# ICSE 2008

## SECTION I (40 Marks)

Attempt all question from this Section

Question1

(a) For parts (a) (i) - (a) (x), select the correct answer from the choices A, B, C, D which are given. Write down only the letter corresponding to the correct answer. [10]

(i) With reference to the variation of properties in the Periodic Table, which of the following is generally true?

A. Atomic size increases from left to right across a period.
B. Ionization potential increases from left to right across a period.
C. Electron affinity increases going down a group.
D. Electro-negativity increases going down a group.

(ii) Which of the following is not a common characteristic of an electrovalent compound?

A. High melting point.
B. Conducts electricity when molten.
C. Consists of oppositely charged ions.
D. Ionizes when dissolved in water

(iii) Dilute sulphuric acid will produce a white precipitate when added to a solution of:

A. Copper nitrate
B. Zinc nitrate
C. Lead nitrate
D. Sodium nitrate

(iv) The salt which in solution gives a pale green precipitate with sodium hydroxide solution and a white precipitate with barium chloride solution is :

A. Iron(III) sulphate
B. Iron(II) sulphate
C. Iron(II) chloride
D. Iron(III) chloride

(v) The gas law which relates the volume of a gas to the number of molecules of the gas is:

A. Avogadro's Law
B. Gay-Lussac's Law
C. Boyle's Law
D. Charle's Law

(vi) During the electrolysis of molten lead bromide. Which of the following takes place?

A. Bromine is released at the cathode
B. Lead is deposited at the anode
C. Bromine ions gain electrons
D. Lead is deposited at the cathode

(vii) Brass is an alloy of:

A. Copper and tin
B. Copper and zinc
C. Zinc and lead
D. Lead and tin

(viii) Ammonia can be obtained by adding water to:

A. Ammonium chloride
B. Ammonium nitrite
C. Magnesium nitride
D. Magnesium nitrate

(ix) Which of the following reactions is used to prepare sulphuryl chloride?

A. Adding concentrated sulphuric acid to a chloride.
B. Passing sulphur dioxide through a solution of chlorine.
C. Reacting dry sulphur dioxide and dry chlorine.
D. Reacting dilute sulphuric acid with a solution of chlorine

(x) The formation of 1, 2-dibromoethane from Ethene and bromine is an example of:

A. Substitution
B. Dehydration
C. Dehydrohalogenation
D. Addition

(b) The equation for the burning of octane is : [5]

$2\ C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O$

(i) How many moles of carbon dioxide are produced when one mole of octane burns?

_____.

_____.

_____.

_____.

(ii) What volume, at stp, is occupied by the number of moles determined in (b)(i)?

_____.

_____.

_____.

(iii) If the relative molecular mass of carbon dioxide is 44, what is the mass of carbon dioxide produced by burning two moles of octane?

(iv) What is the empirical formula of octane?

(c) Name the organic compound prepared by each of the following reactions: [5]

(i) $C_2H_5COONa + NaOH \rightarrow$

(ii) $CH_3I + 2[H] \rightarrow$

(iii) $C_2H_5Br + KOH$ (alcoholic solution) $\rightarrow$

(iv) $CO + 2H_2$ (Zinc oxide catalyst) $\rightarrow$

(v) $CaC_2 + 2H_2O$

(d) Identify the following substances:- [5]

(i) An alkaline gas A which gives dense white fumes with hydrogen chloride.

(ii) A dilute acid B which does not normally give hydrogen when reacted with metals but does give a gas when it reacts with copper.

(iii) Gas C has an offensive smell like rotten eggs

(iv) Gas D is a colourless gas which can be used as a bleaching agent.

(v) Liquid E can be dehydrated to produce ethene

(e) Write the equation for the following reactions: [5]

(i) Aluminium nitride and water.

(ii) Calcium carbide and water.

(iii) Ethene and water (steam).

(iv) Sulphur dioxide and water.

(v) Bromo ethane and an aqueous solution of sodium hydroxide.

(f) [5]

(i) Here is an electrode reaction: $Cu \rightarrow Cu^{2+} + 2e$.
At which electrode (anode or cathode) would such a reaction take place?
Is this an example of oxidation or reduction?

(ii) A solution contains magnesium ions ($Mg^{2+}$), iron (II) ions ($Fe^{2+}$), and copper ions ($Cu^{2+}$). On passing an electric current through this solution which ions will be the first to be discharged at the cathode? Write the equation for the cathode reaction.

_____.

_____.

_____.

(iii) Why is carbon tetrachloride which is a liquid, a non-electrolyte?

_____.

_____.

(g) What are the terms defined in (g) (i) - (v) below? [5]

(i) A bond formed by a shared pair of electrons, each bonding atom contributing one electron to the pair. _____.

(ii) A bond formed by a shared pair of electrons with both electrons coming from the same atom. _____.

(iii) A salt containing a metal ion surrounded by other ions or molecules _____.

(iv) A base which is soluble in water. _____.

(v) A reaction in which the hydrogen of an alkane is replaced by another element like chlorine _____.

## SECTION II (40 Marks)

Attempt any four questions from this Section

Question 2 [10]

Copy and complete the following table relating to important industrial processes. Output refers to the product of the process not the intermediate step.

| Name of process | Inputs | Catalyst | Equation for catalysed reaction | Output |
|---|---|---|---|---|
| Haber Process | Hydrogen + _____ | ______ | _____ | _____ |
| _____ | Ammonia + air | ______ | _____ | Nitric acid |
| Contact Process | Sulphur dioxide + oxygen | ______ | _____ | _____ |

Question 3

The following questions refer to the Periodic Table.

