ICSE-2005

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

Question 1

(a) Write balanced equation s for the following reactions:- [5]

(i) Potassium hydrogen carbonate and dilute sulphuric acid.

(ii) Copper oxide and dilute hydrochloric acid.

(iii) Manganese (IV) oxide and concentrated hydrochloric acid.

(iv) Sulpur and hot concentrated Nitric acid.

(v) Sodium nitrate and concentrated Sulphuric acid.

(b) The volume of gases A, B, C and D are in the ratio, 1:2:2:4 under the same conditions of temperature and pressure. [5]

(i) Which sample of gas contains the maximum number of molecules?

(ii) If the temperature and pressure of gas A are kept constant, then what will happen to the volume of A when the number of molecules is doubled?

(iii) If this ratio of gas volumes refers to the reactants and products of a reaction, which gas law is being observed?

(iv) If the volume of A is actually 5.6 dm^3 at s.t.p. Calculate the number of molecules in the actual volume of D at s.t.p.
(Avogadro's Number is $6x10^{23}$)

(v) Using your answer from (iv), state the mass of D if the gas is Dinitrogen Oxide(N_2O). (N=14 O=16)

(c) [5]

(i) Explain why Copper, though a good conductor of electricity, is a non-electrolyte.

_____.

_____.

(ii) Name the gas released at the cathode when acidulated water is electrolysed. _____.

(iii) Explain why solid sodium chloride does not allow electricity to pass through.

_____.

_____.

(iv) Fill in the blanks:-

(1) As we descend the electrochemical series containing cations, the tendency of the cations to get_____ (oxidized/reduced) at the cathode increases.

(2) The (higher/lower) _____ the concentration of an ion in a solution, the greater is the probability of its being discharged at its appropriate electrode.

(d) Parts (i) to (v) refer to changes in the properties of elements on moving left to right across a period of the Periodic table. For each property, choose the letter corresponding to the correct answer from the choices A, B C and D. [5]

(i) The non-metallic character of the elements:-

A. decreses, B. increases,

C. remains the same, D. depends on the period. _____.

(ii) The elctronegativity:-

A. depends on the number of valence electrons. B. remains the same.

C. decreases. D. increases. _____.

(iii) The ionization potential:-

A. goes up and down. B. decreases. C. increases. D. remains the same. _____.

(iv) The atomic size:-

A. decreases. B. increases.

C. remains the same. D. sometimes increases and sometimes decreases. _____.

(v) The electron affinity of the elements in group 1 to 7:-

A. goes up and then down. B. decreases and then increases.

C. increases. D. decreases. _____.

(e) The questions (i) to (v) refer to the following salt solutions listed A to F:- [5]

A. Copper nitrate; B. Iron (II) sulphate; C. Iron (III) chloride;
D. Lead nitrate; E. Magnesium Sulphate; F. Zinc chloride.

(i) Which two solutions will give a white precipitate when treated with dilute Hydrochloric acid followed by Barium chloride solution? _____.

(ii) Which two solutions will give a white precipitate when treated with dilute nitric acid followed by silver nitrate solution? _____.

(iii) Which solution will give a white precipitate when either dilute Hydrochloric acid or dilute Sulphuric acid is added to it? _____.

(iv) Which solution becomes a deep/inky blue colour when excess of Ammonium hydroxide is added to it? _____.

(v) Which solution gives a white precipitate with excess Ammonium hydroxide solution? _____.

(f) A to F below relate to the source and extraction of either Zinc or Aluminium. [5]

A. Bauxite; B.Coke; C. Cryolite;
D. Froth floatation; E. Sodium hydroxide solution; F. Zinc blende.

(i) Write down three letters each from the above list which are relevant to:-

(1) Zinc. _____.

(2) Aluminium. _____.

(ii) Fill in the blanks using the most appropriate words from A to F:-

(1) The ore from which Aluminium is extracted must first be treated with _____ so that pure Aluminium oxide can be obtained.

(2) Pure Aluminium oxide is dissolved in _____ to make a conducting solution.

