ICSE SEMESTER 2 EXAMINATION

SAMPLE PAPER - 3

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) Identify the pairs of metals and their ores from the following:

Group A	Group B
(1) Bauxite	(i) Iron
(2) Calamine	(ii) Aluminium
(3) Magnetite	(iii) Zinc

(a) (1)-(i), (2)-(ii), (3)-(iii)
(b) (1)-(ii), (2)-(i), (3)-(iii)
(c) (1)-(i), (2)-(iii), (3)-(ii)
(d) (1)-(ii), (2)-(iii), (3)-(i)

(ii) The round bottom flask in the fountain experiment is filled with:

(a) Liquid HCl
(b) Hydrochloric acid
(c) HCl gas
(d) Red litmus solution

(iii) The reaction taking place in the Haber's process is ..... reaction.

(a) Endothermic and irreversible
(b) Endothermic and reversible
(c) Exothermic and reversible
(d) Exothermic and irreversible

(iv) Reaction of aqueous ammonia with nitric acid produces:

(a) NH_4OH and NO_2
(b) NH_4Cl and NO_2
(c) NH_4NO_3 and H_2O
(d) NH_4OH and N_2

(v) What happens if impurities are not removed from the sulphur dioxide produced during the process?
  (a) The impurities will not interfere with the process.
  (b) The impurities will upgrade the quality of a catalyst.
  (c) The impurities will degrade the quality of a catalyst.
  (d) The impurities will form a new product with SO_2.

(vi) Two neighbours of a homologous series differ by:
  (a) CH (b) CH_2 (c) CH_3 (d) CH_4

(vii) A compound X changes blue litmus paper to red, and it reacts readily with potassium chloride to yield hydrochloric acid. What is compound X?
  (a) Acetic acid (c) Carbonic acid
  (b) Sulphuric acid (d) Citric acid

(viii) Which of the following statement is true?
  (a) The rate of dissolution of ammonia in water is low.
  (b) Aqueous ammonia can also be written as NH_3 (aq).
  (c) Ammonia has high vapour density than air.
  (d) All statements are true.

(ix) An alkyne has 75 carbon atoms in its molecule. The number of hydrogen atoms in its molecule will be:
  (a) 148 (b) 150 (c) 147 (d) 152

(x) Why is coke sprinkled over the surface of electrolytes?
  (a) It reduces heat loss. (c) Both (a) and (b)
  (b) It prevents the burning of anode. (d) It is used to increase the conductivity.

Section-B (Attempt any three questions from this Section)

Question 2.

(i) Define:
  (a) Saturated hydrocarbons
  (b) Unsaturated hydrocarbons

(ii) Name the compound formed when:
  (a) Aqueous solution of ammonia is added to solution of ferric chloride.
  (b) Chlorine reacts with excess of ammonia.

(iii) Give the formula of the next higher homologue of:
  (a) Pentane
  (b) Butene
  (c) Ethyne

(iv) Complete and balance the following chemical equations:
  (a) $CH_4 + Cl_2 \xrightarrow{U.V.}$
  (b) $Cu + HNO_3 \xrightarrow{\Delta}$
  (c) $NH_3 + O_2 \xrightarrow[800°C]{Pt}$

Question 3.

(i) Identify the following terms which are underlined :
  (a) <u>An alkaline gas</u> which produces dense white fumes when reacted with hydrogen chloride gas.
  (b) <u>A dilute mineral acid</u> which forms a white precipitate when treated with barium chloride

(ii) State the following:
  (a) The compound added to pure alumina to lower the fusion temperature during the electrolytic reduction of alumina.
  (b) An acid commonly known as oil of vitriol.

(iii) The questions below are related to the manufacture of ammonia:
  (a) Name the process.
  (b) In what ratio must the reactants be taken?
  (c) Name the catalyst and give the equation for the manufacture of ammonia.

(iv) Write balanced equation for the following conversions:
  (a) Oleum from sulphur trioxide.
  (b) Chloroform from methane.
  (c) Lead from lead oxide.

Question 4.

(i) State one relevant reason for the following:
  (a) Upward displacement method is applied to collect hydrogen chloride gas during laboratory preparation of HCl gas.
  (b) Ammonium nitrate is not used in the preparation of ammonia.

(ii) Give the chemical formulae of the following naturally occurring ores:
  (a) Bauxite
  (b) Haematite

(iii) Write the structural formula of the following:
  (a) 1, 2-Dichloroethane.
  (b) 2-Methyl propane
  (c) 2-Propanol.

(iv) Complete the table by writing the gas evolved in each case and its odour:

A solution of hydrogen chloride in water is prepared. The following substances are added to separate portions of the solution.

