ICSE-1995

Section A (40 Marks) (Attempt all questions from this section)

Question 1

(a) From the among the elements chlorine, nitrogen and sulphur, select one element in each case, to which the following descriptions could apply: [8]

(i) The least reactive. _____.

(ii) Bleaches moist blue litmus paper _____.

(iii) Obtained from the atmosphere. _____.

(iv) Used in the vulcanisation of rubber. _____.

(v) Reacts with water. _____.

(vi) Has the property of allotropy. _____.

(vii) Burns in oxygen forming an acidic oxide. _____.

(viii) Prepared in the laboratory by an oxidation reaction. _____.

(b) Name the gas evolved when the following mixtures are heated: [3]

(i) Calcium hydroxide and ammonium chloride.

_____.

(ii) Sodium nitrite and ammonium chloride.

_____.

(iii) Manganese oxide and concentrated hydrochloric acid.

_____.

(c)

(i) *A farmer's land appears to be lacking in nitrogen. State two different ways in which the farmer could increase the amount of nitrogen in the soil.* [1]

(ii) During a thunder storm, the rain water contains nitric acid. The nitric acid is formed as a result of 3 chemical reactions. Describe (or write balanced chemical equations for) these 3 reactions. [3]

_____.

_____.

_____.

(d)

(i) At 0°C and 760mm Hg pressure, a gas occupies a volume of 100cm^3. The Kelvin temperature (Absolute temperature) of the gas is increased by one fifth while the pressure is increased one and a half times. Calculate the final volume of the gas. [2]

(ii) **Complete the following sentences:**

If two gases under the same conditions have the same number of molecules then they must _____ [2]

(iii) What volume of propane is burnt for every 100 cm^3 of oxygen used in the reaction: $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$? [3]
(Gas volumes measured under the same conditions)

(e) **Answer following questions about electroplating a copper-wire with silver:** [4]

(i) What ions must be present in the electrolyte?

_____.

(ii) Of what substance must the anode be made?

_____.

(iii) What will be made the cathode?

_____.

(iv) What is the equation for the reaction which takes place at the cathode?

_____.

(f) [6]

(i) Sodium hydroxide solution is added to solution 'A'.A white precipitate is formed which is insoluble in excess ammonium hydroxide solution. What is the metal ion present in solution 'A'?

_____.

(ii) When ammonium hydroxide is added to solution 'B', a pale blue precipitate is formed. This pale blue precipitate dissolves in excess ammonium hydroxide giving an inky blue solution. What is the cation present in solution 'B'? What is the probable colour of solution 'B'?

_____.

(iii) When an ammonium salt is warmed with sodium hydroxide solution, ammonia gas is evolved. State 3 ways in which you could identify this gas.

_____.

_____.

_____.

(g) **For each of the salts A, B, C and D, suggest a suitable method of preparation which relates to its description given below:** [4]

(i) A is sodium salt _____.

(ii) B is an insoluble salt _____.

(iii) C is a soluble salt of copper _____.

(iv) D is a soluble salt of zinc _____.

(h) **Define or explain the meaning of the following terms:** [4]

(i) Acid.

_____.

_____.

(ii) pH scale.

_____.

_____.

(iii) Catalyst.

_____.

_____.

(iv) Electrolysis.

_____.

_____.

Section – B (40 marks)

(Attempt any four questions from this section)

Question 2

(a) **[4]**

(i) What would you see when a crystal of $CuSO_4 \cdot 5H_2O$ is placed in concentrated sulpuric acid? What is the reason for the observation?

(ii) Describe another way in which you could produce the same effect as observed in (a) (i).

(iii) What is the meaning of the term "water of crystallization"?

(b) **[3]**

(i) Name two other acids other than sulpuric acid which can be prepared by using sulphuric acid.

(ii) In using sulpuric acid to prepare the acids as mention in (b)(i) which property of sulphuric acid is used?

