SECTION A (50 Marks)

ANSWER **ALL** QUESTIONS

Question 1

a) **Directions: For each question, there are four alternatives A, B, C and D. Choose the Correct alternative and circle it. Do not circle more than ONE alternative. If there are more than one circled, NO score will be awarded.** **[25]**

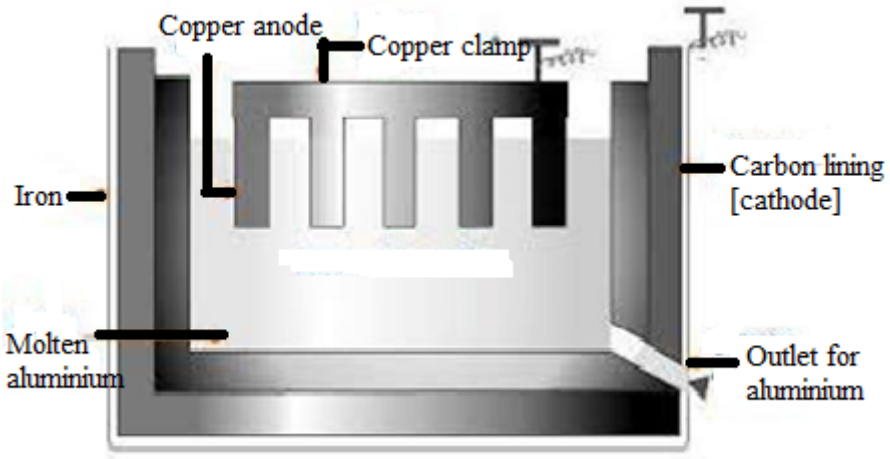
i. "At constant pressure, the volume of a given quantity of a gas increases or decreases by 1/273 of its volume at 0ºC for rise or fall in the temperature by 1ºC." The above law is

A Boyle's law.
B Charles' law.
C Combined gas law.
D Avogadro's law.

ii. The relative formula for a mass of magnesium chloride is

A 95.
B 83.5.
C 59.5.
D 69.5.

iii. With reference to the given figure, state the function of cryolite.



A acts as a solvent for the electrolyte mixture
B maintains a constant fusion temperature
C increases the fusion temperature
D lowers the fusion temperature

iv. The correct order of increasing electronegativity of the halogens is

A F < Cl < I < Br.
B I < Cl < Br < F.
C F < Cl < Br < I.
D I < Br < Cl < F.

v. The electronic configuration of the element 'X' having atomic number 25 would be

A $1s^2\ 2s^2\ 2p^6\ \ 3s^2\ 3p^6\ 3d^7$.
B $1s^2\ 2s^2\ 2p^6\ \ 3s^2\ 4s^0\ 3d^7$.
C $1s^2\ 2s^2\ 2p^6\ \ 3s^2\ 3p^6\ 4s^2\ 3d^5$.
D $1s^2\ 2s^2\ 2p^6\ \ 3s^2\ 3p^6\ 4s^i\ 3d^6$.

vi. Study the given thermo chemical equation and identify the type of reaction.

$$CH_4 + 2O_2 \longrightarrow 2H_2O + CO_2\ \Delta H = 728kJ/mol.$$

A endothermic reaction
B irreversible reaction
C exothermic reaction
D reversible reaction

vii. Which of the following conditions must be applied in Haber's process to increase the yield of ammonia?

I. increasing the concentration of reactant
II. decreasing the concentration of reactant
III. increasing the temperature
IV. increasing the pressure

A I and II
B II and IV
C I and IV
D II and III

viii. The empirical formula of C_2H_2 is

A CH_2.
B CH.
C C_2H_4.
D C_2H_2.

ix. All the following are the alloys of iron **EXCEPT**

A steel.
B invar.
C alnico.
D gun metal.

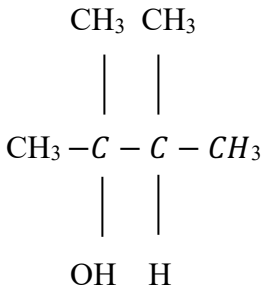
x. Sonam prefers to make ear rings with silver and gold over other metals. What is the reason?

A gold and silver are reactive
B gold and silver are inert
C gold and silver are attractive
D gold and silver are light

xi. Which of the following species will be deposited at the anode on electrolysis of an aqueous solution of magnesium sulphate?

A SO_4^{2-}
B Mg^{2+}
C SO_4
D Mg

xii. The IUPAC name of the given compound is



A 2,3 – dimethylbutan -2-ol.
B 3 – methylbutan -3-ol.
C 1 – methylpropanol.
D 1 – propanol.

xiii. All of the following reactions are exothermic in nature **EXCEPT**

A respiration.
B burning of magnesium ribbon.
C formation of calcium hydroxide.
D decomposition of calcium carbonate.

xiv. The flasks A, B, C and D contain equal number of oxygen molecules. Identify the flask with the highest pressure.