Substance added	Gas evolved	Odour
Calcium carbonate	—	—
Magnesium ribbon	—	—
Manganese (IV) oxide with heating	—	—
Sodium sulphide	—	—

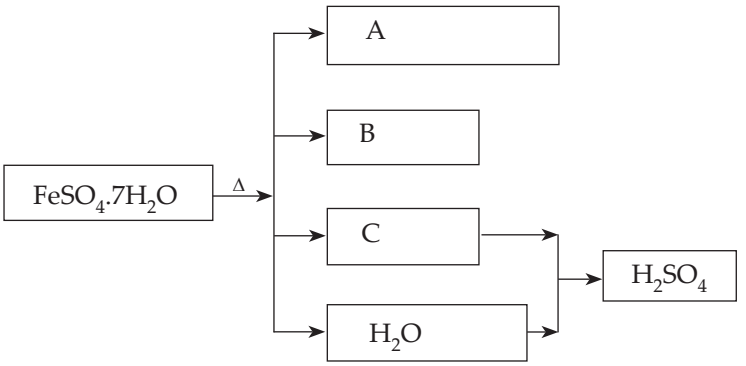
Question 5.

(i) Answer the following:
  (a) Of the two gases, ammonia and hydrogen chloride, which is more dense? Name the method of collection of this gas.
  (b) Give one example of a reaction between the above two gases which produces a solid compound.

(ii) Select the correct answer from the brackets to complete the following statements:
  (a) The metal other than aluminium present both in magnalium and duralumin is _____ [magnesium / manganese].
  (b) _____ is used as a catalyst during preparation of ammonia [Molybdenum / Vanadium]

(iii) Name the following:
  (a) An alloy used in aircraft construction.
  (b) The catalyst used in the catalytic oxidation of ammonia.
  (c) The type of reactions alkenes undergo.

(iv) Fill the missing boxes in the flow chart given below:



Question 6.

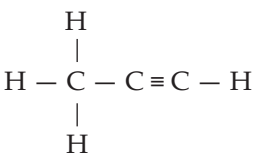
(i) State one relevant observation for each of the following reactions:

(a) A solution of bromine in carbon tetrachloride is passed in a sample of propyne.

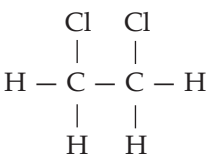
(b) Copper is heated with concentrated nitric acid in a hard glass test tube.

(ii) Give the IUPAC name of the following:

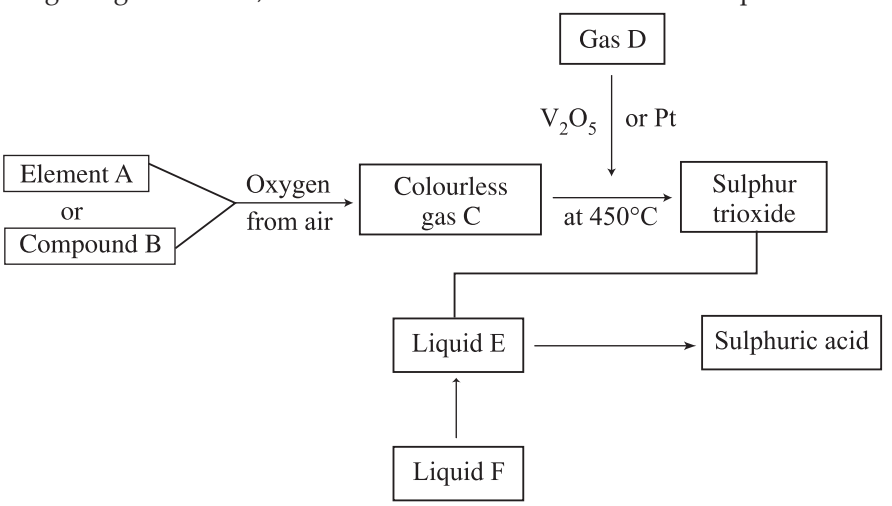
(a)



(b)



(iii) Study the diagram given below, which illustrates the manufacture of sulphuric acid.



(a) Write the name of the substance A to F.

(b) Describe how gas C could be identified?

(c) Explain the purpose of V_2O_5 or Pt.

(iv) The list of some organic compound is given below:

Ethanol, ethane, methanol, methane, ethyne, and ethene.

From the list above, name of compound:

(a) Formed by the dehydration of ethanol by concentrated sulphuric acid.

(b) Which will give red precipitate with ammonical cuprous chloride solution?

(c) Which forms chloroform on halogenation in the presence of sunlight?

Answers

Section-A

Answer 1.

