduced by carbon. Oxides of highly active metals like aluminium have great affinity towards oxygen and so cannot be reduced by carbon.
(**Note: Error in the question.** Zinc oxide can be reduced to zinc metal by using carbon, but aluminium oxide cannot be reduced by a reducing agent.)

(ii) Carbon tetrachloride is made of individual covalently bonded molecules, CCl_4. In addition, the charged particles are absent in CCl_4 which could conduct electricity. So, CCl_4 does not conduct electricity.

(iii) During the electrolysis of molten lead bromide, a graphite anode is preferred because graphite remains unaffected by the reactive bromine vapours which are released at the anode.

(iv) Sulphuric acid is a strong acid compared to acetic acid. A strong acid has more ions than a weak one, and so, its solution will be a better electrical conductor than a weak acid. So, electrical conductivity of acetic acid is less in comparison of electric conductivity of sulphuric acid.

(v) In the electrolysis of molten lead bromide, the following reactions take place:
At the cathode: $Pb^{2+}(l) + 2e^- \rightarrow Pb(l)$
At the anode: $2Br^-(l) \rightarrow Br_2(g) + 2e^-$
Lead (II) ions (Pb^{2+}) are attracted to the negative electrode, and the Pb^{2+} ions are forced to accept two electrons. Pb^{2+} ions are reduced. Bromide ions (Br^-) are attracted to the positive electrode and the bromide ions are forced to give away their extra electron to form bromine atoms. Thus, bromide ions are oxidised. So, electrolysis of molten lead bromide is a redox reaction.

(g)

(i) A: $2Fe + 3Cl_2 \rightarrow 2FeCl_3$
B: $2FeCl_3 + 3Zn \rightarrow 3ZnCl_2 + 2Fe$
$Fe + H_2CO_3 \rightarrow FeCO_3 + H_2\uparrow$
C: $FeCO_3 + 2HNO_3 \rightarrow Fe(NO_3)_2 + H_2O + CO_2$

(ii)

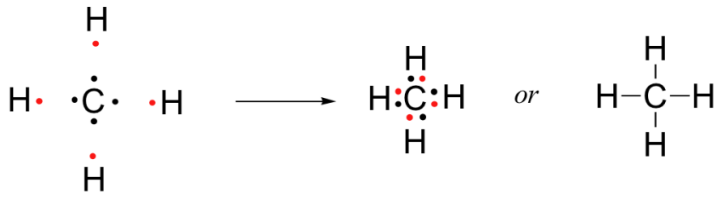
Strong Electrolytes	**Weak Electrolytes**
Electrolytes which allow a large amount of electricity to flow through them.	Electrolytes which allow a small amount of electricity to flow through them.
The solution of a strong electrolyte contains only free mobile ions.	The solution of a weak electrolyte contains ions and molecules.

(h)

(i) **Formation of methane molecule – Non-polar covalent compound:**

Atom	Electronic configuration	Nearest noble gas	To attain stable electronic configuration of nearest noble gas
Carbon	$^{12}_{6}C$ [2,4]	Neon [2,8]	Carbon needs four electrons to complete the octet
Hydrogen	$^{1}_{1}H$ [1]	Helium [2]	Hydrogen needs one electron to complete the duplet

One atom of carbon shares four electron pairs, one with each of the four atoms of hydrogen.

	
Before combination (4 [H] and 1 [C] atom)	After combination (CH_4 – Methane molecule)

(ii)

(1) In group 2, the atomic size increases down the group. As the atomic size increases, the nuclear charge decreases. Due to this, electrons of the outermost shell lie further away from the nucleus making the removal of electrons easy. So, Ba will form ions readily.

(2) All the elements have 2 electrons in their valence shell.

SECTION II

2.

(a)

(i) Li < Na < K < Rb < Cs

(ii) Na > Mg > Si > S > Cl

(iii) Na < Si < S < Cl

(iv) I < Br < Cl < F

(b)

(i) Na_2O

(ii) SO_2

(iii) Al_2O_3

(iv) SiO_2

(c)

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

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

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

$3X + Y_2 \rightarrow X_3Y_2$

3.

