ICSE SEMESTER 2 EXAMINATION

SAMPLE PAPER - 4

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) All ores are minerals, while all minerals are not ores because:

(a) The metals can't be extracted economically from all the minerals.

(b) Minerals are complex compounds.

(c) The minerals are obtained from mines.

(d) All of the above

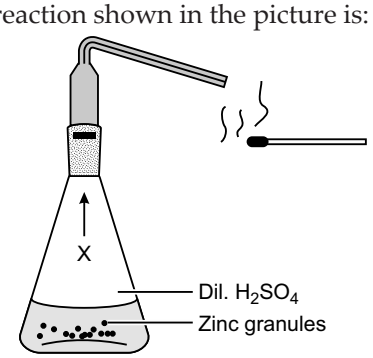
(ii) When HCl gas reacts with a gas X (having a pungent choking smell), it produces white fumes. The gas X is:

(a) H_2 (b) Cl_2 (c) N_2 (d) NH_3

(iii) The hydrocarbon 2-Methyl butane is an isomer of :

(a) *n*-Butane (b) *n*-Pentane (c) Propane (d) None of these

(iv) The gas X evolved during the reaction shown in the picture is:



(a) O_2 (b) H_2 (c) SO_2 (d) CO_2

(v) Why promoter is used in the Haber's process:

(a) To increase the efficiency of finely divided iron

(b) To increase the pressure

(c) To decrease the rate of reaction

(d) To decrease the temperature

(vi) Match the following reactants with their correct products:

Reaction	Products
(i) $NaCl + H_2SO_4 \xrightarrow{\text{below } 200°C}$	(p) $Na_2SO_4 + 2HCl$
(ii) $2NaCl + H_2SO_4 \xrightarrow{\text{above } 200°C}$	(q) $Na_2SO_4 + HCl$
(iii) $NaHSO_4 + NaCl \xrightarrow{\text{above } 200°C}$	(r) $NaHSO_4 + HCl$

(a) (i)-(p), (ii)-(q), (iii)-(r) (c) (i)-(r), (ii)-(q), (iii)-(p)

(b) (i)-(r), (ii)-(p), (iii)-(q) (d) (i)-(q), (ii)-(p), (iii)-(r)

(vii) $Al(OH)_3$ is heated at 1000°C to produce:

(a) $NaAlO_2$ (b) $Al_2O_3.2H_2O$ (c) Al_2O_3 (d) NaOH

(viii) The molecular formula of A is $C_{10}H_{18}$. In which homologous series "A" belongs to:

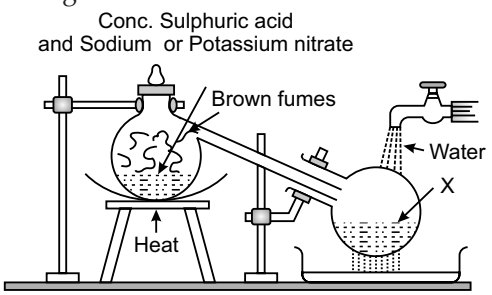
(a) Alkane (b) Alkene (c) Alkyne (d) None of these

(ix) _____ is used for demonstrating solubility of ammonia in water.

(a) Baeyer's test (c) Pop sound test

(b) Lime water test (d) Fountain experiment

(x) The compound X in the given figure is:



(a) Sulphuric acid (c) Nitric acid

(b) Phosphoric acid (d) Acetic acid

Section-B

Question 2.

(i) Define:

(a) Functional group (b) Gangue or matrix

(ii) What is the special feature of the structure of:

(a) C_2H_4 (b) C_2H_2

(iii) Draw the structure of the following:

(a) Iso-butane (c) Iso-butanol

(b) Neo-pentane

(iv) Complete and balance the following chemical equations:

(a) $NaAlO_2 + H_2O \xrightarrow{\Delta}$

(b) $NH_3 + CO_2 \xrightarrow[150 \text{ atm}]{150°C}$

(c) $Cu + H_2SO_4 \longrightarrow$ (Conc.)

Question 3.

(i) Identify the gas evolved in each of the following cases :

(a) A colourless gas liberated on decomposition of nitric acid.

(b) Dilute hydrochloric acid is added to zinc sulphide.

