ICSE SEMESTER 2 EXAMINATION

SAMPLE PAPER - 1

CHEMISTRY

(SCIENCE PAPER 2)

Maximum Marks: 40

Time allowed: One and a half hours

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write during the first 10 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.

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*Attempt **all** questions from **Section A** and **any three** questions from **Section B**.*

SECTION A

*(Attempt **all** questions.)*

Section-A (Attempt all questions)

Question 1.

Choose the correct answers to the questions from the given options. (Do not copy the question, write the correct answer only.)

(i) The IUPAC name of Acetylene is :

(a) Propane (b) Propyne (c) Ethene (d) Ethyne

(ii) Aluminium powder is used in thermite welding because:

(a) it is a strong reducing agent.
(b) it is a strong oxidising agent.
(c) it is corrosion resistant.
(d) it is a good conductor of heat.

(iii) An aqueous solution of HCl gas is named:

(a) Aqua fortis
(b) Aqua regia
(c) Oil of vitriol
(d) Muriatic acid

(iv) Which of the following can be used as a drying agent for ammonia?

(a) CaO (b) H_2SO_4 (c) P_2O_5 (d) $CaCl_2$

(v) Rearrange the following steps involved in the contact process for the manufacturing of H_2SO_4.

(i) Production of sulphur trioxide
(ii) Addition of water to $H_2S_2O_7$
(iii) Production of sulphur dioxide
(iv) Production of oleum
(v) Purification of gases

(a) (i), (v), (iii), (iv), (ii)
(b) (iii), (v), (i), (iv), (ii)
(c) (v), (iii), (i), (iv), (ii)
(d) (iii), (i), (v), (iv), (ii)

(vi) Compounds having the same molecular formula but different arrangements of atoms are called:

(a) Isotope (b) Isobar (c) Isomers (d) None of these

(vii) Liquor ammonia fortis is:
(a) Unsaturated solution of ammonia in water
(b) Saturated solution of ammonia in water
(c) Saturated solution of ammonia in alcohol
(d) Unsaturated solution of ammonia in alcohol

(viii) What are the constituent elements of duralumin?
(a) Al, Cu, Mg
(b) Al and Mg
(c) Al, Cu, Mg and Mn
(d) Al, Cu and Mn

(ix) The arrangement of the round bottom flask in the fountain experiment is:
(a) Inverted position
(b) Erect position
(c) Facing 90° to left
(d) Facing 90° to right

(x) When sulphuric acid is added to sodium carbonate, brisk effervesence is produced which is due to :
(a) Evolution of H_2S gas
(b) Evolution of Cl_2 gas
(c) Evolution of CO_2 gas
(d) Evolution of O_2 gas

Section-B

Question 2.

(i) Define:
(a) Isomerism
(b) Ore

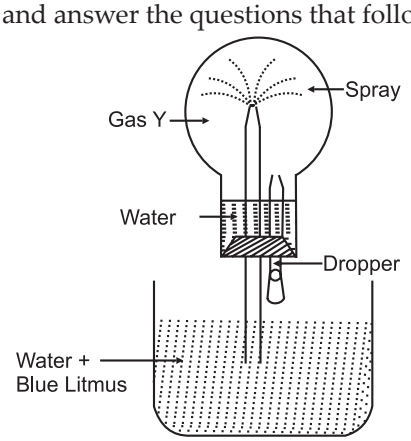
(ii) Name the compound formed when:
(a) Copper turnings are heated with conc. H_2SO_4.
(b) A mixture of ammonia and oxygen are passed over heated platinum at 800°C.

(iii) Draw the structural diagram of:
(a) Ethanol
(b) Methanoic acid
(c) 2, 3-Dimethyl butane

(iv) Complete and balance the following chemical equations:
(a) $CH_2 = CH_2 + Cl_2 \xrightarrow[(Solvent)]{CCl_4}$
(b) $SO_3 + H_2SO_4 \xrightarrow[(Conc.)]{} \rightarrow$
(c) $2NH_3 + 3CuO \rightarrow$

Question 3.

(i) Study the figure given below and answer the questions that follow:



(a) Identify the gas Y.
(b) What property of gas Y does this experiment demonstrate?

(ii) State the following:
(a) Name one lead compound that can be used to oxidise HCl to chlorine.
(b) The compound added to pure alumina to lower the fusion temperature during the electrolytic reduction of alumina.