(a) [5]

(i) Name the first and last element in period2.

_____.

(ii) What happens to the atomic size of elements moving from top to bottom of a group?

_____.

(iii) Which of the elements has the greatest electron affinity among the halogens?

_____.

(iv) What is the common feature of the electronic configurations of the elements in group 7?

_____.

_____.

(b) Supply the missing word from those in brackets: (Do not write out the sentence) [2]

(i) If an element has low ionization energy then it is likely to be _____ (metallic/non-metallic).

(ii) If an element has seven electrons in its outermost shell then it is likely to have the _____ (largest/smallest) atomic size among all the elements in the same period.

(c) [3]

(i) The metals of Group 2 from top to bottom are: Be, Mg, Ca, Sr, Ba.

Which of these metals will form ions most readily and why?

_____.

(ii) What property of an element is measured by electro negativity?

_____.

_____.

Question 4

(a) Distinguish between the saturated hydrocarbon ethane and the unsaturated hydrocarbon ethene by drawing their structural formulae. [2]

(b) Addition reactions and substitution reactions are types of organic reactions. [3]

Which type of reaction is shown by:

(i) ethane _____.

(ii) ethene? _____.

(c)

(i) Write the equation for the complete combustion of ethane. [4]

_____.

(ii) Using appropriate catalysts, ethane can be oxidized to an alcohol, an aldehyde and an acid. Name the alcohol, aldehyde and acid formed when ethane is oxidized.

_____.

_____.

_____.

(d) [2]

(i) Why is pure acetic acid known as glacial acetic acid?

_____.

_____.

(ii) What type of compound is formed by the reaction between acetic acid and an alcohol?

_____.

Question5

(a) [6]

(i) A compound has the following percentage composition by mass: carbon l4.4%, hydrogen 1.2% and chlorine 84.5%. Determine the empirical formula of this compound. Work correct to l decimal place (H=l ; C= 12, C l=35.5)

| Ele | % | RAM | Atomic Ratio | Simplest Ratio |
|---|---|---|---|---|
| C | 14.4 | 12 | | |
| H | 1.2 | 1 | | |
| Cl | 84.5 | 35.5 | | |

(ii) The relative molecular mass of this compound is 168, so what is its molecular formula?

(iii) By what type of reaction could this compound be obtained from ethyne?

(b) From the equation [4]

$C + 2H_2SO_4 \rightarrow CO_2 + 2H_2O + 2SO_2$

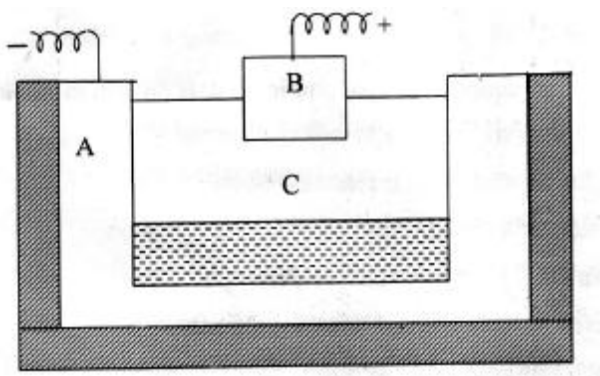
Calculate:

(i) The mass of carbon oxidized by 49 g of sulphuric acid (C = 12; relative molecular Mass of sulphuric acid = 98).

(ii) The volume of sulphur dioxide measured at stp, liberated at the same time. (Volume occupied by 1 mole of a gas at stp is 22.4 $dm^3$ ).

Question 6

(a) The following is a sketch of an electrolytic cell used in the extraction of aluminium: [5]




(i) What is the substance of which the electrodes A and B are made?

_____.

(ii) At which electrode (A or B) is the aluminium formed

_____

(iii) What are the two aluminium compounds in the electrolyte C ?

_____.

(iv) Why is it necessary for electrode B to be continuously replaced?

_____.

_____.

(b) Making use only of substance chosen from those given below:- [5]

| | |
|---|---|
| Dilute sulphuric acid | sodium carbonate |
| Zinc | sodium sulphite |
| Lead | calcium carbonate |

Give the equations for the reactions by which you could obtain:

(i) hydrogen _____.

(ii) sulphur dioxide _____.

(iii) carbon dioxide _____.

(iv) zinc carbonate _____.

(two steps required) _____.

Question 7

(a) [5]

(i) What is the property of concentrated sulphuric acid which allows it to be used in the preparation of hydrogen chloride and nitric acid?

_____.

(ii) What property of hydrogen chloride is demonstrated when it is collected by downward delivery (upward displacement)?

_____.

(iii) Why is hydrogen chloride not collected over water?

_____.

_____.

_____.

(iv) What is the property of nitric acid which allows it to react with copper?

_____.

(v) What property of concentrated sulphuric acid is in action when sugar turns black in its presence?

_____.

(b) Write the equations for the following reactions:- [5]

(i) Dilute nitric acid and copper.

_____.

(ii) Dilute sulphuric acid and barium chloride.

_____.

(iii) Dilute hydrochloric acid and sodium thiosulphate.

_____.

(iv) Dilute hydrochloric acid and lead nitrate solution.

_____.

(v) Dilute sulphuric acid and sodium sulphide.

_____.