ICSE 2010 : SCIENCE Paper 2 (Chemistry)

SCIENCE (PAPER–2)

Chemistry

(One hour and a 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)

Question 1.

(*a*) From the list given below, select the word(s) required to correctly complete the blanks (*i*) to (*v*) in the following passage :

Note : words chosen from the list are to be used only once. Write only the answers. Do not copy the passage.

[reddish brown, ammonium, nitrogen dioxide, hydroxyl, dirty green, ammonia, acidic, alkaline]

Nitrogen and hydrogen combine in the presence of a catalyst to give (*i*) ..... gas. When the above mentioned gas is passed through water it forms a solution which will be (*ii*) ..... in nature and the solution contains (*iii*) ..... ions and (*iv*) ..... ions. The above solution when added to iron (II) sulphate solution, gives a (*v*) ..... coloured precipitate of iron (II) hydroxide. [5]

(*b*) Select from the list given (A to E) one substance in each case which matches the description given in parts (*i*) to (*v*).

(Note : Each substance is used only once in the answer.)

(A) Nitroso Iron (II) sulphate (B) Iron (III) chloride (C) Chromium sulphate (D) Lead (II) chloride (E) Sodium chloride.

(*i*) A compound which is deliquescent.

(*ii*) A compound which is insoluble in cold water, but soluble in hot water.

(*iii*) The compound responsible for the brown ring during the brown ring test of nitrate ion.

(*iv*) A compound whose aqueous solution is neutral in nature.

(*v*) The compound which is responsible for the green coloration when sulphur dioxide is passed through acidified potassium dichromate solution. [5]

(c) For part (c) (i) – (c) (x), select the correct answer from the choices A, B, C and D which are given.

Write **only** the letter corresponding to the correct answer.

(i) A particular solution contains molecules and ions of the **solute** so it is a :

(A) weak acid (B) strong acid

(C) strong base (D) salt solution

(ii) A compound which liberates reddish brown gas around the anode during electrolysis in its molten state is :

(A) Sodium chloride (B) Copper (II) oxide

(C) Copper (II) sulphate (D) Lead (II) bromide.

(iii) An organic compound undergoes addition reactions and gives a red colour precipitate with ammoniacal cuprous chloride. Therefore, the organic compound could be :

(A) Ethane (B) Ethene

(C) Ethyne (D) Ethanol.

(iv) An organic weak acid is :

(A) Formic acid (B) Sulphuric acid

(C) Nitric acid (D) Hydrochloric acid.

(v) During ionization metals lose electrons, this change can be called :

(A) Oxidation (B) Reduction

(C) Redox (D) Displacement.

(vi) Which one of the following is **not** true of metals :

(A) Metals are good conductors of electricity.

(B) Metals are malleable and ductile.

(C) Metals form non-polar covalent compounds.

(D) Metal will have 1 or 2 or 3 electrons in their valence shell.

(vii) An example of a complex salt is :

(A) Zinc sulphate (B) Sodium hydrogensulphate

(C) Iron (II) ammonium sulphate (D) Tetrammine copper (II) sulphate.

(viii) Aqua regia is a mixture of :

(A) Dilute hydrochloric acid and concentrated nitric acid

(B) Concentrated hydrochloric acid and dilute nitric acid

(C) Concentrated hydrochloric acid [1 part] and concentrated nitric acid [3 parts]

(D) Concentrated hydrochloric acid [3 parts] and concentrated nitric acid [1 part]

(ix) The organic compound mixed with ethanol to make it spurious is :

(A) Methanol (B) Methanoic acid

(C) Methanal (D) Ethanoic acid.

(*x*) The number of electrons present in the valence shell of a halogen is :

(A) 1 (B) 3

(C) 5 (D) 7 [10]

(*d*) State your observation for the following cases :

(*i*) Moist blue litmus is introduced into a gas jar of sulphur dioxide.

(*ii*) Dry red rose petals are placed in the jar of sulphur dioxide.

(*iii*) Paper soaked in potassium permanganate solution is introduced into a gas jar of sulphur dioxide.

(*iv*) Ammonia gas is burnt in an atmosphere of oxygen in the absence of a catalyst.

(*v*) Glass rod dipped in ammonium hydroxide is brought near the mouth of the concentrated hydrochloric acid bottle. [5]

(*e*) Match the column A with column B.

Column A	Column B
(*i*) Sodium chloride	Increases
(*ii*) Ammonium ion	Covalent bond
(*iii*) Electronegativity across the period	Ionic bond
(*iv*) Non metallic character down the group	Covalent and Coordinate bond
(*v*) Carbon tetrachloride	Decreases

Answer as follows :

(*i*) correct item from B matching sodium chloride.

(*ii*) correct item from B matching ammonium ion, and so on. [5]

(*f*) Write the equation for each of the following reactions :

(*i*) Sulphur is heated with concentrated sulphuric acid.

(*ii*) Zinc oxide is treated with sodium hydroxide solution.

(*iii*) Ammonium chloride is heated with sodium hydroxide.