(iii) State the observation for the following, when:
  (a) Hydrogen chloride gas comes in contact with ammonia solution.
  (b) Ammonia is passed through yellow lead oxide.
  (c) Action of nitric acid on limestone.

(iv) Write balanced equation for the following conversions:
  (a) Potassium sulphate from potassium hydrogen carbonate and sulphuric acid.
  (b) Methyl chloride from methane
  (c) Carbonic acid from carbon and concentrated nitric acid.

Question 4.

(i) State the relevant reason for the following:
  (a) During the extraction of aluminium, cryolite and fluorspar are added to alumina. Why?
  (b) Why in construction work alloy duralumin is used rather than aluminium?

(ii) Write the composition of the alloys given below:
  (a) Duralumin (b) Magnalium

(iii) Identify the terms for the following:
  (a) The experiment which demonstrates extreme solubility of hydrogen chloride gas.
  (b) The industrial process which starts with the reaction of catalytic oxidation of ammonia.
  (c) The electrode where oxidation takes place.

(iv) Complete and balance the equations given below:
  (a) $NaCl + H_2SO_4 \xrightarrow{< 200°C} Na_2SO_4 + 2HCl(g)$
  (b) $Mg_3N_2 + H_2O \rightarrow Mg(OH)_2 + NH_3$
  (c) $C_2H_5OH + H_2SO_4 \rightarrow$ _____ + _____

Question 5.

(i) The chief ore of aluminium, bauxite is concentrated by Baeyer's process and extracted by electrolytic reduction by Hall Heroult's process. Furnish the following by means of equations.
  (a) The three steps required in the concentration of the ore.
  (b) The cathode and anode reactions in the extraction of aluminium by electrolytic reduction.

(ii) Select the correct answer from the brackets to complete the following statements:
  (a) The drying agent used to dry ammonia gas is _____ [quick lime / calcium carbonate].
  (b) The product formed when ammonia reacts with carbon dioxide at 150 °C and 150 atm. pressure is _____ [urea / ammonium nitrate]

(iii) Name the following organic compound:
  (a) A hydrocarbon which on catalytic hydrogenation gives a saturated hydrocarbon.
  (b) The first homologue whose general formula is C_nH_{2n+2}.
  (c) The product formed when mixture of acetylene and hydrogen is heated at 200°C temperature.

(iv) Some bacteria obtain their energy by oxidizing sulphur, producing sulphuric acid as a byproduct. In the laboratory, or industrially, the first step in the conversion of sulphur to sulphuric acid is to produce sulphur dioxide. Then sulphur dioxide is converted to sulphur trioxide which reacts with water, producing sulphuric acid.
  (a) Name the catalyst used industrially which speeds up the conversion of sulphur dioxide to sulphur trioxide.
  (b) Write the equation for the conversion of sulphur dioxide to sulphur trioxide. Why does this reaction supply energy?
  (c) What is the name of the compound formed between sulphur trioxide and sulphuric acid?

Question 6.

(i) Distinguish between the following:
  (a) Ethene and ethane [using potassium permanganate solution]
  (b) Hydrogen chloride gas and carbon dioxide gas [using silver nitrate solution]

(ii) Give one word for the following statements:
  (a) A hydrocarbon which is a greenhouse gas.
  (b) The processes involved in the extraction of pure metals from their ore.

(iii) A, B, C and D summarize the properties of sulphuric acid depending on whether it is dilute or concentrated.

A = Typical acid property.

B = Non-volatile acid

C = Oxidizing agent

D = Dehydrating agent

Choose the property (A, B, C or D) depending on which is relevant to each of the following :

(a) Preparation of Hydrogen chloride gas.

(b) Preparation of copper sulphate from copper oxide.

(c) Action of conc. sulphuric acid on sulphur.

(iv) Copy and complete the following table which relates to three homologous series of Hydrocarbons:

	$_nH_{2n-2}$	C_nH_{2n}	C_nH_{2n+2}
IUPAC name of the homologous series	Alkynes	(a) _____	(b) _____
Characteristics bond type	(c) _____	(d) _____	Single bonds
IUPAC name of the first member of the series	(e) _____	Ethene	(f) _____

Section-A

Answer 1.

(i) (d) Ethyne

Explanation :

Because formula of acetylene is CH ≡ CH .

Thus, IUPAC name is Ethyne .

(ii) (a) It is a strong reducing agent

Explanation :

It reduces Fe_2O_3 to iron, this reduced iron (molten) sinks and flows in to the gap of grinder thereby welding it.