(iii) Write the formula of Cryolite. _____.

(g) Match the descriptions (i) to (v) below with the appropriate terms from the list A to J. [5]

A. Acidic oxide.	B. Alkali.	C. Amphoteric oxide.
D. Basic oxide.	E. Deliquescence.	
F. Efflorescence.	G. Electrolysis.	H. Electrolyte.
I. Homologous series.	J. Hydrocarbons.	

(i) The property of spontaneously giving up water of crystallization to the atmosphere. _____.

(ii) A liquid or solution, which conducts electricity with accompanying chemical change. _____.

(iii) A compound, which is soluble in water and the only negative ions in the solution are hydroxide ions _____.

(iv) An oxide, which forms salts when it reacts with both acids and alkalies. _____.

(v) A set of compounds having the same general formula, similar methods of preparation and similar chemical properties. _____.

(h) The bleaching action of chlorine is permanent whereas the bleaching action of Sulphur dioxide is temporary. In this context:- [5]

(1) Give a reason why Chlorine is not used to bleach silk.

(2) State the similarity in the use of Sulphur dioxide and Chlorine as bleaching agent.

(3) Explain the bleaching action of Sulphur dioxide with the help of Chemical equations.

(4) Why is bleaching by Sulpur dioxide only temporary?

Section – B (40 marks) (Attempt any four questions from this section)

Question 2

(a) Draw the structural formula of a compound with two carbon atoms in each of the following cases. [3]

(i) An alkane with a carbon single bond.

(ii) An alcohol containing two carbon atoms.

(iii) An unsaturated hydrocarbon with a carbon to carbon triple bond.

(b) From the box given above, name:- [3]

Ethane, Ethene, Ethanoic acid, Ethyne, Ethanol

(i) The compound with – OH as the part of its structure. _____.

(ii) The compound with – COOH as the part of its structure. _____.

(iii) Homologue of Homologous series with general formula C_nH_{2n}. _____.

(c) Write the equations for the following laboratory preparations:- [4]

(i) Ethane from sodium propionate.

_____.

(ii) Ethene from Iodoethane.

_____.

(iii) Ethyne from Calcium carbide.

_____.

(iv) Methanol from Iodomethane.

_____.

Question 3

(a) What is observed when:- [3]

(i) Hydrogen sulphide gas is passed through Lead acetate solution.

_____.

_____.

(ii) Neutral litmus solution is added to Sodium hydrogen carbonate solution.

_____.

_____.

(iii) A small piece of Iron is placed in Copper sulphate solution.

_____.

_____.

(b) The preparation of Lead sulphate from Lead carbonate is a two-step process. (Lead sulphate cannot be prepared by adding dilute Sulphuric acid to Lead Carbonate.) [3]

(i) What is the first step that is required to prepare Lead sulphate from Lead carbonate?

_____.

(ii) Write the equation for the reaction that will take place when this first step is carried out.

_____.

(iii) Why is the direct addition of dilute Sulphuric acid to Lead carbonate an impractical method of preparing Lead Sulphate?

_____.

_____.

_____.

(c) Fill in the blanks with suitable words:- [4]

An acid is a compound which when dissolved in water forms Hydronium ions as the only (1) _____ ions. A base is a compound which if soluble in water contains (2) _____ ions. A base react with an acid to form a (3) _____ and water only. This type of reaction is known as (4) _____.

Question 4

(a) Compound X is consists of molecules. Choose the letter corresponding to the correct answer from the choices A, B, C and D given below:- [3]

(i) The type of bonding in X will be:-

A. Ionic. B. Electrovalent. C. Covalent. D. Molecular. _____.

(ii) X is likely to have a:-

A. low melting point and high boiling point.

B. high melting point and low boiling point.

C. low melting point and low boiling point.

D. high melting point and high boiling point. _____.

(iii) In the liquid state, X will:-

A. become ionic. B. be an electrolyte.

C. conduct electricity. D. not conduct electricity. _____.

(b) Electrons are getting added to an element Y. [3]

(i) is Y getting oxidized or reduced? _____.

