ICSE-1998

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

Question 1

(a) **Answer the question below, relating your answers only to salts in the following list: Sodium chloride, anhydrous calcium chloride, copper sulphate-5 water.** **[5]**

(i) What name is given to the water in the compound copper sulphate-5 water?

_____.

(ii) If copper sulphate 5-water is heated, water is driven off leaving anhydrous copper sulphate:

(1) What is the colour of anhydrous copper sulphate? _____.

(2) By what means, other than heating, could you dehydrate copper sulphate-5 water and obtain anhydrous copper sulphate?

_____.

(iii) What is deliquescence?

_____.

_____.

_____.

_____.

_____.

(iv) Which one of the salts in the given list is deliquescent?

_____.

(b) **State what you see when:** **[5]**

(i) A piece of moist blue litmus paper is placed in a gas jar of chlorine.

_____.

(ii) A piece of moist red litmus paper is placed in a jar of ammonia.

_____.

(iii) Silver nitrate solution is added to dilute hydrochloric acid.

_____.

(iv) Zinc oxide is heated.

_____.

(v) A glowing splint is introduced into a gas jar containing oxygen.

_____.

(c) Write correctly balanced equations for the following reactions: **[5]**

(i) Molten sodium and chlorine.

_____.

(ii) Nitrogen and oxygen when lightning strikes.

_____.

(iii) Iron and dilute sulphuric acid.

_____.

(iv) *Decomposition of hypochlorous acid in sunlight.*

(v) Action of heat on potassium nitrate.

_____.

(d) Water can be split into hydrogen and oxygen under suitable conditions. The equation representing the change is :- **[5]**

$2H_2O_{(l)} \rightarrow 2H_{2(g)} + O_{2(g)}$.

(i) If a given experiment results in 2500 cm^3 of hydrogen being produced, what volume of oxygen is liberated at the same time under the same conditions of temperature and pressure?

(ii) The 2500 cm^3 of hydrogen is subjected to 2 ½ times increase in pressure (temperature remaining constant). Calculate the new volume.

(iii) Taking the volume of hydrogen calculated in (d)(ii), what change must be made in Kelvin (absolute) temperature to return the volume to 2500 cm^3 (pressure remaining constant)?

(e) The compound $Na_2B_4O_7 \cdot 10H_2O$ is commonly known as Borax. When litmus is added to a solution of borax it turns blue. [5]
(H= 1, B= 11, O= 16, Na= 23. Answer correct to 1 decimal place,)

(i) What can you say about pH of borax solution? _____.

(ii) Calculate percentage of boron (B) in borax.

(f) [5]

(i) Sodium hydroxide solution can be used to distinguish between iron (II) sulphate solution & iron (III) sulphate solution because these solutions give different colours of the precipitate with sodium hydroxide solution. Give the colour of the precipitate formed with:

(1) iron (II) sulphate solution:

_____.

(2) iron (III) sulphate solution:

_____.

(ii) What will you see when barium chloride solution is added to iron (II) sulphate solun? _____.

_____.

(iii) **How will the action of dilute hydrochloric acid on sodium carbonate and sodium sulphite enable you to distinguish between these two compounds?**

_____.

_____.

_____.

(g) **Choosing only word from following list, write down appropriate words to fill the blanks (i) to (v):** [5]

Anions, anode, cathode, cations, electrode, electrolyte, nickel, voltameter.

To electroplate an article with nickel requires an (i) _____ which must be a solution containing (ii) _____ ions. The article to be plated is placed as the (iii) _____ of the cell in which the plating is carried out. The (iv) _____ of the cell is made from pure nickel. The ions which are attracted to the negative electrode and discharged are called (v) _____

(h) *The following question related to the Nitrogen cycle.* *[5]*

(i) *What are the soluble nitrogen compounds absorbed by the roots of plants?*

(ii) *What kind of plant directly absorbs nitrogen from the atmosphere?*

(iii) *What term is applied to conservation of atmospheric nitrogen to useful compound of nitrogen*

(iv) *Compounds such as ammonium nitrate, urea and super phosphate are used to replace nitrogen and other elements lost from the soil as a result of cultivation. What is the common name given to these compounds?*

(v) *What insoluble substance is used in making super phosphate?*

Section – B (40 marks)

(Attempt **any four** questions from this section)

Question 2

(a)

(i) Name the oxide of sulphur which reacts with water to give sulphuric acid. _____.

(ii) In the contact process, the direct reaction between the oxide of sulpur and water is avoided. In this process, what does the oxide of sulphur reacts with instead of water and what is the name of the product?

_____.

_____.

(iii) Give name and formula of acid salt which can give sodium ions and sulphate ions in solution _____. [4]

(b) The metal zinc is extracted from the ore zinc blende. [3]

(i) Name the zinc compound in zinc blende. _____.

(ii) Zinc blend when roasted in air gives off a gas which, if allowed to escape, would constitute an atmospheric pollutant. What is this gas? _____.