(*iv*) Concentrated sulphuric acid is poured over sugar.

(*v*) Magnesium sulphate solution is mixed with barium chloride solution. [5]

(*g*) (*i*) LPG stands for liquefied petroleum gas. Varieties of LPG are marketed including a mixture of **propane (60%)** and **butane (40%)**. If **10 litre** of this mixture is burnt, find the total volume of carbon dioxide gas added to the atmosphere. Combustion reactions can be represented as :

$$C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(g)}$$

$$2C_4H_{10(g)} + 13O_{2(g)} \rightarrow 8CO_{2(g)} + 10H_2O_{(g)}$$

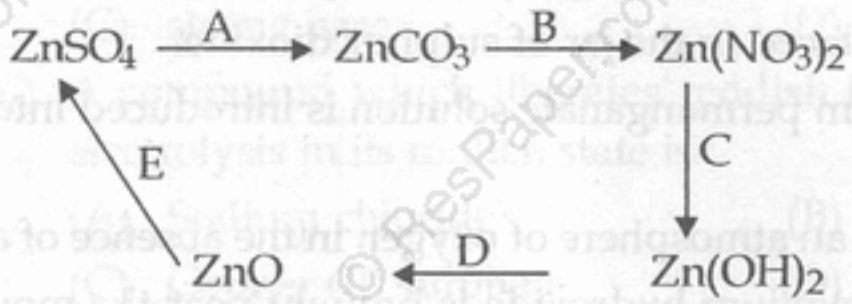
(*ii*) Calculate the percentage of nitrogen and oxygen in ammonium nitrate. [Relative molecular mass of ammonium nitrate is 80, H = 1, N = 14, O = 16]. [5]

SECTION - II (40 MARKS)

(Attempt any FOUR Questions)

Question 2.

(*a*) Give the equations for the following conversions A to E.



[5]

(*b*) The questions below are related to the manufacture of ammonia.

(*i*) Name the process.

(*ii*) In what ratio must the reactants be taken?

(*iii*) Name the catalyst used.

(*iv*) Give the equation for the manufacture of ammonia.

(*v*) Ammonia can act as a reducing agent - write a relevant equation for such a reaction. [5]

Question 3.

(*a*) Draw the structural formula for each of the following :

(*i*) Ethanoic acid

(*ii*) But-2-yne [2]

(*b*) Mr. Ramu wants to electroplate his key chain with nickel to prevent rusting. For this electroplating :

(*i*) Name the electrolyte

(*ii*) Name the cathode

(*iii*) Name the anode

(*iv*) Give the reaction at the cathode

(*v*) Give the reaction at the anode. [5]

(*c*) Three different electrolytic cells A, B and C are connected in separate circuits. Electrolytic cell A contains sodium chloride solution. When the circuit is completed a bulb in the circuit glows brightly. Electrolytic cell B contains acetic acid solution and in this case the bulb in the circuit glows dimly. The electrolytic cell C contains sugar solution and the bulb does not glow. Give a reason for each of these observations. [3]

Question 4.

(*a*) 4.5 moles of calcium carbonate are reacted with dilute hydrochloric acid.

(*i*) Write the equation for the reaction.

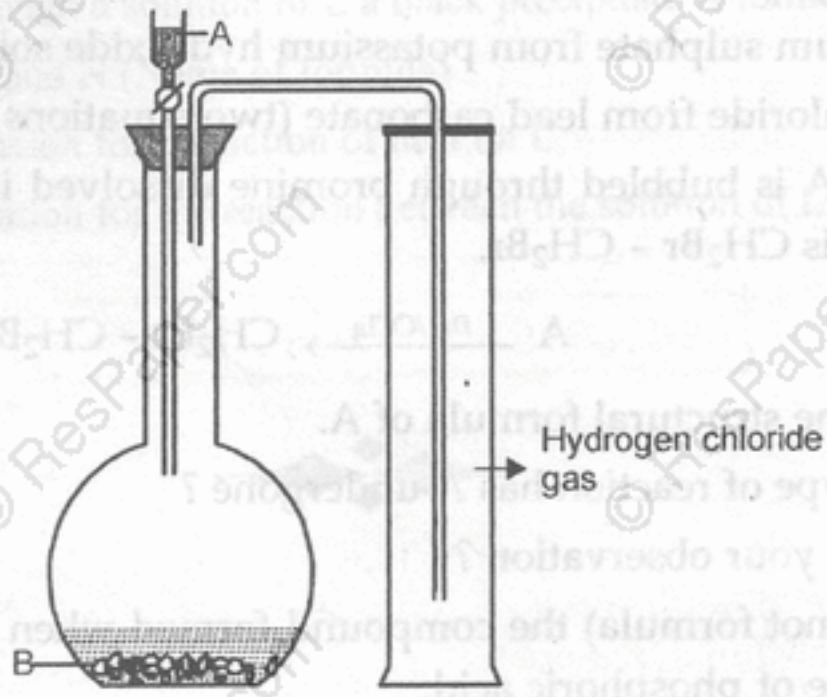
(*ii*) What is the mass of 4.5 moles of calcium carbonate ? (Relative molecular mass of calcium carbonate is 100).