(i) (d) (1)-(ii), (2)-(iii), (3)-(i)

Explanation :

Bauxite is an ore of Aluminium, white calamine is zinc carbonate and Magnetite is triferric tetraoxide.

(ii) (c) HCl gas

Explanation :

The fountain experiment is done to demonstrate the solubility of HCl gas in water. Therefore, it is filled with HCl gas. It is not easy to arrange the flask in an inverted position with liquid HCl. Moreover, hydrochloric acid will not give a fountain as it already consists of water. Red litmus solution is taken in a trough.

(iii) (c) Exothermic and reversible

Explanation :

The reaction of nitrogen and hydrogen gas to produce ammonia is highly exothermic as it produces an enormous amount of heat. Also, it is reversible in nature. The reason is that some of produce, ammonia converts back to the original reactants, nitrogen and hydrogen under the reaction conditions. Since the reverse reaction occurs under the same conditions as the forward reaction, the reaction is reversible.

(iv) (c) NH_4NO_3 and H_2O

Explanation :

Ammonia is a weak base. When it is mixed with water, it produces ammonium hydroxide, which gives salt and water upon reaction with nitric acid. This salt is NH_4NO_3.

(v) (c) The impurities will degrade the quality of a catalyst.

Explanation :

If impurities are not removed, they will reduce the efficiency of the catalyst used during the conversion of sulphur dioxide to sulphur trioxide. This will affect the yield of sulphuric acid.

(vi) (b) CH_2

Explanation :

The characteristic property of homologous series is that each member of the series differs from the preceding one by the addition of CH_2 group. Hence the two neighbours of a homologous series differ by CH_2 whose molecular mass is 14 amu. For example, C_2H_6 differs from CH_4 by CH_2.

(vii) (b) Sulphuric acid

Explanation :

Sulphuric acid is an acid; therefore, it turns blue litmus paper to red. Also, it reacts with KCl to give $KHSO_4$ and HCl. The reaction is given as:

$$KCl + H_2SO_4 \rightarrow KHSO_4 + HCl$$

The other three acids, acetic acid, carbonic acid, and citric acid, are very mild acids.

(viii) (b) Aqueous ammonia can also be written as NH (aq).

Explanation :

The rate of dissolution of ammonia in water is very high. Also, ammonia has high vapour density than

air. Therefore, both the options (a) and (c) are wrong. Hence, only option (b) is correct.

(ix) (a) 148

Explanation :

The general formula of alkyne is C_nH_{2n-2}.

Here $C = 75$ (given)

$\therefore$ $H = 2 \times 75 - 2 = 150 - 2$

$= 148.$

(x) (c) Both (a) and (b)

Explanation :

The prominent role of sprinkling coke over electrolyte in Hall and Heroult's experiment is to prevent heat loss and prevent burning of anode rode.

Section-B

Answer 2.

(i) (a) Hydrocarbons in which the carbon atoms are linked to each other by single bonds only are known as saturated hydrocarbons. Examples include methane (CH_4), ethane ($CH_3 - CH_3$) etc.

(b) Hydrocarbons in which the carbon atoms are linked to each other by double (C=C) or triple (C≡C) bonds are known as unsaturated hydrocarbons. Examples include ethene ($H_2C=CH_2$), propyne ($HC\equiv CH-CH_3$) etc.

(ii) (a) A reddish brown precipitate of ferric hydroxide is produced which is insoluble even in the excess of ammonium hydroxide.

$$FeCl_3 + 3NH_4OH \longrightarrow \underset{\text{Ferric hydroxide (reddish brown ppt.)}}{Fe(OH)_3 \downarrow} + 3NH_4Cl$$

(b) When chlorine reacts with excess of ammonia, ammonium chloride is formed.

$$3Cl_3 + 8NH_3 \longrightarrow \underset{\text{Ammonium chloride}}{6NH_4Cl_4} + N_2$$

(iii) (a) Hexane — C_6H_{14}

(b) Pentene — C_5H_{10}

(c) Propyne — C_3H_4

(iv) (a) $CH_4 + 4Cl_2 \xrightarrow{U.V.} \underset{\text{Carbon tetrachloride}}{CCl_4} + 4HCl$

(b) $Cu + 2HNO_3 \xrightarrow{Heat} Cu(NO_3)_2 + 2H_2O + 2NO_2\uparrow$

(Conc.) — Copper nitrate, Blue — Nitrogen dioxide, Brown gas

(c) $4NH_3 + 5O_2 \xrightarrow[800°C]{Pt} 4NO + 6H_2O$

Answer 3.

(i) (a) Ammonia

(b) Dilute sulphuric acid

(ii) (a) Cryolite.