(ii) State the following:

(a) The process of converting ammonia into nitric acid industrially.

(b) The reagent used to dry ammonia gas during its laboratory preparation.

(iii) State the observation for the following, when:

(a) Dilute sulphuric acid is added to iron sulphide.

(b) When dilute hydrochloric acid is added to sodium carbonate crystals.

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

(iv) Write balanced equation for the following conversions:

(a) Ethane from ethyne.

(b) Sodium chloride from sodium hydrogen carbonate.

(c) Sulphuric acid from sulphur.

Question 4.

(i) State the relevant reason for the following:

(a) Concentrated hydrochloric acid cannot be not used in place of sulphuric acid for laboratory preparation of nitric acid.

(b) There are fumes in the air when the stopper of a bottle full of hydrogen chloride gas is opened.

(ii) Give the chemical formulae of the following naturally occuring ores:

(a) Galena (b) Zincite

(iii) Identify the terms for the following:

(a) A mixture of three parts of conc. HCl and one part of conc. nitric acid.

(b) A catalyst used during Haber's process.

(c) A catalyst used during hydrogenation of alkene.

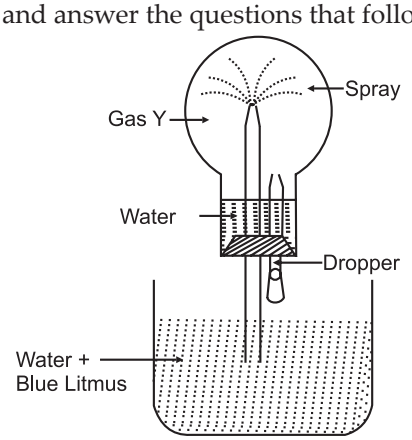
(iv) (a) Copy and complete the following table:

Name of the process	Catalyst	Temperature	Equation for the reaction
Haber's Process			

(b) How is ammonia separated from unreacted nitrogen and hydrogen?

Question 5.

(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) Select the correct answer from the brackets to complete the following statements:

(a) The ore from which aluminium is extracted must first be treated with _____ so that pure aluminium oxide can be obtained. (sodium hydroxide solution/sodium chloride solution).

(b) _____ has two carbon atoms joined by a triple covalent bond [Ethyne / Ethene]

(iii) Give the IUPAC name of the following:

(a) 

(b) 

(c) $C_2H_5—O—C_2H_5$

(iv) (a) State one condition under which chlorine and hydrogen react to form hydrogen chloride gas.

(b) Give balanced chemical equation for the above reaction.

(c) For which gas, ammonia fountain experiment can be used?

Question 6.

(i) Complete and balance the following:

(a) $NH_3 + Cl_2 \longrightarrow$ (b) $Na_2CO_3 + HNO_3 \longrightarrow$

(ii) Give one word for the following statements:

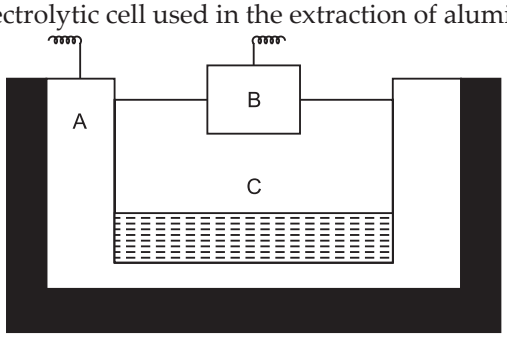
(a) The oxide of sulphur which reacts with water to give sulphuric acid.

(b) This gas is used as a fruit ripening agent.

(iii) Name the functional group in the following compounds given below:

(a) CH_3OH (b) CH_3COOH (c) CH_3CHO

(iv) The given sketch of an electrolytic cell used in the extraction of aluminium:



(a) What is the substance of which the electrode A and B are made?

(b) At which electrode (A or B) aluminium is formed?

(c) What are the two aluminium compound in the electrolyte C?

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

Answers

Section-A

Answer 1.

(i) (a) The metals can't be extracted economically from all the minerals.

Explanation :

The naturally occurring compound of metals generally mixed with other matters such as soil, sand, limestone rocks are known as minerals. At the same time, ores are only those minerals in which metals can be extracted commercially and economically.