(iii) (d) Muriatic acid

Explanation :

An aqueous solution of HCl gas is hydrochloric acid. It was first named by Lavoisier as muriatic acid. Later on, Davy, in 1810, named it as hydrochloric acid.

(iv) (a) CaO

Explanation :

Calcium oxide or limewater is generally used for obtaining dry ammonia gas. On the other hand, sulphuric acid, phosphorus pentoxide, and calcium chloride react with ammonia to give a product, and hence they are not suitable for drying purposes.

(v) (b) (iii), (v), (i), (iv), (ii)

Explanation :

The first step in the contact process is to produce SO_2 from sulphur or metallic sulphide, which includes some impurities. Therefore, the second step is the purification of SO_2 produced in the first step. Then purified SO_2 is used to produce SO_3 gas, which is further converted to oleum ($H_2S_2O_7$). The last step is the production of sulphuric acid by adding water to the oleum.

(vi) (c) Isomers

Explanation :

The compounds which have the same number of atoms of the same elements but differ in structural arrangements and properties.

(vii) (b) Saturated solution of ammonia in water

Explanation :

Liquor ammonia fortis is a name given to the saturated solution of ammonia in water, and it is also known as 880 ammonia because it has a density of nearly about 0.880. It is always stored in tightly stoppered bottles in a cold place.

(viii) (c) Al, Cu, Mg and Mn

Explanation :

The constituents of duralumin are aluminium, copper, magnesium and manganese.

(ix) (a) Inverted position

Explanation :

The round bottom flask is generally arranged in an inverted position using a retort stand for the fountain experiment. It is arranged in such a position so that suction of the litmus solution can take place.

(x) (c) Evolution of CO_2 gas

Explanation :

The reaction of sulphuric acid and sodium carbonate produces sodium sulphate, water, and brisk effervescence of carbon dioxide. The reaction is given as:

$$Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + H_2O + CO_2(\uparrow)$$

Section-B

Answer 2.

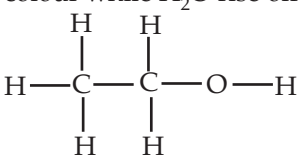
(i) (a) Compounds having the same molecular formula but different structural formula are called 'isomers' of one another and this phenomenon is called 'isomerism'.

(b) A mineral from which, metals are extracted commercially at a comparatively low cost and with minimum effort are called ores of the metals.

(ii) (a) $Cu + 2H_2SO_4 \xrightarrow{\Delta} CuSO_4 + 2H_2O + SO_2\uparrow$. Thus, $SO_2\uparrow$ evolved.

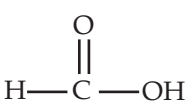
(b) $4NH_3 + 5O_2 \xrightarrow[Pt]{750-900^\circ C} 4NO + 6H_2O$, NO formed which further forms NO_2 which is brown in colour while H_2O rise off as steam.

(iii) (a)



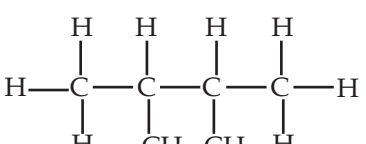
Ethanol

(b)



Methanoic acid

(c)



2, 3-Dimethyl butane

(iv) (a) $CH_2 = CH_2 + Cl_2 \xrightarrow[\text{(Solvent)}]{CCl_4} \underset{\text{1, 2-Dichloro ethane}}{CH_2(Cl) - CH_2(Cl)}$
(Ethene)

(b) $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$
(Conc.) (Pyrosulfuric acid) or oleum

(c) $2NH_3 + 3CuO \rightarrow N_2\uparrow + 3H_2O + 3Cu$

Answer 3.

(i) (a) Y is Hydrochloride (HCl) gas.

(b) Gas Y is highly soluble in water.

(ii) (a) Lead dioxide or red lead

(b) Cryolite

(iii) (a) When hydrogen chloride gas comes in contact with ammonia, it combines with ammonia to form dense white fumes of ammonium chloride.

$NH_3(g) + HCl(g) \rightarrow \underset{\text{Ammonium Chloride}}{NH_4Cl}$

(b) When ammonia is passed through yellow lead oxide, it changes to silvery white lead.

$\underset{\text{Lead Oxide (Yellow)}}{3PbO} + 2NH_3 \xrightarrow{\Delta} \underset{\text{Lead (Silvery White)}}{3Pb} + N_2 + 3H_2O$

(c) When nitric acid reacts with limestone(calcium carbonate) carbon dioxide gas is liberated.

$CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_2\uparrow$

(iv) (a) $\underset{\text{Potassium hydrogen carbonate}}{2KHCO_3} + \underset{\text{Sulphuric acid (dil.)}}{H_2SO_4} \longrightarrow \underset{\text{Potassium sulphate}}{K_2SO_4} + \underset{\text{Water}}{2H_2O} + \underset{\text{Carbon dioxide}}{2CO_2\uparrow}$

(b) $CH_4 + Cl_2 \xrightarrow[\text{Diffused sunlight}]{\text{Chlorination}} \underset{\text{Methyl chloride}}{CH_3Cl} + HCl$

(c) $C + 4HNO_3 \xrightarrow{\Delta} \underset{\text{Carbonic acid}}{H_2CO_3} + 4NO_2\uparrow + H_2O$

Answer 4.

(i) (a) Cryolite and fluorspar are added to alumina :

(i) To lower the melting point of aluminium.

(ii) To make alumina a good conductor of electricity.

(iii) Cryolite acts as a solvent for alumina.

(b) In construction work alloy duralumin is used rather than aluminium because duralumin is harder, stronger and more resistant to corrosion.

(ii) (a) Al (90%) Cu (4%), Mg (0.5%) and Mn (less than 1 %)

(b) Al (95%), Mg (5%)

(iii) (a) Fountain experiment. (b) Ostwald's process. (c) Anode

(iv) (a) $Na_2SO_4 + HCl$

(b) NH_3

(c) $C_2H_5OH + H_2SO_4 \xrightarrow[\text{conc.}]{\text{conc.}} CH_2 = CH_2\,(\uparrow) + H_2O$

Answer 5.

(i) (a) Bauxite is mixed with concentrated sodium hydroxide solution, bauxite dissolves to from sodium aluminate leaving behind the impurity ferric oxide unreacted. The solution is filtered where sodium is collected as filtrate and the impurities are left behind.

$$Al_2O_32H_2O + 2NaOH \longrightarrow 2NaAlO_2 + 3H_2O$$

Sodium aluminate solution is diluted with water, white precipitate of aluminium hydroxide is formed which is filtered, washed and dried.

$$NaAlO_2 + 2H_2O \longrightarrow NaOH + Al(OH)_3$$

Aluminium hydroxide is heated to high temperatures to obtain alumina.

$$2Al(OH)_3 \longrightarrow Al_2O_3 + 3H_2O$$

(b) **At cathode :**

$$Al^{3+} + 3e^- \longrightarrow Al$$

At anode :

$$O^{-2} + 2e^- \longrightarrow [O]$$
$$[O] + [O] \longrightarrow O_2$$
$$2C + O_2 \longrightarrow CO_2$$
$$2CO + O_2 \longrightarrow 2CO_2$$

(ii) (a) Quick lime

(b) Urea

(iii) (a) Ethene

(b) Methane (An alkane) (CH_4)

(c) Ethane (C_2H_6)

(iv) (a) Platinum and Vanadium pentaoxide.

(b) When conversion of SO_2 to SO_3 takes place according to the following reaction.

$$SO_2 + O_2 \longrightarrow 2SO_3 + 45 \text{ kcal}$$

The 45 k cal energy supplied by above reaction.

(c) Oleum ($H_2S_2O_7$).

Answer 6.

(i) (a) When few drops of purple colour potassium permanganate is added to ethane, its purple colour does not fades but when a few drops of it is added to ethene, the solution decolourizes.

(b) $$HCl + AgNO_3 \longrightarrow \underset{\text{Curdy white ppt}}{AgCl\downarrow} + HNO_3$$

When carbon dioxide gas is passed into lime water, it forms a milky white precipitate of calcium carbonate.

$$CO_2 + Ca(OH)_2 \longrightarrow \underset{\text{Milky white ppt}}{CaCO_3\downarrow} + H_2O$$

(ii) (a) Methane

(b) Metallurgy

(iii) (a) B = Non-volatile acid.

(b) A = Typical acid property.

(c) C = Oxidizing agent.

(iv)

General formula	C_nH_{2n-2}	C_nH_{2n}	C_nH_{2n+2}
IUPAC name of the homologous series	Alkynes	Alkenes	Alkanes
Characteristics bond type	Triple bond	Double bond	Single bonds
IUPAC name of the first member of the series	Ethyne	Ethene	Methane

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