(iii) What particular polluting effect does this gas have?

_____.

(c) Write correctly balanced equations for reaction of dilute sulphuric acid with each: [3]

(i) Copper carbonate.

_____.

(ii) Lead nitrate solution.

_____.

(iii) Zinc hydroxide.

_____.

Question 3

(a) The following reactions are carried out: [4]

A.: Nitrogen + metal → Compound X

B : X + Water → ammonia + another compound

C : Ammonia + Metal oxide → Metal + Water + Nitrogen

(i) One metal that can be used for reaction A is magnesium.

(1) State the conditions for the reaction.

_____.

(2) Write the formula of compound X formed when nitrogen and magnesium reacts together._____.

(ii) Write the correctly balanced equation for reaction B where X is the compound formed between nitrogen and magnesium.

_____.

(iii) What property of ammonia is demonstrated by reaction C?

_____.

(b) Industrially, ammonia is obtained by direct combination between nitrogen and hydrogen. [3]

(i) Write correctly balanced equation for direct combination of N_2 with H_2._____.

(ii) Which of the metals- iron, platinum, copper catalyse-this direct combination?_____.

(iii) Is formation of ammonia promoted by use of high pressure or low pressure._____.

(c) [3]

(i) Is ammonia more dense or less dense than air?

_____.

(ii) What property of ammonia is demonstrated by the Fountain Experiment?

_____.

(iii) Write correct balanced equation for the reaction between NH_3 and H_2SO_4.

_____.

Question 4

(a) [6]

(i) The compound A has the following percentage composition by mass: Carbon 26.7%; Oxygen 71.1%; Hydrogen 2.2%. Determine the empirical formula of A.

Ele	%	RAM	ATOMIC RATIO	SIMPLEST RATIO

(ii) If the relative molecular mass of A is 90, what is the molecular formula of A?

(iii) The compound A is a weak acid. What is meant by this statement?

_____.

_____.

(b) Ammonia burns in oxygen and the combustion, in the presence of a catalyst, may be represented by: [4]

$2NH_3 + 2½\ O_2 \rightarrow 2NO + 3\ H_2O$

(i) What mass of steam is produced when 1.5 kg of nitrogen monoxide is formed?

(ii) What volume of oxygen, at s.t.p., is required to form 10 moles of products?

Question 5

(a) The table below compares some properties of metals & non-metals. Write down (i) to (iv): [4]

Metal	Non-Metal
(i) Poor conductor of heat	
(ii)Malleable	
(iii)Form positive ions	
(iv) Form acidic oxides	

(b) [2]

(i) Metals are generally solid at room temperature. Name the metal which is a liquid at room temperature. (say 25°C)

_____.

(ii) Which allotrope of the non-metal carbon conducts electricity?

_____.

(c) [4]

(i) How many valence electrons are present in:

(1) Metals: _____.

(2) Non – metals: _____.

(ii) Name all the particles found in a solution of sodium chloride.

_____.

_____.

Question 6

(a) [5]

(i) Ethane and chlorine react together to form monochloroethane (ethyl chloride).

(1) Write down the structural formula of ethane.

(2) What type of reaction has taken place between ethane and chlorine?

_____.

(ii) The type of reaction between ethene and chlorine is different from that between ethane & chlorine.

(1) What is the type of reaction between ethene and chlorine?

_____.

(2) What feature of the ethene structure makes such a reaction possible?

_____.

(3) Name the product of the reaction between ethene and chlorine

_____.

(b) Ethane burns completely in air or oxygen to give carbon dioxide (and water vapour) with a limited supply of air/oxygen, carbon monoxide is formed. The same gases are found in automobile exhaust gases. Both gases can be considered as atmospheric pollutants. [5]

(i) Write the equation of the complete combustion of ethane.

_____.

(ii) What danger is associated with carbon monoxide?

_____.

(iii) What effect is associated with too much carbon dioxide in the atmosphere?

_____.

_____.

(iv) Burning acetylene (ethyne) in oxygen under appropriate conditions produces a very hot flame. What is this hot flame used for?

_____.

_____.

Question 7

(a) **Solution P has a pH of 13, solution Q has a pH of 6 and solution R has a pH of 2.** [3]

(i) Which solution will liberate ammonia from ammonium sulphate on heating?

(ii) Which solution is a strong acid?

(iii) Which solution contains solute molecules as well as ions?

(b) **From the list of substances given below, choose the pair required to prepare the salts (i) to (iii) in the laboratory and write down the relevant equations.** [6]

The substances are:

Chlorine, iron, lead, lead nitrate solution, sodium nitrate solution, iron (III) carbonate, Iron (III) hydroxide, sodium hydroxide solution, dilute hydrochloric acid.

The salts are:

(i) Sodium chloride.

_____.

(ii) Lead chloride.

_____.

(iii) anhydrous iron(III) chloride.

_____.

(c) **All ammonium salts are decomposed on heating. What other property do ammonium salts have in common?** [1]

_____.

_____.

_____.