

SUBJECT: Chemistry

MAX. MARKS: 80

CLASS: X

DURATION: 2 HRS

SECTION I (40 marks)

Attempt all questions from this section

Question 1

a) Choose the correct answer from the options given below: [5]

i. An Electrolyte which completely dissociates into ions is:

- A. Alcohol
- B. Carbonic acid
- C. Sucrose
- D. Sodium hydroxide

Ans: (D) Sodium hydroxide, NaOH is strong base

ii. The most electronegative element from the following elements is:

- A. Magnesium
- B. Chlorine
- C. Aluminium
- D. Sulphur

Ans: (B) Chlorine, Chlorine is a non-metal and most electronegative element.

iii. The reason for using Aluminium in the alloy duralumin is:

- A. Aluminium is brittle.
- B. Aluminium gives strength.
- C. Aluminium brings lightness.
- D. Aluminium lowers melting point.

Ans. (C) Aluminium brings lightness. Alloy of aluminium, duralumin is used in making aircrafts as it is light and corrosion resistant.

iv. The *drying agent* used to dry HCl gas is :

- A. Conc. H₂SO₄
- B. ZnO
- C. Al₂O₃
- D. CaO

Ans. (A) Conc. H₂SO₄

- v. A hydrocarbon which is a *greenhouse gas* is:
- Acetylene
 - Ethylene
 - Ethane
 - Methane

Ans. (D) Methane

b) Fill in the blanks with the choices given in brackets: [5]

- Conversion of *ethanol to ethene* by the action of *concentrated sulphuric acid* is an example of _____. (dehydration / dehydrogenation / dehydrohalogenation)
- When *sodium chloride* is heated with *concentrated sulphuric acid below 200 °C*, one of the products formed is _____. (sodium hydrogen sulphate / sodium sulphate / chlorine)
- Ammonia* reacts with *excess chlorine* to form _____ (nitrogen / nitrogen trichloride / ammonium chloride)
- Substitution reactions* are characteristic reactions of _____. (alkynes / alkenes / alkanes)
- In Period 3, the most metallic element is _____. (sodium / magnesium / aluminium)

Ans:

- Dehydration: Ethanol loses water in presence of conc. H_2SO_4 to produce ethene.
- NaHSO_4 (Sodium hydrogen sulphate)
 $\text{NaCl} + \text{H}_2\text{SO}_4 \longrightarrow \text{NaHSO}_4 + \text{HCl}$ (Below 200 °C)
- NCl_3 (Nitrogen trichloride)
 $\text{NH}_3 + 3\text{Cl}_2 \longrightarrow \text{NCl}_3 + 3\text{HCl}$
- Alkanes (Alkanes show substitution reaction by replacing H atom.)
- Sodium (Metallic character decreases across the period.)

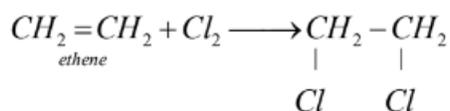
c) Write a balanced chemical equation for each of the following reactions: [5]

- Reduction of copper (II) oxide by hydrogen.
- Action of dilute sulphuric acid on sodium hydroxide.
- Action of dilute sulphuric acid on zinc sulphide.
- Ammonium hydroxide is added to ferrous sulphate solution.
- Chlorine gas is reacted with ethene.

Ans:

- $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$
- $\text{NaOH} + \text{H}_2\text{SO}_4 \longrightarrow \text{NaHSO}_4 + \text{H}_2\text{O}$
 $\text{NaHSO}_4 + \text{H}_2\text{SO}_4 \longrightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- $\text{ZnS} + \text{dil. H}_2\text{SO}_4 \longrightarrow \text{ZnSO}_4 + \text{H}_2\text{S}$
- $\text{FeSO}_4 + 2\text{NH}_4\text{OH} \longrightarrow (\text{NH}_4)_2\text{SO}_4 + \text{Fe}(\text{OH})_2$

v.



d) State one observation for each of the following: [5]

- i. Concentrated nitric acid is reacted with sulphur.
- ii. Ammonia gas is passed over heated copper (II) oxide.
- iii. Copper sulphate solution is electrolysed using copper electrodes.
- iv. A small piece of zinc is added to dilute hydrochloric acid.
- v. Lead nitrate is heated strongly in a test tube.