(a)

(i) Ethanoic acid to ethyl ethanoate

$$CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$

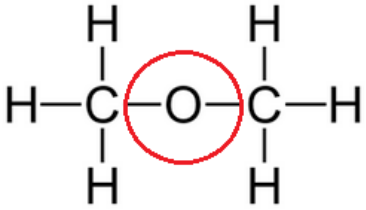
(ii) $CaC_2 + 2\,H_2O \rightarrow Ca(OH)_2 + CH \equiv CH$

Calcium carbide — Calcium hydroxide

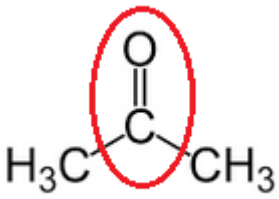
(iii) $CH_3COONa + NaOH \xrightarrow[300^\circ C]{CaO} Na_2CO_3 + CH_4$

(b)

(i) Dimethyl ether



(ii) Propanone



(c)

(i) Hydrogenation
(ii) Methane
(iii) Esterification
(iv) Catenation
(v) Dehydrohalogenation

4.

(a)

(i) Chloride ion (Cl^-)
(ii) Carbonate (CO_3^{2-})
(iii) Sulphate (SO_4^{2-})

(b)

(i) Zn^{2+}
(ii) Cu^{2+}
(iii) Ca^{2+}
(iv) NH_4^+

(c)

(i) Ammonia is prepared in the laboratory by suing ammonium chloride.

$2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O + 2NH_3$

Ammonium chloride — Calcium chloride — Ammonia gas

(ii) When ammonia reacts with excess of chlorine, it forms nitrogen trichloride and HCl.

$NH_3 + 3Cl_2 \longrightarrow NCl_3 + 3HCl$

(Nitrogen trichloride)

(iii) Ammonia reacts with sulphuric acid to form ammonium sulphate.

$2NH_3 + H_2SO_4 \longrightarrow (NH_4)_2SO_4$

Ammonium sulphate

5.

(a) The given reaction is as follows:

$$(NH_4)_2Cr_2O_7 \xrightarrow{heat} N_2(g) + 4H_2O(g) + Cr_2O_3$$

(i) Given:

Weight of $(NH_4)_2Cr_2O_7$ = 63 gm

Molar mass of $(NH_4)_2Cr_2O_7$

= $(2 \times 14) + (8 \times 1) + (2 \times 52) + (7 \times 16)$

= 28 + 8 + 104 + 112

= 252 gm

1 mole $(NH_4)_2Cr_2O_7$ = 252 gm

Hence, 63 gm of $(NH_4)_2Cr_2O_7$ = 0.25 moles

The quantity of moles of $(NH_4)_2Cr_2O_7$ if 63 gm of $(NH_4)_2Cr_2O_7$ is heated is **0.25** moles.

(ii) From the given chemical equation, 1 mole of $(NH_4)_2Cr_2O_7$ produces 1 mole of nitrogen gas.

Hence, 0.25 moles of $(NH_4)_2Cr_2O_7$ can produce 0.25 moles of nitrogen gas.

The quantity in moles of nitrogen formed is **0.25** moles.

(iii) One mole of an ideal gas at S.T.P. occupies 22.4 litres or dm^3.

Hence, 0.25 moles of $(NH_4)_2Cr_2O_7$ will occupy $0.25 \times 22.4 = 5.6$ litres or dm^3.

The volume in litres or dm^3 of N_2 evolved at S.T.P. is **5.6** litres or dm^3.

(iv) From the given chemical equation, 1 mole of $(NH_4)_2Cr_2O_7$ produces 1 mole of Cr_2O_3.

Hence, 0.25 moles of $(NH_4)_2Cr_2O_7$ will produce 0.25 moles of Cr_2O_3.

Molar mass of Cr_2O_3

= $(2 \times 52) + (3 \times 16)$

= 104 + 48

= 152 gm

1 mole Cr_2O_3 = 152 gm

Hence, 0.25 moles of $Cr_2O_3 = 0.25 \times 152 = 38$ gm

The mass in grams of Cr_2O_3 formed at the same time is **38** gm.