Flask A Flask B Flask C Flask D

A Flask A
B Flask B
C Flask C
D Flask D

xv. Study the equation below and answer the question that follows:

$$2SO_2 + O_2 \underset{450°C}{\overset{Pt}{\rightleftharpoons}} 2SO_3 + 45Kcal$$

What will happen to the yield of SO_3, if the temperature is increased?

A It will increase.
B It will decrease.
C It will remain same.
D It will increase the amount of oxygen.

xvi. What would be the effective nuclear charge experienced by the electrons of a fluorine atom in 'L' shell?

A 5
B 6
C 7
D 8

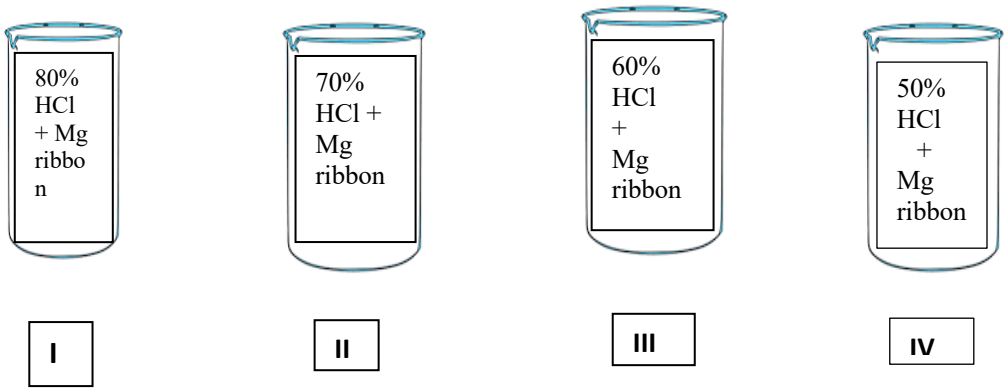
xvii. Which of the following molecule contains the maximum number of moles?

A 10g of N_2
B 10g of CO_2
C 10g of SO_2
D 10g of NH_3

xviii. Dechen was provided with an unknown halogen 'X'. 'X' when dissolved in water turned orange red. She concluded that the halogen is

A fluorine.
B chlorine.
C bromine.
D iodine.

xix. Study the figure below and answer the question.



In which case, magnesium ribbon will take the LEAST time to react?

A Set up I
B Set up II
C Set up III
D Set up IV

xx. The molecular formula of alcohol having four carbon atoms is

A C_4H_7OH.
B C_4H_8OH.
C C_4H_9OH.
D $C_4H_{10}OH$.

xxi. A certain mass of gas occupies a volume of 3.0L at 90 atm. What pressure would the gas exert if it were placed in a 9L container at the same temperature?

A 0.03 atm
B 0.32 atm
C 3.0 atm
D 30 atm

xxii. The chief ore of iron is

A Haematite.
B Bauxite.
C Galena.
D Zinc blende.

xxiii. Which of the following statement best describe the similarities between copper and zinc?

A They occur in their native state in nature.
B Both metals dissolve in aqua-rega.
C Both metals exhibit bivalency.
D Both metals are white in colour.

xxiv. Alcohols are viscous liquids and their viscosity depends on the strength of the inter-molecular forces. The alcohol with the highest viscosity is

A methanol.
B octanol.
C hexanol.
D propanol.

xxv. The equation for the combustion of butane is shown below:

$$2H_4H_{10} + 13O_2 \longrightarrow 8CO_2 + 10H_2O$$

How many molecules of water are formed when one molecule of butane burns completely?

A 4 molecules
B 5 molecules
C 8 molecules
D 10 molecules

b) Match each item under Column A with the item in Column B. Rewrite the correct pairs by writing the alphabet against the number in the space provided. **[5]**

Column A		Column B	
i.	Simplest ratio of number of atoms	a.	complete dissociation
ii.	Strong electrolyte	b.	hydroxyl ion
iii.	Functional group of alcohol	c.	Dalton's law
iv.	Relation between volume, pressure, number of moles and temperature	d.	Avogadro's law
v.	Total pressure is equal to sum of partial pressures	e.	empirical formula
		f.	ideal gas equation
		g.	molecular formula

i.	
ii.	
iii.	
iv.	
v.	

c) Fill in the blanks with appropriate words. **[5]**

i.	The heating of concentrated ore in a limited supply of air _____.	
ii.	In a reaction, if $H_R > H_P$; then the value of ΔH will be _____ .	
iii.	Poisonous chemical substances added to ethanol, making it unfit for consumption is _____.	
iv.	The bleaching action of chlorine is due to _____.	
v.	The number of atoms or ions surrounding a central metal atom in a complex ion by means of a coordinate bond is called _____.	

d) Correct the following statement by changing the underlined word(s) ONLY. Re-write the correct word(s) only. DO NOT copy the whole sentence. **[5]**

i. The vapour density of a gas is <u>twice</u> its relative molecular mass.

ii. Aluminium is extracted from its ore by <u>smelting</u>.