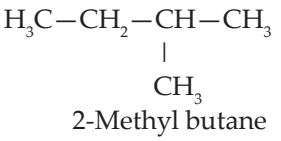
(ii) (d) NH_3

Explanation :

The reaction of ammonia with HCl gas gives ammonium chloride, which produces white fumes. The ammonia gas has a pungent choking smell. If a glass rod dipped in aqueous ammonia solution is brought near HCl gas, then the white fumes are produced, which act as an identification test for HCl gas.

(iii) (b) *n*-pentane

Explanation :



2-Methyl butane

n-Pentane

These two molecules have same molecular formula C_5H_{12} but their structure is different.

(iv) (b) H_2

Explanation :

Zinc is a reactive metal that gives salt and hydrogen gas upon reaction with dilute sulphuric acid. When a burning candle is brought near to the gas, the candle blows out with a pop sound indicating the presence of hydrogen gas.

(v) (a) To increase the efficiency of finely divided iron

Explanation :

The Haber's process uses finely divided iron as a catalyst which increases the speed of reaction. However, to increase the efficiency of this catalyst, a promoter is used, which is usually molybdenum or aluminium oxide.

(vi) (b) (i)-(r), (ii)-(p), (iii)-(q)

Explanation :

When NaCl reacts with sulphuric acid at a lower temperature, it produces sodium bisulphate and one molecule of HCl, while at high temperature, it produces sodium sulphate and two molecules of HCl. Sodium bisulphate is acidic and reacts with common salt to give a conjugate base (Na_2SO_4) and one molecule of HCl.

(vii) (c) Al_2O_3

Explanation :

Aluminium hydroxide is heated at 1000°C to produce alumina having molecular formula Al_2O_3. The reaction is given as:

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

(viii) (c) Alkyne

Explanation :

$$C_nH_{2n-2} \longrightarrow \text{Alkyne}$$

Here $n = 10$

Thus $C_{10}H_{2\times 10-2} = C_{10}H_{18}$

(ix) (d) Fountain experiment

Explanation :

In the fountain experiment, ammonia on mixing with small amounts of water creates a pressure difference, leading the red litmus solution to rush inside the flask to give a blue fountain. The basic ammonia imparts the blue colour. This demonstrates the high solubility of ammonia in water.

(x) (c) Nitric acid

Explanation :

When concentrated sulphuric acid is added to sodium or potassium nitrate, a double displacement reaction occurs in which sodium or potassium bisulphate is formed along with nitric acid.

$$KNO_3 + H_2SO_4 \longrightarrow KHSO_4 + HNO_3.$$

Section-B

Answer 2.

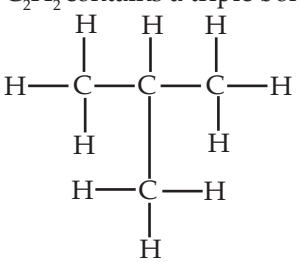
(i) (a) Functional group is defined as an atom or a group of atoms present in a molecule which largely determines its chemical properties.

(b) The unwanted impurities which are associated with ore are called gangue or matrix. e.g., stone, clay etc.

(ii) (a) C_2H_4 contains a double bond between two carbon atoms.

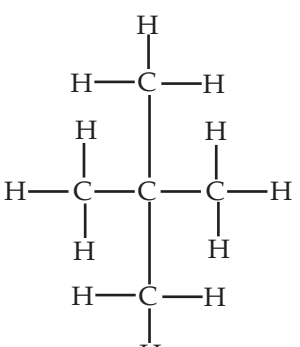
(b) C_2H_2 contains a triple bond between two carbon atoms.

(iii) (a)



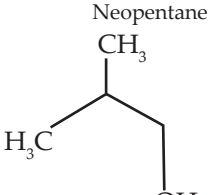
Isobutane

(b)



Neopentane

(c)



Iso-Butanol

(iv) (a) $NaAlO_2 + H_2O \xrightarrow{\Delta} NaOH + Al(OH)_3\downarrow$

(b) $NH_3 + CO_2 \xrightarrow[150\ atm]{150°C} \underset{\text{Urea}}{NH_2CONH_2} + H_2O$

(c) $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2\uparrow + 2H_2O$

(Conc.)

Answer 3.