Ans:

- i. Reddish brown gas NO_2 is observed.
- ii. Metallic Cu is formed.
- iii. When copper electrodes are used then the mass loss of copper from anode is equal to mass gained and deposited on – ve electrode.
- iv. Bubbles of H_2 gas observed.
- v. Cracking noise is observed.

e) (i) Calculate: [5]

1. The number of moles in 12 g of oxygen gas. [O=16]
2. The weight of 10^{22} atoms of carbon.
[C = 12, Avogadro's No. = 6×10^{23}]

(ii) Molecular formula of a compound is $\text{C}_6\text{H}_{18}\text{O}_3$. Find its empirical formula.

Ans:

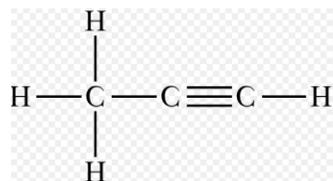
i. 1. $\text{Moles} = \frac{\text{Mass}}{\text{molar mass}} = \frac{12}{16} = 0.75 \text{ moles}$

2. 6×10^{23} atoms of carbon weigh 12 gm. Therefore, 10^{22} atoms will weigh =
 $\left(\frac{12 \times 10^{22}}{6 \times 10^{23}} \right) = 0.2 \text{ g}$

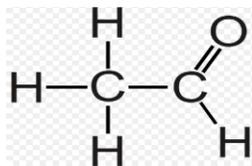
- ii. Empirical formula is simplest whole no. ratio. if molecular formula is $\text{C}_6\text{H}_{18}\text{O}_3$ then empirical formula = $\text{C}_2\text{H}_6\text{O}$

f) (i) Give the IUPAC name of the following organic compounds: [5]

1.



2.



- (ii) What is the special feature of the structure of ethyne?
- (iii) Name the saturated hydrocarbon containing two carbon atoms.
- (iv) Give the structural formula of Acetic acid.

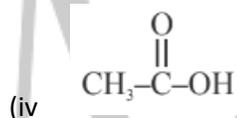
Ans: (i) IUPAC name

(1) Prop-1-yne

(2) Ethanal

(ii) It has linear non-polar structure.

(iii) Ethane



- g) Give the appropriate term defined by the statements given below: [5]
- The formula that represents the simplest ratio of the various elements present in one molecule of the compound.
 - The substance that releases hydronium ion as the only positive ion when dissolved in water.
 - The tendency of an atom to attract electrons towards itself when combined in covalent compound.
 - The process by which certain ores, specially carbonates, are converted to oxides in the absence of air.
 - The covalent bond in which the electrons are shared equally between the combining atoms.

Ans.

- Empirical formula
- Acid
- Electronegativity
- Calcination
- Non-polar covalent bond

- h) Arrange the following according to the instructions given in brackets: [5]
- K, Pb, Ca, Zn (In the increasing order of reactivity)

- ii. Mg^{2+} , Cu^{2+} , Na^{1+} , H^{1+} (In the order of preferential discharge at the cathode)
- iii. Li, K, Na, H (In the decreasing order of their ionization potential)
- iv. F, B, N, O (In the increasing order of electron affinity)
- v. Ethane, methane, ethene, ethyne (In the increasing order of the molecular weight.)
[H = 1 , C=12]

Ans.

- i. $Pb < Zn < Ca < K$
- ii. $Na^+ < Mg^{2+} < H^+ < Cu^{+2}$
- iii. $H < Li < Na < K$
- iv. $B < N < O < F$
- v. Methane < ethyne < ethane <ethane

SECTION II (40 Marks)

*Attempt any **four** questions from this section*

Question 2

- a) Draw the electron dot structure of: [3]
- i. Nitrogen molecule [N = 7]
 - ii. Sodium chloride [Na = 11, Cl = 17]
 - iii. Ammonium ion [N = 7, H = 1]

- b) The pH values of three solutions A, B and C are given in the table. Answer the following [3]
Questions:

Solution	pH value
A	12
B	2
C	7

- i. Which solution will have no effect on litmus solution?
 - ii. Which solution will liberate CO_2 when reacted with sodium carbonate?
 - iii. Which solution will turn red litmus solution blue?
- c) Study the extract of the periodic table given below and answer the questions that follow. [4]

Give the alphabet corresponding to the element in question DO NOT repeat an element.

