Mock Board Exam
ICSE SEMESTER 2 EXAMINATION

Chemistry
SECTION A – 10 MARKS

Question 1

(i) The working principle of _____ is based on the difference in the density of the ore and gangue particles.

(a) Magnetic separation
(b) Froth floatation
(c) Leaching
(d) Grinding

Answer: (b) Froth floatation

(ii) Brass is an alloy of copper and _____.

(a) Magnesium
(b) Iron
(c) Aluminium
(d) Zinc

Answer: (d) Zinc

(iii) _____ metal does not react with water at any temperature.

(a) Zinc
(b) Silver
(c) Sodium
(d) Magnesium

Answer: (b) Silver

(iv) The drying agent used to dry HCl gas is _____.

(a) Conc. H_2SO_4
(b) ZnO
(c) Al_2O_3
(d) CaO

Answer: (a) Conc. H_2SO_4

(v) _____ is insoluble in excess of ammonium hydroxide.

(a) Calcium hydroxide
(b) Ferric hydroxide

(c) Copper hydroxide
(d) Zinc hydroxide

Answer: (b) Ferric hydroxide

(vi) _____ colour precipitate forms when sodium hydroxide is added to ferric salt.

(a) Dirty green
(b) White
(c) Brown
(d) Reddish brown

Answer: (d) Reddish brown

(vii) The chemical used in the brown ring test is _____.

(a) $CuSO_4$
(b) $FeSO_4$
(c) $Cu(OH)_2$
(d) $ZnSO_4$

Answer: (b) $FeSO_4$

(viii) Covalent bond is formed between:

(a) Metal and non-metal
(b) Two metals
(c) Two non-metals
(d) Non-metal and an ion

Answer: (c) Two non-metals

(ix) The IUPAC name of CH_3-CH_2-CH_2-CH_2-$CH=CH_2$ is:

(a) Hex-2-ene
(b) Pent-2-ene
(c) Hex-1-ene
(d) Pent-1-ene

Answer: (c) Hex-1-ene

(x) The isomerism exhibited by the pair of compounds 1-Propanol & 2-Propanol is:

(a) Position isomerism
(b) Chain isomerism
(c) Functional isomerism
(d) Both position and chain isomerism.

Answer: (a) Position isomerism

SECTION B

Question 2

(i) Differentiate between calcination and roasting. **[2]**

Answer:

Calcination	Roasting
In this process, ore is heated in the absence of air.	In this process, ore is heated in the excess of air.
In general, carbonates and hydroxides are converted into their oxides by this process.	In general, sulphide ores are converted into their oxides by this process.
Example: $ZnCO_3$ (s) + Heat → ZnO (s) + CO_2 (g)	Example: 2PbS (s) + $3O_2$ (g) → 2PbO (s) + $2SO_2$ (g)

(ii) Write balanced chemical equations for the reaction of dilute hydrochloric acid with each of the following: **[2]**

(a) Iron (b) sodium hydrogen carbonate

Answer: (a) Fe (s) + 2HCl (aq) → $FeCl_2$ (aq) + H_2 (g)

(b) $NaHCO_3$ (s) + HCl (aq) → NaCl (aq) + H_2O (l) + CO_2 (g)

(iii) Write the steps involved in industrial manufacturing of ammonia. **[3]**

Answer: Ammonia is industrially manufactured using Haber's process. Following are the steps involved:

Step1: Nitrogen and hydrogen are dried, purified and then mixed in the ratio of 1:3 respectively.

Step 2: The mixture obtained in step 1 is passed through an electrically heated catalytic chamber containing finely divided iron with little amount of molybdenum.

Step 3: Mixture of ammonia is formed along with residual nitrogen and hydrogen.

(iv) Define the term functional group. Identify the functional group family of the given compounds:

(a) CH_3 - CH_2-CH_2-OH (b) CH_3-CH_2-COOH **[3]**

Answer: A functional group is defined as an atom or group of atoms present in a molecule which largely determines its chemical properties.

(a) CH_3 - CH_2-CH_2-OH belongs to the alcohol family since it contains -OH atoms.

(b) CH_3-CH_2-COOH belongs to the carboxylic acid family since it contains the -COOH atoms.

Question 3

(i) Suggest a process that can be used for converting carbonate and sulphide ores into their respective metal oxides. Give examples for the same. **[2]**

Answer: The carbonate ores can be converted into their oxides through calcination. In calcination, the ore is heated in absence of air.

For example: $ZnCO_3$ (s) + Heat → ZnO (s) + CO_2 (g)

The sulphide ores can be converted into their oxides through roasting. In roasting the ore is heated in the excess of air.