(i) (a) Nitrogen dioxide (NO_2) gas.

$$HNO_3 \xrightarrow[\text{\& heat}]{\text{Light}} 4NO_2 + O_2 + H_2O$$

(b) Hydrogen sulphide (H_2S) gas.

$ZnS + HCl \rightarrow ZnCl_2 + H_2S\uparrow$

(ii) (a) Ostwald's process

(b) Quicklime

(iii) (a) Iron(II) sulphate is formed with the evolution of hydrogen sulphide gas, which has a rotten egg smell.

$$FeS + H_2SO_4 \longrightarrow \underset{\text{(Iron(II) sulphate)}}{FeSO_4} + \underset{\text{Hydrogen sulphide}}{H_2S\uparrow}$$

(b) A colourless odourless CO_2 gas evolves with brisk effervescence.

(c) An insoluble, white precipitate of silver chloride is obtained.

$$AgNO_3 + HCl \longrightarrow \underset{\text{(Silver Chloride)}}{AgCl} + \underset{\text{(Nitric acid)}}{HNO_3}$$

(iv) (a) $\underset{\text{Ethyne}}{CH \equiv CH} \xrightarrow[150°C]{Ni/H_2} \underset{\text{Ethene}}{C_2H_4} \xrightarrow[150°C]{Ni/H_2} \underset{\text{Ethane}}{C_2H_6}$

(b) $NaHCO_3 + \underset{\text{(Dil.)}}{HCl} \longrightarrow NaCl + H_2O + CO_2$

(c) $\underset{\text{(Hot and Conc.)}}{S} + 6HNO_3 \xrightarrow{\Delta} H_2SO_4 + 6NO_2 + 2H_2O$

Answer 4.

(i) (a) Concentrated hydrochloric acid cannot be used in place of sulphuric acid because hydrochloric acid is a volatile acid and the produced nitric acid carry away the HCl vapours from reaction mixture.

(b) Hydrogen chloride gas is highly water soluble. When it comes out of the bottle it gets dissolved in the atmospheric moisture and the newly formed solution looks like a dense fume.

(ii) (a) PbS (b) ZnO

(iii) (a) Aqua regia (b) Finely divided iron (c) Nickel

(iv) (a)

Name of the process	Catalyst	Temperature	Equation for the reaction
Haber's Process	Iron	450°–500°C	$N_2 + 3H_2 \rightleftharpoons 2NH_3$

(b) The unreacted nitrogen and hydrogen, together with the ammonia are proceeded into a cooling tank. The cooling tank liquefies the ammonia. The unreacted hydrogen and nitrogen gases are recycled by being fed back through pipes to pass through the hot iron catalyst beds again.

Answer 5.

(i) (a) Y is Hydrochloride (HCl) gas. (b) Gas Y is highly soluble in water.

(ii) (a) Sodium hydroxide solution

(b) Ethyne

(iii) (a) Methanal (b) Propanone (c) Ethoxy Ethane

(iv) (a) Presence of diffused sunlight. (c) Hydrogen chloride gas.

(b) $H_2 + Cl_2 \longrightarrow 2HCl$

Answer 6.

(i) (a) $8NH_3 + 3Cl_2 \longrightarrow 6NH_4Cl + N_2\uparrow$ but if Cl is taken in excess then NCl_3 obtained.
$NH_3 + 3Cl_2 \longrightarrow NCl_3 + 3HCl$

(b) $Na_2CO_3 + 2HNO_3 \longrightarrow 2NaNO_3 + H_2O + CO_2$

(ii) (a) Sulphur trioxide $SO_3 + H_2O \longrightarrow H_2SO_4$

(b) Acetylene gas (C_2H_2) when calcium carbide comes in contact with moisture produce C_2H_2 gas.

(iii) (a) Alcoholic — OH group present in CH_3OH

(b) Carboxylic – COOH group present in CH_3COOH.

(c) Aldehyde group – CHO group present in CH_3CHO.

(iv) (a) Carbon or (Graphite)

(b) A (Cathode)

(c) Aluminium oxide, (Alumina) and cryolite (sodium aluminium fluoride).

(d) It is necessary for electrode B to be continuously replaced because it burns always in the presence of oxygen produced or consumed and get oxidised by oxygen to CO_2 at anode.

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