(b)

(i) In the extraction of aluminium, the given compounds play the following roles:

(1) Cryolite: It lowers the fusion temperature from 2050°C to 950°C and enhances conductivity.

(2) Sodium hydroxide:

Two roles are played by sodium hydroxide in the extraction of aluminium.

First, finely grinded bauxite (ore of aluminium) is heated under pressure with conc. caustic soda solution (NaOH solution) for 2–8 hours at 140°C to 150°C to produce sodium aluminate. The chemical equation is as follows:

$Al_2O_3.2H_2O + 2NaOH \rightarrow 2NaAlO_2 + 3H_2O$

Second, on diluting sodium aluminate with water and cooling to 50°C, sodium aluminate is hydrolysed to give aluminium hydroxide as precipitate. Here, the impurities dissolve in sodium hydroxide.

(3) Graphite: Thick rods of graphite are suspended into the fused electrolyte. They act as an anode where oxygen gas is discharged.

(ii)

(1) In the electrolysis of alumina using the Hall–Héroult process, the electrolyte is covered with powdered coke as it

- reduces heat loss by radiation
- prevents the burning of the anode

(2) Iron sheets are coated with zinc during galvanisation to prevent them from rusting.

6.

(a)

(i)

(1) Action of sulphuric acid on potassium hydrogen carbonate

$2KHCO_3 + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O + 2CO_2\uparrow$

(2) Action of sulphuric acid on sulphur

$S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$

(ii) In the contact process for the manufacture of sulphuric acid, the equations for the conversion of sulphur trioxide to sulphuric acid are

$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$ (oleum or pyrosulphuric acid)

$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

(b)

(i)

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

(ii) Equation at the anode:

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

(c)

(i) Dilute nitric acid is generally considered a typical acid but not in its reaction with metals because the action of nitric acid on metals depends on the temperature and concentration of nitric acid. These conditions are not required in case of hydrochloric acid or sulphuric acid.

(ii) Although pure concentrated nitric acid is colourless, it appears yellow when left standing in a glass bottle due to the dissolution of reddish brown nitrogen dioxide gas in the acid. Nitrogen dioxide is produced because of the thermal decomposition of a portion of nitric acid.

$4HNO_3 \rightarrow 2H_2O + 4NO_2 + O_2$

(iii) An all-glass apparatus is used in the laboratory preparation of nitric acid because nitric acid vapours corrode rubber and cork.

7.

(a)

(i) The equation for the laboratory preparation of hydrogen chloride gas:

$NaCl + H_2SO_4 \xrightarrow{<200°C} NaHSO_4 + HCl\uparrow$

Although it is a reversible reaction, it goes to completion as hydrogen chloride continuously escapes as a gas.

The reaction can occur up to the stage of the formation of sodium sulphate on heating above 200°C.

$NaHSO_4 + NaCl \xrightarrow{\text{above } 200°C} Na_2SO_4 + HCl\uparrow$

(ii) The drying agent used in the laboratory preparation of hydrochloric acid is conc. sulphuric acid.

The other drying agents such as phosphorus pentoxide (P_2O_5) and quick lime (CaO) cannot be used because they react with hydrogen chloride.

$2P_2O_5 + 3HCl \rightarrow POCl_3 + 3HPO_3$

$CaO + 2HCl \rightarrow POCl_3 + 3HPO_3$

(iii) A safety precaution which should be taken during the preparation of hydrochloric acid:

Always wear chemical splash goggles, chemical-resistant gloves and a chemical-resistant apron in the laboratory during the preparation of hydrochloric acid.

(b)

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

(ii) When L is heated with iron metal, it forms a compound FeL.

Here, oxidation of Fe and reduction of L occur as follows:

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

(c)

(i) A deliquescent salt = $MgCl_2$

(ii) An insoluble chloride = AgCl

(iii) On heating, this salt gives a yellow residue when hot and a white residue when cold = $ZnCO_3$

(iv) On heating this salt, a brown-coloured gas is evolved = $Ca(NO_3)_2$