CHEMISTRY

SCIENCE Paper – 2

(One hour and half)

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 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) Name the gas in each of the following:

(i) The gas evolved on reaction of Aluminium with boiling concentrated caustic alkali solution.

(ii) The gas produced when excess ammonia reacts with chlorine.

(iii) A gas which turns acidified potassium dichromate clear green.

(iv) The gas produced when copper reacts with concentrated nitric acid.

(v) The gas produced on reaction of dilute sulphuric acid with a metallic sulphide. [5]

(b) State one observation for each of the following:

(i) Excess ammonium hydroxide solution is added to lead nitrate solution.

(ii) Bromine vapours are passed into a solution of ethyne in carbon tetrachloride.

(iii) A zinc granule is added to copper sulphate solution.

(iv) Zinc nitrate crystals are strongly heated.

(v) Sodium hydroxide solution is added to ferric chloride solution at first a little and then in excess. [5]

(c) Some word/words are missing in the following statements. You are required to rewrite the statements in the correct form using the appropriate word/words:

(i) Ethyl alcohol is dehydrated by sulphuric acid at a temperature of about 170°C.

(ii) Aqua regia contains one part by volume of nitric acid and three parts by volume of hydrochloric acid.

(iii) Magnesium nitride reacts with water to liberate ammonia.

(iv) Cations migrate during electrolysis.

(v) Magnesium reacts with nitric acid to liberate hydrogen gas. [5]

(d) Choose the correct answer from the options given below:

(i) An element in period-3 whose electron affinity is zero.

(A) Neon

(B) Sulphur

(C) Sodium

(D) Argon

(ii) An alkaline earth metal.

(A) Potassium

(B) Calcium

(C) Lead

(D) Copper

(iii) The vapour density of carbon dioxide [C=12, O=16]

(A) 32

(B) 16

(C) 44

(D) 22

(iv) Identify the weak electrolyte from the following:

(A) Sodium Chloride solution

(B) Dilute Hydrochloric acid

(C) Dilute Sulphuric acid

(D) Aqueous acetic acid.

(v) Which of the following metallic oxides cannot be reduced by normal reducing agents?

(A) Magnesium oxide

(B) Copper(II) oxide

(C) Zinc oxide

(D) Iron(III) oxide [5]

(e) Match the following:

Column A	Column B
1. Acid salt	A. Ferrous ammonium sulphate
2. Double salt	B. Contains only ions
3. Ammonium hydroxide solution	C. Sodium hydrogen sulphate
4. Dilute hydrochloric acid	D. Contains only molecules
5. Carbon tetrachloride	E. Contains ions and molecules

[5]

(f) Give the structural formula for the following:

(i) Methanoic acid

(ii) Ethanal

(iii) Ethyne

(iv) Acetone

(v) 2-methyl propane. [5]

(g) Concentrated nitric acid oxidises phosphorus to phosphoric acid according to the following equation:

$$P + 5HNO_3 \text{ (conc.)} \longrightarrow H_3PO_4 + H_2O + 5NO_2$$

If 9.3g of phosphorus was used in the reaction, calculate:

(i) Number of moles of phosphorus taken. [1]

(ii) The mass of phosphoric acid formed. [2]

(iii) The volume of nitrogen dioxide produced at STP.

[H=1, N=14, P=31, O=16] [2]

(h) Give reasons for the following:

(i) Iron is rendered passive with fuming nitric acid.

(ii) An aqueous solution of sodium chloride conducts electricity.

(iii) Ionisation potential of the element increases across a period.

(iv) Alkali metals are good reducing agents.

(v) Hydrogen chloride gas cannot be dried over quick lime. [5]

SECTION II (40 Marks)

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

Question 2

(a) Some properties of sulphuric acid are listed below. Choose the role played by sulphuric acid as **A, B, C,** or **D** which is responsible for the reactions (i) to (v). Some role/s may be repeated.

A. Dilute acid

B. Dehydrating agent

C. Non-volatile acid

D. Oxidising agent

(i) $CuSO_4.5H_2O \xrightarrow{conc.H_2SO_4} CuSO_4 + 5H_2O$

(ii) $S + H_2SO_4(conc.) \longrightarrow 3SO_2 + 2H_2O$

(iii) $NaNO_3 + H_2SO_4(conc.) \xrightarrow{<200°C} NaHSO_4 + HCl$

(iv) $MgO + H_2SO_4 \longrightarrow MgSO_4 + H_2O$

(v) $Zn + 2H_2SO_4(conc.) \longrightarrow ZnSO_4 + SO_2 + 2H_2O$ [5]

(b) Give balanced equations for the following reactions:

(i) Dilute nitric acid and Copper carbonate.

(ii) Concentrated hydrochloric acid and Potassium permanganate solution.

(iii) Ammonia and Oxygen in the presence of a catalyst.

(iv) Silver nitrate solution and Sodium chloride solution.

(v) Zinc sulphide and Dilute sulphuric acid. [5]

Question 3

(a) Select the correct answer from the list given in brackets:

(i) An aqueous electrolyte consists of the ions mentioned in the list, the ion which could be discharged most readily during electrolysis. [Fe^{2+}, Cu^{2+}, Pb^{2+}, H^+].

(ii) The metallic electrode which does not take part in an electrolytic reaction. [Cu, Ag, Pt, Ni].