(b) Sulphuric acid

(iii) (a) Haber's process.

(b) Nitrogen one part, hydrogen three parts.

(c) Iron powder

$N_2 + 3H_2 \longrightarrow 2NH_3$

(iv) (a) $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$

Sulphur trioxide (conc.) Oleum

(b) $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$

$CH_3Cl + Cl_2 \xrightarrow{hv} CH_2Cl_2 + HCl$

$CH_2Cl_2 + Cl_2 \xrightarrow{hv} CHCl_3 + HCl$

(c) $3PbO + 2NH_3 \longrightarrow 3Pb + 3H_2O + N_2$

Answer 4.

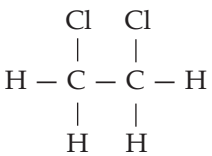
(i) (a) HCl gas is 1.28 times heavier than air so, upward displacement method is applied to collect hydrogen chloride gas.

(b) Ammonium nitrate does not undergo a reversible sublimation reaction; it melts and decomposes into nitrogen dioxide gas and water vapour. Thus, it is not used in the preparation of ammonia.

(ii) (a) $Al_2O_3.2H_2O$

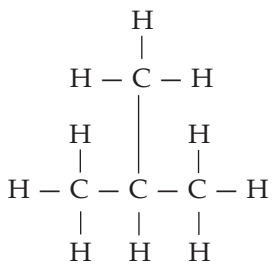
(b) Fe_2O_3

(iii) (a)



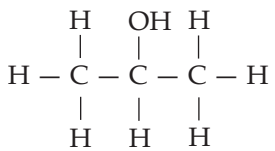
1,2-Dichloroethane

(b)



2-Methyl propane

(c)



2-Propanol

(iv)

Substance added	Gas evolved	Odour
Calcium carbonate	Carbon dioxide	Odourless
Magnesium ribbon	Hydrogen	Odourless
Manganese (IV) oxide with heating	Chlorine	Pungent irritating
Sodium sulphide	Hydrogen sulphide	Rotten eggs

Answer 5.

(i) (a) HCl gas is more dense because vapour density of HCl = 18.25 while of NH_3 = 8.5. Thus, HCl collected by upward displacement of air.

(b) $NH_3 + HCl \rightarrow NH_4Cl$.

(ii) (a) Magnesium

(b) Vanadium

(iii) (a) Duralumin

(b) Platinum

(c) Addition reaction

(iv) A = Fe_2O_3

B = SO_2

C = SO_3

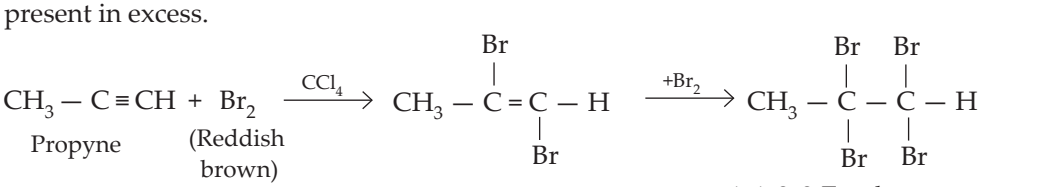
$$FeSO_4.7H_2O \xrightarrow{\Delta} FeSO_4(s) + 7H_2O$$

$$FeSO_4(s) + 7H_2O \xrightarrow{\Delta} Fe_2O_3(s) + SO_2\uparrow SO_3(g)$$

The flow chart shown in the question represents the decomposition of green vitriol to produce sulphuric acid. This is shown in two steps. The first step involves the production of Fe_2O_3, sulphur dioxide, sulphur trioxide and water. In the second step, sulphur trioxide and water react to give sulphuric acid.

Answer 6.

(i) (a) The reddish brown coloured bromine solution becomes colourless due to the formation of 1, 1, 2, 2-Tetrabromopropane. The reddish brown colour of bromine is discharged as long as propyne is present in excess.



Propyne (Reddish brown)

1, 1, 2, 2-Tetrabromopropane (colourless)

(b) A reddish brown fumes of nitrogen dioxide gas is evolved.

$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + NO_2\uparrow$$

(Reddish brown gas)

(ii) (a) Propyne

(b) 1, 2-dichloro ethane

(iii) (a) A—Sulphur B—Iron pyrites

C—Sulphur dioxide D—Oxygen

E—Concentrated sulphuric acid F—Water

(b) The gas C will turn acidified potassium dichromate paper green.

(c) V_2O_5 or Pt acts as a catalyst and increases the rate of formation of sulphur trioxide from sulphur dioxide and oxygen.

(iv) (a) Ethene

(b) Ethyne

(c) Methane

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