For example: 2PbS (s) + $3O_2$ (g) → 2PbO (s) + $2SO_2$ (g)

(ii) Why concentrated H_2SO_4 is not used as a drying agent during the preparation of ammonia? **[2]**

Answer: Ammonia is a base. Hence it reacts with concentrated sulphuric acid to form ammonium sulphate salt.

$2NH_3$ (g) + H_2SO_4 (aq) → $(NH_4)_2SO_4$ (aq)

So it is not used as a drying agent in preparation of ammonia.

(iii) (a) Name the acid formed when sulphur dioxide dissolves in water. **[3]**

(b) Name the gas released when dilute sulphuric acid reacts with metallic sulphide.

(c) Name the gas released when dilute sulphuric acid reacts with metal carbonate.

Answer: (a) Sulphur dioxide in reaction with water forms sulphurous acid. The reaction involved is:

SO_2 (g) + H_2O (l) → H_2SO_3 (aq)

(b) Dilute sulphuric acid reacts with metallic sulphide to evolve hydrogen sulphide gas.

For example: FeS (s) + H_2SO_4 (aq) → $FeSO_4$ (aq) + H_2S (g)

(c) Dilute sulphuric acid liberates carbon dioxide gas in reaction with metal carbonates.

For example: Na_2CO_3 (s) + H_2SO_4 (aq) → Na_2SO_4 (aq) + H_2O (l) + CO_2 (g)

(iv) Write a balanced chemical equation for the reaction of ethanoic acid with the following:

(a) Sodium (b) Sodium hydroxide (c) Ethanol. **[3]**

Answer: (a) $2CH_3COOH\ (aq) + 2Na\ (s) \rightarrow 2CH_3COONa\ (aq) + H_2\ (g)$

(b) $CH_3COOH\ (aq) + NaOH\ (aq) \rightarrow CH_3COONa\ (aq) + H_2O\ (l)$

(c) $CH_3COOH\ (aq) + C_2H_5OH\ (aq) \rightarrow CH_3COOC_2H_5\ (aq) + H_2O\ (l)$

Question 4

(i) How would you distinguish experimentally between an alcohol and a carboxylic acid? **[2]**

Answer: Take a small amount of each compound in a test tube and add an aqueous solution sodium bicarbonate ($NaHCO_3$) to it. The compound which produces brisk effervescence due to evolution of carbon dioxide gas must be a carboxylic acid.

(ii) Give reasons for the following statements: **[2]**

(a) Conc. nitric acid prepared in the laboratory is yellow in colour.

(b) In the laboratory preparation of nitric acid, the mixture of concentrated sulphuric acid and sodium nitrate should not be heated very strongly above 200 ^oC.

Answer: (a) Nitric acid prepared in the laboratory is yellow in colour due to the dissolution of reddish brown coloured nitrogen dioxide gas. This gas is produced due to the thermal dissociation of a portion of nitric acid.

(b) The temperature of the mixture of concentrated sulphuric acid and sodium nitrate should not exceed 200^oC because at higher temperatures the sodium sulphate formed in this reaction transforms into a hard crust which sticks to the walls of the retort and is difficult to remove. Also at higher temperatures nitric acid can also decompose.

(iii) Give favourable conditions for the oxidation of sulphur dioxide in the contact process. . **[3]**

Answer: Favourable conditions for the oxidation of sulphur dioxide to sulphur trioxide in contact process are given below.

1) **Exothermic reactions are favoured at low temperatures:** The temperature should be as low as possible. The yield has been found to be maximum at 410-450 ^oC.
2) **High Pressure:** High pressure favours the reaction because the product formed has less volume than reactant.
3) **A suitable catalyst:** Platinum is more efficient as a catalyst than vanadium pentoxide but platinum is more expensive hence vanadium pentoxide is used as catalyst.

(iv) (a) Carbonate of metal 'X' is abundant in the earth crust and its hydroxide is used in white washing. Identify metal 'X'.

(b) How will you convert this carbonate into its oxide? Name the process and write its chemical equation. **[3]**

Answer: (a) The compound used for white washing is calcium hydroxide ($Ca(OH)_2$). Therefore metal X is Calcium. It's carbonate is calcium carbonate which comprises more than 4% of earth's crust.

(b) Calcium carbonate can be converted into its oxide through a calcination process in which it is heated in absence of air. The reaction involved is given below.

$CaCO_3$ (s) + Heating → CaO (s) + CO_2 (g)

Question 5

(i) Write the structural formula of ethanol. What happens when it is heated with excess concentrated H_2SO_4 at 443 K? **[2]**

Answer: The structural formula of ethanol is CH_3CH_2OH.

When ethanol is heated with excess concentrated sulphuric acid at 443 K , it forms ethene. The reaction involved is as follows:

CH_3CH_2OH (aq) + Conc. H_2SO_4 (aq) → $CH_2=CH_2$ (aq) + H_2O (l)

(ii) Why do HCl, HNO_3 etc., show acidic character in aqueous solution while solutions of compounds like alcohol and glucose do not show acidic character? **[2]**

Answer: (a) According to Arrhenius theory, acids are compounds which when dissolved in water give H^+ ions.