(iii) The ion which is discharged at the anode during the electrolysis of copper sulphate solutions using copper electrodes as anode and cathode. [Cu^{2+}, OH^-, SO_4^{2-}, H^+].

(iv) When dilute sodium chloride is electrolysed using graphite electrodes, the cation is discharged at the cathode most readily. [Na^+, OH^-, H^+, Cl^-].

(v) During silver plating of an article using potassium argentocyanide as an electrolyte, the anode material should be [Cu, Ag, Pt, Fe]. [5]

(b) Match the properties and uses of alloys in **List 1** with the appropriate answer from **List 2**.

List 1	List 2
1. The alloy contains Cu and Zn, is hard, silvery and is used in decorative articles.	A. Duralumin
2. It is stronger than Aluminium, light and is used in making light tools.	B. Brass
3. It is lustrous, hard, corrosion resistant and used in surgical instruments.	C. Bronze
4. Tin lowers the melting point of the alloy and is used for soldering purpose.	D. Stainless steel
5. The alloy is hard, brittle, takes up polish and is used for making statues	E. Solder

[5]

Question 4

(a) Identify the anion present in the following compounds:

(i) Compound **X** on heating with copper turnings and concentrated sulphuric acid liberates a reddish brown gas.

(ii) When a solution of compound **Y** is treated with silver nitrate solution a white precipitate is obtained which is soluble in excess of ammonium hydroxide solution.

(iii) Compound **Z** which on reacting with dilute sulphuric acid liberates a gas which turns lime water milky, but the gas has no effect on acidified potassium dichromate solution.

(iv) Compound **L** on reacting with Barium chloride solution gives a white precipitate insoluble in dilute hydrochloric acid or dilute nitric acid. [4]

(b) State one chemical test between each of the following pairs:

(i) Sodium carbonate and Sodium sulphite

(ii) Ferrous nitrate and Lead nitrate

(iii) Manganese dioxide and Copper(II) oxide [3]

(c) Draw an electron dot diagram to show the structure of hydronium ion. State the type of bonding present in it. [3]

Question 5

(a) (i) 67.2 litres of hydrogen combines with 44.8 litres of nitrogen to form ammonia under specific conditions as:

$N_2(g)+3H_2(g) \longrightarrow 2NH_3(g)$

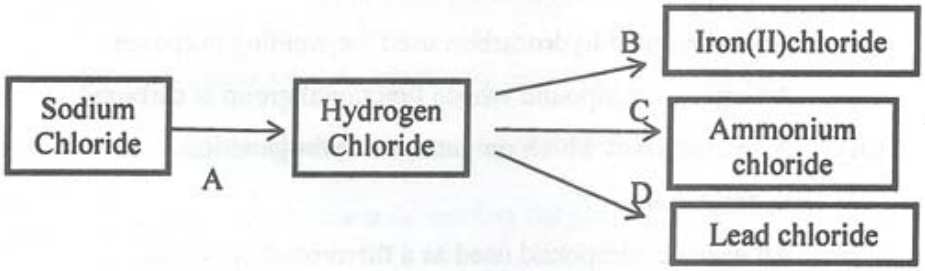
Calculate the volume of ammonia produced. What is the other substance, if any, that remains in the resultant mixture? [2]

(ii) The mass of 5.6 dm^3 of a certain gas at STP is 12.0 g. Calculate the relative molecular mass of the gas. [2]

(iii) Find the total percentage of Magnesium in magnesium nitrate crystals, $Mg(NO_3)_2.6H_2O$.

[Mg=24; N=14; O=16 and H=1] [2]

(b) Refer to the flow chart diagram below and give balanced equations with conditions, if any, for the following conversions A to D.



[4]

Question 6

(a) Name the following metals:

(i) A metal present in cryolite other than sodium.

(ii) A metal which is unaffected by dilute or concentrated acids.

(iii) A metal present in period 3, group 1 of the periodic table. [3]

(b) The following questions are relevant to the extraction of Aluminium:

(i) State the reason for addition of caustic alkali to bauxite ore during purification of bauxite.

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

(iii) Along with cryolite and alumina, another substance is added to the electrolyte mixture. Name the substance and give one reason for the addition. [3]

(c) The following questions are based on the preparation of ammonia gas in the laboratory:

(i) Explain why ammonium nitrate is not used in the preparation of ammonia.

(ii) Name the compound normally used as a drying agent during the process.

(iii) How is ammonia gas collected?

(iv) Explain why it is not collected over water. [4]

Question 7

(a) From the following organic compounds given below, choose one compound in each case which relates to the description [i] to [iv]:

[*Ethyne, ethanol, acetic acid, ethene, methane*]

(i) An unsaturated hydrocarbon used for welding purposes.

(ii) An organic compound whose functional group is carboxyl.

(iii) A hydrocarbon which on catalytic hydrogenation gives a saturated hydrocarbon.

(iv) An organic compound used as a thermometric liquid. [4]

(b) (i) Why is pure acetic acid known as glacial acetic acid?

(ii) Give a chemical equation for the reaction between ethyl alcohol and acetic acid. [2]

(c) There are three elements E, F, G with atomic numbers 19, 8 and 17 respectively.

(i) Classify the elements as metals and non-metals. [3]

(ii) Give the molecular formula of the compound formed between E and G and state the type of chemical bond in this compound. [1]