

General Instructions

1.

SECTION I (40 Marks)

Attempt all questions from this Section

Question 1

(a) Chlorine is subject of the following questions: [5]

- i. What is the atomicity of chlorine?
- ii. Name the compounds formed when chlorine reacts with water (formulae are NOT acceptable.)
- iii. Chlorine reacts with white phosphorous forming phosphorous trichloride and phosphorous pentachloride. Write balanced equations for the formation of each of these compounds.

(b) Answer the following questions, relating your answers only to salts in the list given below:

Anhydrous calcium chloride, copper sulphate-5-water, sodium carbonate-10- water. [5]

- i. Which compound is efflorescent?
- ii. Which compound is blue in colour?
- iii. Which compound is deliquescent?
- iv. What would be seen on mixing a solution of calcium chloride with a solution of sodium carbonate?
- v. Write the balanced equation for the reaction occurring when a solution of calcium chloride is mixed with a solution of sodium carbonate.

(c) In this question you are required to supply the word (or words) that will make each sentence into correct statement which is to be written down in full.

Example : Sodium reacts with chlorine to form sodium chloride. Molten sodium reacts with chlorine to form sodium chloride [5]

- i. The electrolysis of lead bromide liberates lead and bromine.
- ii. Copper sulphate crystals are dehydrated by sulphuric acid.
- iii. Calcium nitrate reacts with sodium sulphate to form calcium sulphate (same is required in two places).
- iv. Crystals of sulphur are obtained when a solution of sulphur in carbon disulphide is allowed to evaporate.

(d) If a crop of wheat removes 20 kg of nitrogen per hectare of soil, what mass of the fertilizer, calcium nitrate $\text{Ca}(\text{NO}_3)_2$ would be required to replace nitrogen in 10 hectare field? (N = 14, O = 16, Ca = 40), (Answer to nearest kg.) [5]

(e) [5]

- i. A vessel contains N molecules of oxygen at a certain temperature and pressure. How many molecules of sulphur dioxide can the vessel, accommodate at the same temperature and pressure?
- ii. Each of two flasks contain 2.0 g of gas at the same temperature and pressure. One flask contains oxygen and the other hydrogen.
 - a. Which sample contains the greater number of molecules?
 - b. If the hydrogen sample contains N molecules, how many molecules are present in oxygen sample?
- iii. A gas sample occupies 4 litre at 27°C and P atmospheric pressure. What would be its volume at 327°C and 2P atmospheric pressure?

(f) Describe in each case one chemical test that would enable you to distinguish between the following pairs of chemicals. Describe what happens with each chemical or state no 'visible reaction'. [9]

- i. Sodium chloride solution and sodium nitrate solution.
- ii. Sodium sulphate solution and sodium chloride solution.
- iii. Calcium nitrate solution and zinc nitrate solution.

(g) Write balanced equations for each of the following reactions: [6]

- i. Magnesium heated in nitrogen.
- ii. Action of heat on sodium nitrate.
- iii. Action of heat on copper nitrate.
- iv. Zinc and dilute sulphuric acid.
- v. Ethene and hydrogen.
- vi. Nitrogen monoxide and oxygen.

SECTION II (40 marks)

Attempt any four questions

Question 2

(a) Choose the correct word or phrase from the brackets to complete the following sentences: [4]

- i. Ammonium chloride is a soluble salt prepared by (precipitation, neutralisation).

- ii. When ammonium chloride is heated, it undergoes (thermal decomposition, thermal dissociation).
- iii. Heating ammonium chloride with sodium hydroxide produces (ammonia, nitrogen).
- iv. Heating a solution of ammonium chloride and sodium nitrite produces (ammonia, nitrogen)

(b) Write correctly the balanced equation for each of the reactions mentioned in statement (i) to (iv) above. [4]

(c) Describe what you see when concentrated nitric acid is added to copper. [2]

Question 3

(a) [5]

- i. What is the colour of the flame when sulphur burns in air?
- ii. Name the product formed when sulphur is burnt in air or oxygen.
- iii. When burning sulphur reacts with water, a compound is formed. Name the compound.
- iv. Write the balanced equation for the reaction between sulphur dioxide and moist chlorine.
- v. In the reaction mentioned in question (iv) above, which substance is the oxidising agent?

(b) [3]

- i. What is the purpose of the contact process
- ii. Name the catalyst used in the contact process.
- iii. Write the balanced equation for the reaction in the contact process which takes place in the presence of the catalyst.

(c) [2]

- i. When hydrogen sulphide reacts with oxidising agent, what substance is always a product of the reaction?
- ii. What is the colour of the precipitate formed when hydrogen sulphide is bubbled through copper sulphate solution?

Question 4 [2]

(a) With reference to the reduction of copper oxide, iron (II) oxide, lead (II) oxide and magnesium oxide by hydrogen, place the oxides in order of increasing ease of reduction.

That is, put first the oxide that is most difficult to reduce, and last, the oxide that is most easily reduced.

(b) Write balanced equation for the following reactions: [3]

- i. Reduction of copper oxide by hydrogen.
- ii. Reduction of iron (III) oxide by carbon monoxide.
- iii. Reduction of lead (II) oxide by carbon.

(c) [3]

- i. What is the type of bonding expected in metallic chloride?
- ii. If fused metallic chloride is electrolysed, at which electrode would the metal be obtained?
- iii. What metallic property is shown by the non-metal graphite?

(d) [2]

- i. Cast iron contains about 4% carbon. By what chemical process is the amount of carbon decreased to make steel?
- ii. Which metal is added to steel to make stainless steel?

Question 5

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



- i. What mass of phosphoric acid can be prepared from 6.2 g of phosphorus?
- ii. What mass of nitric acid will be consumed at the same time?
- iii. What would be the volume of steam at the same time of measured at 760 mm Hg pressure and 273°C?
(H = 1, N = 14; O = 16; P = 31)

(b) Ammonia may be oxidised to nitrogen monoxide in the presence of a catalyst according to the following equation:



If 27 litres of reactants are consumed, what volume of nitrogen monoxide is produced at the same temperature and pressure ? [2]

Question 6 [6]

(a) For each of the compounds: (i) Ethane, (ii) Vinegar, (iii) Marsh gas, draw the relevant structural formula.

(b) [4]

- i. What word is used to describe these three compounds taken together?
- ii. What is the special feature of the structure of:
(1) C_2H_4 (2) C_2H_2
- iii. What type of reaction is common to both of these compounds?

Question 7

(a) Define the following terms: [3]

- i. Acid
- ii. pH scale
- iii. Neutralisation.

(b) [7]

- i. Outline the steps that would be necessary to convert insoluble lead (II) oxide into insoluble lead chloride.
- ii. Write the balanced equations for the reactions required to convert insoluble lead (II) oxide into insoluble lead chloride.
- iii. If iron reacts with dilute sulphuric acid, what will be the products?
- iv. A solution of iron (III) chloride has a pH less than 7. Is the solution acidic or alkaline?