Therefore, HCl and HNO_3 show acidic behaviour in an aqueous solution as they dissociate in water to produce hydrogen ions while glucose and alcohol do not dissociate to give out any ions.

(iii) Identify the substance oxidised, substance reduced, oxidising agent and reducing agent in the following chemical reaction:

ZnO (s) + C (s) → Zn (s) + CO (g) **[3]**

Answer: ZnO (s) + C (s) → Zn (s) + CO (g)

The substance that gains oxygen is said to be oxidised. Therefore, the substance oxidised here is C.

The substance that loses oxygen is said to be reduced. Therefore, the substance reduced here is ZnO.

The substance that gives off oxygen is called an oxidising agent while the substance that takes the oxygen is called a reducing agent. Therefore ZnO is an oxidising agent and C is a reducing agent.

(iv) With reference to electrolytic refining of copper, answer the following: **[3]**

(a) Name the electrolyte used.
(b) Name the cathode and anode used.
(c) Write the reaction that occurs at cathode and anode.

Answer: (a) The electrolyte used in electrolytic refining of copper is aqueous copper

sulphate solution.

(b) Cathode: A rod of pure copper ; Anode: A rod of impure copper

(c) At Cathode (Reduction): Cu^{2+} (aq) + $2e^-$ → Cu (s) ;
At Anode (oxidation): Cu (s) → Cu^{2+} (aq) + $2e^-$

Question 6

(i) (a) All alkalis are bases, but all bases are not alkalis. Explain.
(b) Sodium hydroxide is a monoacidic base. Give reason. **[2]**

Answer: (a) According to Arrhenius, bases are substances that give out OH^- ions when dissolved in water. Example: Sodium hydroxide.

Whereas only the water soluble bases are called alkalis. Sodium hydroxide is a base as well as an alkali while copper hydroxide is just a base. Therefore all alkalis are bases but all bases are not alkali.

(b) The number of hydroxide ions released by a base, when dissolved in water, is known as its acidity.

When sodium hydroxide dissolves in water, it dissociates to form one hydroxide ion per molecule of sodium hydroxide solution.

$$NaOH\ (aq) \rightarrow Na^+\ (aq) + OH^-\ (aq)$$

Therefore it is called a monoacidic base.

(ii) Which method will be used to reduce the following? Explain by giving a suitable example.

(a) Oxides of less reactive metals
(b) Oxides of moderately reactive metals **[2]**

Answer: (a) Oxides of less reactive metals can be reduced by heating alone.
For example: 2HgO (s) + Heating → 2Hg (s) + O_2 (g)

(b) Oxides of moderately reactive metals can be reduced by using suitable reducing agents like carbon. For example: ZnO (s) + C (s) + Heating → Zn (s) + CO (s)

(iii) An organic compound 'A' having molecular formula $C_2H_4O_2$ turns blue litmus red and gives a brisk effervescence with sodium hydrogen carbonate. Give the structural formula, the IUPAC name and the common name of compound 'A'.
[3]

Answer: Since compound 'A' turns blue litmus paper red and gives a brisk effervescence with sodium hydrogen carbonate, therefore compound A is carboxylic acid.

Molecular formula of A (carboxylic acid) is $C_2H_4O_2$. Therefore it is a two-carbon carboxylic acid whose structural formula is CH_3COOH.

The IUPAC name of CH_3COOH is ethanoic acid. It's common name is acetic acid.

(iv) Explain the following reactions.

(a) Carbon and conc. nitric acid is heated
(b) Dilute HNO_3 is added to copper
(c) Concentrated nitric acid is heated **[3]**

Answer: (a) The concentrated nitric acid reacts with carbon on heating to form carbon dioxide gas, nitrogen dioxide gas along with water. The reaction involved is given below:

$$C\ (s)\ + 4HNO_3\ (aq)\ \rightarrow CO_2\ (g) + 2H_2O\ (l) + 4NO_2\ (g)$$

(b) Dilute nitric acid oxidises copper that results in the formation of copper nitrate, water and nitric oxide. The reaction involved is given below:

$$3Cu\ (s) + 8HNO_3\ (aq) \rightarrow 3Cu(NO_3)_2\ (aq) + 4H_2O\ (l) + 2NO\ (g)$$

(c) On heating, the concentrated nitric acid gives brown fumes of nitrogen dioxide along with formation of water and oxygen gas. The reaction involved is given below:

$$4HNO_3\ (aq) + Heat \rightarrow 2H_2O\ (l) + 4NO_2\ (g) + O_2\ (g)$$