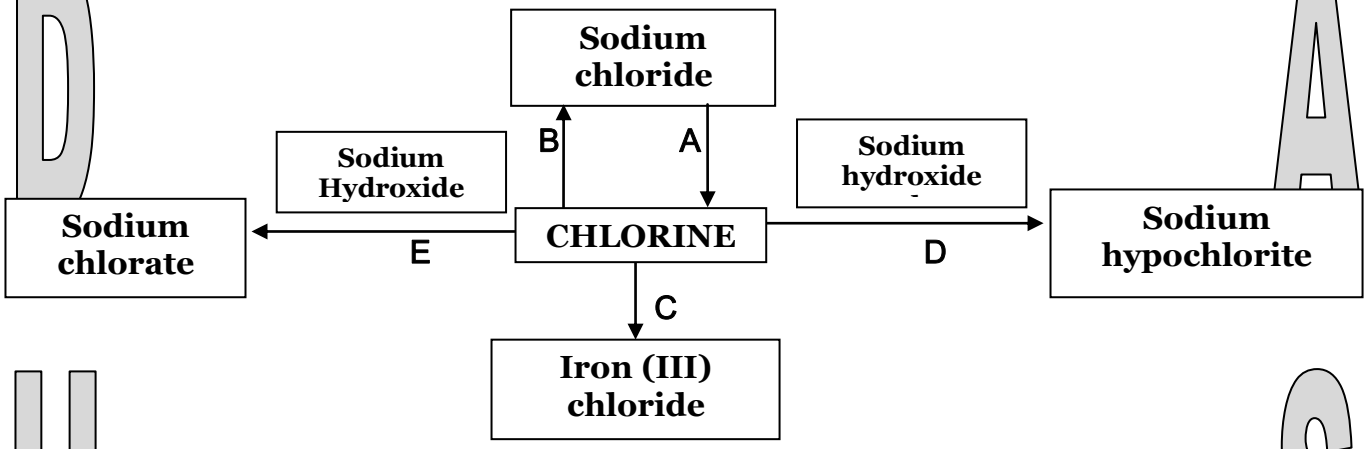
(c) Sulphuric acid can be used to prepare a number of gases in laboratory. **[3]**
Write balanced equations for reactions in which following gases are obtained using dilute sulpuric acid as one of the reactants:

(i) Hydrogen.

(ii) Carbon dioxide.

(iii) Sulpur dioxide.

Question 3



(a) Parts (a) (i)-(iv) refer to the above diagram: [6]

(i) For the conversion A, name two other reactants required.

(ii) How can conversion B be brought about

(iii) Write a balanced equation for conversion C, if it is brought about by direct combination.

(iv) State the conditions necessary for the conversions D and E.

(b) [4]

(i) How does Sodium hydroxide solution act in distinguish iron (II) chloride solution from iron (III) chloride solution?

(ii) What is the chemical process involved in using moist chlorine as a bleaching agent?

(iii) Why does bleaching powder smell of chlorine?

Question 4

(a) **[2]**

(i) Iron pyrites has the formula FeS_2. What mass of sulphur is contained in 30g of pyrites?

(ii) When roasted, iron pyrites gives sulphur dioxide according to the following equation: (S=32; Fe=56) (molar volume of a gas is 22.4 litres at s.t.p.) **[3]**

$$4\ FeS_2 + 11\ O_2 \rightarrow 2\ Fe_2O_3 + 8\ SO_2$$

What volume of sulpur dioxide (at STP) would be liberated by roasting 30g of pyrites?

(b) **[5]**

(i) Write balanced equations for the 3 chemical reactions that take place during conversion of sulphur dioxide to sulphuric acid in 'Contact process'

(ii) Name the catalyst used in the contact process.

(iii) Name another ore which on roasting gives sulpur dioxide.

Question 5

(a) Copy and complete the equations: **[4]**

(i) $Mg_3N_2 + 6H_2O \rightarrow$ _____.

(ii) $2\ NH_3 + 3\ CuO \rightarrow$ _____.

(iii) $8\ NH_3 + 3\ Cl_2 \rightarrow$ _____.

(iv) $4\ NH_3 + 5\ O_2 \rightarrow$ _____.

(b) **[4]**

(i) How would you obtain the compound magnesium nitride?

_____.

(ii) What property of ammonia is illustrated by reaction (a) (ii) above?

_____.

(iii) What important industrial process starts with reaction (a) (iv) above? Name the catalyst used.

_____.

_____.

(c) During laboratory preparation how is ammonia dried and collected? **[2]**

_____.

_____.

_____.

_____.

_____.

Question 6

(a) **[5]**

(i) The pH value of pure water is 7.Compare the pH values of sulphur dioxide solution and ammonia solution with that of pure water.

_____.

_____.

(ii) Why is it necessary to add acid to water before proceeding with the electrolysis of water?

_____.

_____.

_____.

(iii) Name an alloy of Zinc used in the simple voltaic cells.

_____.

(b) [5]

(i) Two bases which are not alkalies.

_____.

(ii) A normal salt and an acid salt of the same acid.

_____.

(iii) A salt insoluble in cold water but soluble in hot water.

_____.

Question 7

Following questions refer to extraction of aluminium and iron from their ores.

(a) Name the principal ore from which **(i)** iron and **(ii)** aluminium are extracted **[2]**

_____.

_____.

(b) What is the most important chemical process in the extraction of any metal? **[3]**

State how this essential step is carried out in the extraction of

(i) iron, **(ii)** aluminium.

_____.

_____.

_____.

_____.

(c) Iron and aluminium ores both, contain impurities, Explain briefly how these impurities are removed

_____.

_____.

_____.

(d) ***What is the major impurity present in iron, when it is removed from the blast furnace?*** **[5]**