- ii. Non – electrolyte
 - iii. Weak electrolyte
- b) Distinguish between the following pairs of compounds using the reagent given in the bracket. [3]
- i. Manganese dioxide and copper (II) oxide. (using concentrated HCl)
 - ii. Ferrous sulphate solution and ferric sulphate solution. (Using sodium hydroxide solution)
 - iii. Dilute hydrochloric acid and dilute sulphuric acid. (Using lead nitrate solution)
- c) Choose the method of preparation of the following salts, from the methods given in the list: [4]
- [List : A. Neutralization B. Precipitation C. Direct combination D. Substitution]
- i. Lead chloride
 - ii. Iron (II) sulphate
 - iii. Sodium nitrate
 - iv. Iron (III) chloride

Ans.

- a) Particles:
- i. Ions
 - ii. Molecules
 - iii. Ions and Molecules
- b) Distinguish
- i. MnO_2 with conc. HCl gives Cl_2 gas whereas Cu_2O does not.
 - ii. Ferrous sulphate gives pale green ppt of Fe^{+2} where as ferric sulphate gives brown ppt of Fe^{+3} .
 - iii. dil. HCl gives white ppt of PbCl_2 with lead nitrate solution and sulphuric acid does not.
- c) Methods:
- i. B. Precipitation
 - ii. D. Substitution
 - iii. A. Neutralization
 - iv. C. Direct Combination

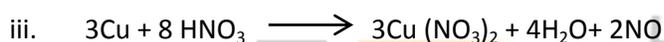
Question 4

- a) Complete the following equations : [3]
- i. $\text{S} + \text{conc. HNO}_3 \longrightarrow$
 - ii. $\text{C} + \text{cons. H}_2\text{SO}_4 \longrightarrow$
 - iii. $\text{Cu} + \text{dil. HNO}_3 \longrightarrow$
- b) Write a balanced chemical equation for the preparation of : [3]

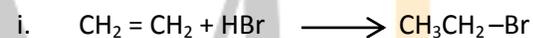
- i. Ethene from bromoethane
 - ii. Ethyne using calcium carbide
 - iii. Methane from sodium acetate
- c) Name the following organic compounds : [4]
- i. The compound with 3 carbon atoms whose functional group is a carboxyl.
 - ii. The first homologue whose general formula is C_nH_{2n} .
 - iii. The compound that reacts with acetic acid to form ethyl ethanoate.
 - iv. The compound formed by complete chlorination of ethyne.

Ans.

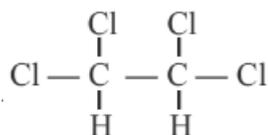
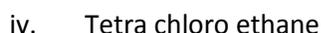
a) Equations:



b) Balanced Equations:



c) Organic Compounds:



Question 5

- a) Give the chemical formula of : [3]
- i. Bauxite
 - ii. Cryolite
 - iii. Sodium aluminate
- b) Answer the following questions based on the extraction of aluminium from alumina by Hall - Heroult's Process : [3]

- i. What is the function of cryolite used along with alumina as the electrolyte?
- ii. Why is powdered coke sprinkled on top of the electrolyte?
- iii. Name the electrode, from which aluminium collected.

c) Match the alloys given in column I to the uses given in column II :

[4]

Column I	Column II
i) Duralumin	A. Electrical Fuse
ii) Solder	B. Surgical Instruments
iii) Brass	C. Aircraft Body
(iv)Stainless Steel	D. Decorative Articles

Ans.

a) Chemical Formula

- i. $Al_2O_3 \cdot 2H_2O$
- ii. Na_3AlF_6
- iii. $NaAlO_2$

b) Hall Hearult

- i. In the extraction of aluminium, the metal is to be isolated from alumina $Al_2O_3 \cdot 2H_2O$ by carrying out its electrolytic reduction. The melting point of alumina is very high (2323K). It is therefore, mixed with cryolite (Na_3AlF_6) which lowers its melting point to 1173 K. More over, cryolite also increase the electrical conductivity of alumina.
- ii. Coke while burning takes up oxygen from Al_2O_3 (bauxite) and is converted into CO and also into CO_2 . The CO produced also reduces Al_2O_3 . This reduction process helps in purification of aluminium.
- iii. Aluminium is collected at cathode.