(*iii*) What is the volume of carbon dioxide liberated at stp ?

(*iv*) What mass of calcium chloride is formed ? (Relative molecular mass of calcium chloride is 111)

(*v*) How many moles of HCl are used in this reaction ? [5]

(b) The diagram shows an apparatus for the laboratory preparation of hydrogen chloride.



(*i*) Identify A and B.

(*ii*) Write the equation for the reaction.

(*iii*) How would you check whether or not the gas jar is filled with hydrogen chloride ?

(*iv*) What does the method of collection tell you about the density of hydrogen chloride ? [5]

Question 5.

(*a*) Name the **main** constituent metal in the following alloys :

(*i*) Duralumin.

(*ii*) Brass.

(*iii*) Stainless steel. [3]

(*b*) An element has an atomic number 16. State

(*i*) the period to which it belongs.

(*ii*) the number of valence electrons.

(*iii*) whether it is a metal or non-metal. [3]

(*c*) Solution A is a sodium hydroxide solution. Solution B is a weak acid. Solution C is dilute sulphuric acid. Which solution will

(*i*) liberate sulphur dioxide from sodium sulphite.

(*ii*) give a white precipitate with zinc sulphate solution.

(*iii*) contain solute molecules and ions ? [3]

(*d*) By the addition of only **one** solution how would you distinguish between dilute hydrochloric acid and dilute nitric acid ? [1]

Question 6.

(*a*) Give the equation for the preparation of each of the following salts from the starting material given.

(*i*) Copper sulphate from copper (II) oxide.

(*ii*) Iron (III) chloride from Iron.

(*iii*) Potassium sulphate from potassium hydroxide solution.

(*iv*) Lead chloride from lead carbonate (two equations). [5]

(*b*) Compound A is bubbled through bromine dissolved in carbon tetrachloride and the product is $CH_2Br - CH_2Br$.

$$A \xrightarrow{Br_2/CCl_4} CH_2Br - CH_2Br$$

(*i*) Draw the structural formula of A.

(*ii*) What type of reaction has A undergone ?

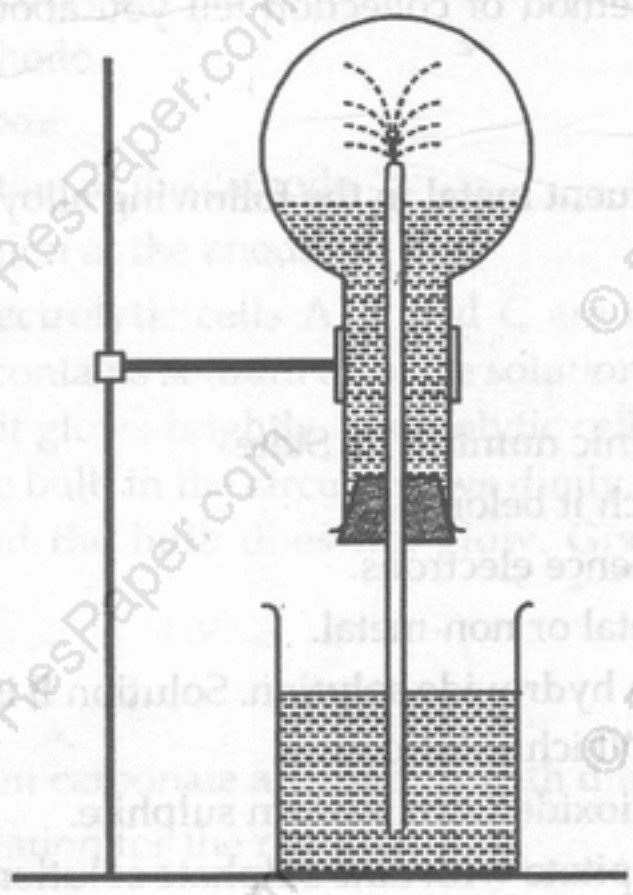
(*iii*) What is your observation ?

(*iv*) Name (not formula) the compound formed when steam reacts with A in the presence of phosphoric acid.

(*v*) What is the procedure for converting the product of (*b*) (*iv*) back to A ? [5]

Question 7.

(*a*) The diagram shows a simple arrangement of the fountain experiment :



(*i*) Name the two gases you have studied which can be used in this experiment.

(*ii*) What is the common property demonstrated by this experiment ? [3]

(*b*) Define the following terms :

(*i*) Ionization potential.

(*ii*) Electron affinity. [2]

(*c*) The action of heat on the blue crystalline solid L gives a reddish brown gas M, a gas which re-lights a glowing splint and leaves a black residue. When gas N, which has a rotten egg smell, is passed through a solution of L a black precipitate is formed.

(*i*) Identify L, M and N (Name of formula)

(*ii*) Write the equation for the action of heat on L

(*iii*) Write the equation for the reaction between the solution of L and the gas N. [5]