(ii) What charge will Y have after the addition of electrons? _____.

(iii) Which electrode will Y migrate to during the process of electrolysis? _____.

(c) [4]

(i) Acids dissolve in water to produce positively charged ions. Draw the structure of these positive ions.

(ii) Explain why Carbon tetrachloride does not dissolve in water.

_____.

_____.

(iii) Elements Q and S react together to form an ionic compound. Under normal conditions, which physical state will the compound QS exist in?

_____.

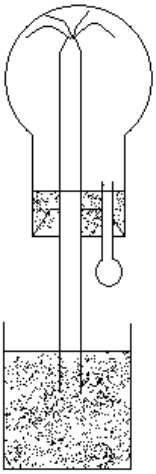
(iv) Can Q and S, both be metals? Justify your answer.

_____.

_____.

Question 5

(a) [3]



(i) Name the experiment illustrated above.

_____.

(ii) Which property of Hydrogen chloride is demonstrated by this experiment?

_____.

(iii) State the colour of water that has entered the round bottomed flask.

_____.

(b) A,B,C and D summarize the properties of Sulphuric acid depending on whether it is dilute or concentrated. Choose the property (A. B. C. or D.) depending on which is relevant to each of the preparation (i) to (iii):- [3]

A. Dilute acid (typical acid properties) C. Oxidizing agent.

B. Non-volatile acid. D. Dehydrating agent.

(i) Preparation of Hydrogen Chloride. _____.

(ii) Preparation of Ethene from Ethanol. _____.

(iii) Preparation of Copper sulphate from Copper oxide. _____.

(c) In the manufacture of Iron, a mixture of Limestone, Coke and Iron ore is added to the blast furnace. In this context:- [4]

(i) State the purpose of adding Limestone to the furnace.

(ii) Give the equation for the reduction of the Iron ore.

(iii) Name the substance which is collected along with Cast iron at the bottom of the furnace.

(iv) Write the chemical equation for the formation of the substance named in (iii) above.

Question 6

(a) [3]

(i) Dilute Nitric acid is generally considered a typical acid except for its reaction with metals. In what way is dilute Nitric acid different from other acids when it reacts with metals?

(ii) Write the equation for the reaction of dilute Nitric acid with Copper.

(iii) Account for the yellow colour that appears in concentrated Nitric acid when it is left standing in an ordinary glass bottle.

(b) [3]

(i) Which feature of the ammonia molecule leads to the formation of the Ammonium ion when Ammonia dissolves in water?

(ii) Name the other ion formed when Ammonia dissolved in water.

(iii) Give the test that can be used to detect the presence of the ion produced in (b) (ii).

(c) [4]

(i) Write the equations for the following reactions which result in the formation of Ammonia:-

1. A mixture of Ammonium chloride and slaked Lime is heated.

2. Aluminium nitride and water.

(ii) Calculate the percentage of Nitrogen in Aluminium nitride.
(Al = 27, N =14)

Question 7

The equation given below relate to the manufacture of Sodium carbonate [3]
(Mol. Wt. of Na_2CO_3 = 106)

1. $NaCl + NH_3 + CO_2 + H_2O \rightarrow NaHCO_3 + NH_4Cl$
2. $2NaHCO_3 \rightarrow N_2CO_3 + H_2O + CO_2$

Question (a) and (b) are based on the production of 21.2 g of Sodium carbonate. [3]

(a) What mass of Sodium Hydrogen carbonate must be heated to give 21.2 g of Sodium carbonate? (Mol. Wt. of $NaHCO_3$ = 84)

(b) To produce the mass of Sodium hydrogen carbonate calculated in (a), what volume of Carbon dioxide,measured at s.t.p. would be required?

(c)

(i) Define the following terms:- [4]

(a) Atomic weight.

(b) Catenation.

(ii)

Calcium, Copper, Lead, Aluminium, Zinc, Chromium, Magnesium, Iron

Choose the major metals from the list given above to make the following alloys:-

(1) Stainless steel.

(2) Brass.