c) Match the following:

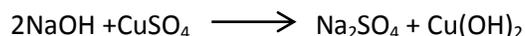
- i. Duralumin – (C) Aircraft body
- ii. Solder – (A) Electrical fuse
- iii. Brass – (D) Decorative articles
- iv. Stainless steel – (B) surgical instruments

Question 6

a) Identify the substance underlined:

[3]

- i. The catalyst used to oxidise ammonia.
 - ii. The organic compound which when solidified, forms an ice like mass.
 - iii. The dilute acid which is an oxidizing agent.
- b) Copper sulphate solution reacts with sodium hydroxide solution to form a precipitate of copper hydroxide according to the equation : [3]



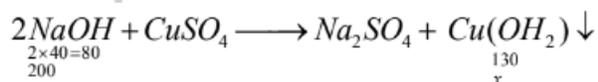
- i. What mass of copper hydroxide is precipitated by using 200 gm of sodium hydroxide [H = 1, O = 16, Na = 23, S = 32, Cu = 64]
 - ii. What is the colour of the precipitate formed?
- c) Find the empirical formula and the molecular formula of an organic compound from the data given below : [4]
 C = 75.92%, H = 6.32% and N = 17.76% . The vapour density of the compound is 39.5. [C = 12, H = 1, N = 14]

Ans.

a) Substances:

- i. Platinum
- ii. Acetic Acid
- iii. Nitric Acid

b)



$$x \times 80 = 130 \times 200$$

$$x = \frac{130 \times 200}{80}$$

$$= 325 \text{ gm}$$

- i.
 - ii. The colour of the precipitate formed is pale Blue.
- c) Empirical Formula

Element	%	
C	75.92	$\frac{75.92}{12} = \frac{6.32}{1.26} = 5$
H	6.32	$\frac{6.32}{1} = \frac{6.32}{1.26} = 5$
N	17.76	$\frac{17.76}{14} = \frac{1.26}{1.26} = 1$

Empirical formula:- C₅H₅N

Molecular weight = 2 × Vapour Density

$$= 2 \times 39.5$$

$$= 79$$

Empirical formula weight = C X 5 + H X 5 + N X 1

$$= (12 \times 5) + (1 \times 5) + (1 \times 14)$$

$$= 60 + 5 + 14$$

$$= 79$$

$$n = \frac{\text{Molecular Wt.}}{\text{Empirical formula Wt.}} = \frac{79}{79} = 1$$

Therefore, Molecular Formula = Empirical Formula = C₅H₅N

Question 7

- a) Name the gas evolved in each of the following cases : [3]
- Alumina undergoes electrolytic reduction.
 - Ethene undergoes hydrogenation reaction.
 - Ammonia reacts with heated copper oxide.
- b) Study the flow chart given and give balanced equations to represent the reactions A, B and C:



[3]

- c) Copy and complete the following table which refers to the industrial method for the preparation of ammonia and sulphuric acid: [4]

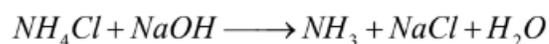
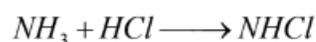
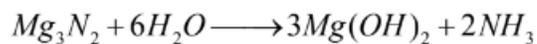
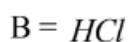
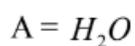
Name of The Compound	Name of the process	Catalytic Equations (with the catalyst)
Ammonia	i. _____	ii. _____
Sulphuric Acid	iii. _____	iv. _____

Ans:

a) Gas Evolved is:

- i. CO₂ and CO
- ii. Ethane
- iii. Nitrogen

b) Flow Chart :



c)

Name of The Compound	Name of the process	Catalytic Equations (with the catalyst)
Ammonia	i. Haber Process	ii. $\text{N}_2 + 3\text{H}_{2(g)} \xrightleftharpoons[450^\circ\text{C}, 200\text{atm}]{\text{Fe catalyst}} \text{NH}_{3(g)} \uparrow$
Sulphuric Acid	iii. Contact Process	iv. $2\text{SO}_{2(g)} + \text{O}_{2(g)} \xrightarrow[450^\circ\text{C}]{\text{V}_2\text{O}_5} 2\text{SO}_{3(g)}$