iii. According to <u>internal energy,</u> whenever one form of energy disappears, an equivalent amount of some other energy appears.

iv. At chemical equilibrium, the concentrations of the reactant and product <u>increases.</u>

v. An enzyme in the yeast, which converts glucose to ethanol is <u>maltase.</u>

i.	
ii.	
iii.	
iv.	
v.	

e) Answer the following questions: **[5]**

i. State **ONE** similarity of silver and cadmium.

ii. What would happen to the volume of 10L carbon dioxide, if the pressure is doubled and temperature is kept constant?

iii. Calculate the percentage composition of nitrogen in NH_4NO_3.

iv. Why are Halogens usually stored in the glass containers?

v. Write the IUPAC name of the following:

a) C_3H_7OH	
b) C_2H_5OH	

f) Write **ONE** difference for the following based on what is given in the bracket. **[5]**

i. Brass and bronze (composition)

Brass	Bronze	

ii. Ferromagnetic and diamagnetic substance (magnetic properties)

Ferromagnetic substance	Diamagnetic substance	

iii. Internal energy and enthalpy (form of energy)

Internal energy	Enthalpy	

iv. Fluorine and Chlorine (Name the Scientist)

Fluorine	Chlorine	

v. Monohydric and dihydric alcohol (definition)

Monohydric alcohol	Dihydric alcohol	

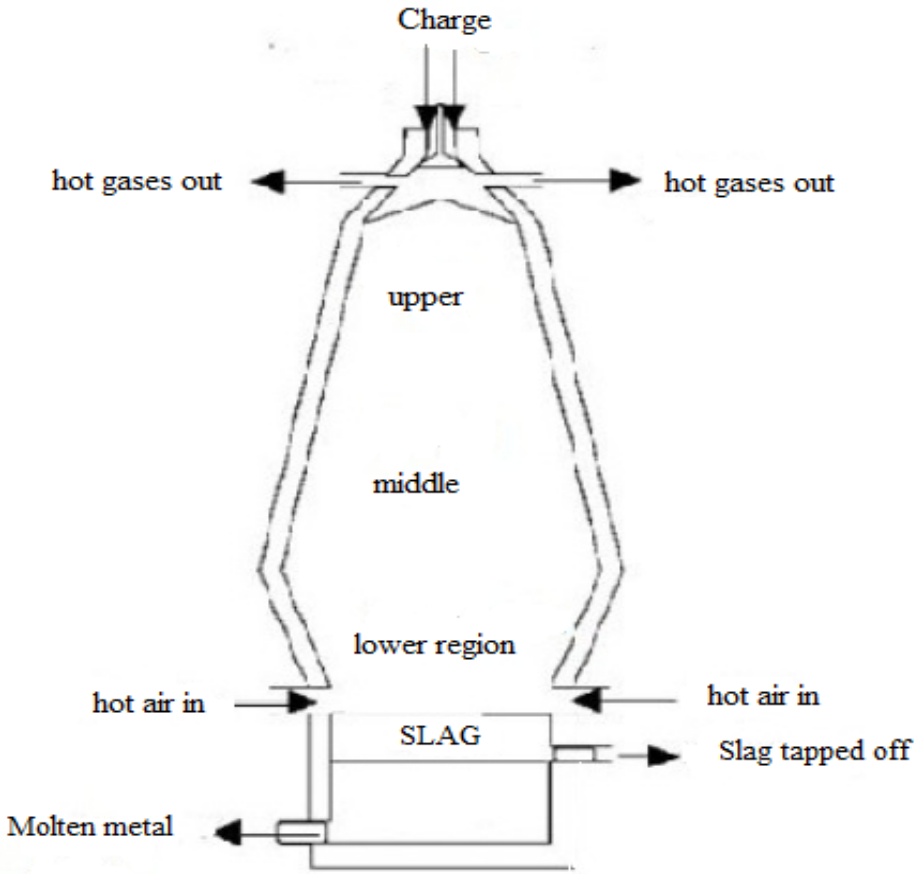
SECTION B (50 Marks)

Attempt **any FIVE** questions

Question 2

a) A balloon with a volume of 2.0 L is filled with a gas at 3 atmospheres. If the pressure is reduced to 0.5 atmosphere without change in temperature, what would be the volume of the balloon? [2]

b) Study the figure given below and answer the following questions.



i. Name the metal extracted. [1]

ii. Write the reactions occurring in the middle region of the structure. [2]

iii. In the above metal extraction, slag is generated as one of the by-products. How is slag re-used productively. [1]

c) Define.

i. Amphoteric compound [1]

ii. Dynamic equilibrium [1]

iii. Write the electronic configuration in s, p, d, f notation for the following: [2]

1. $29^{Cu}2$	2. 21^{Sc}	

Question 3

a) A compound on analysis gives the following % composition: Carbon = 40%, Oxygen = 53.3% and Hydrogen = 6.67%. Its vapour density is 30. Find the molecular formula of the compound. [4]

b) Give reasons for the following:

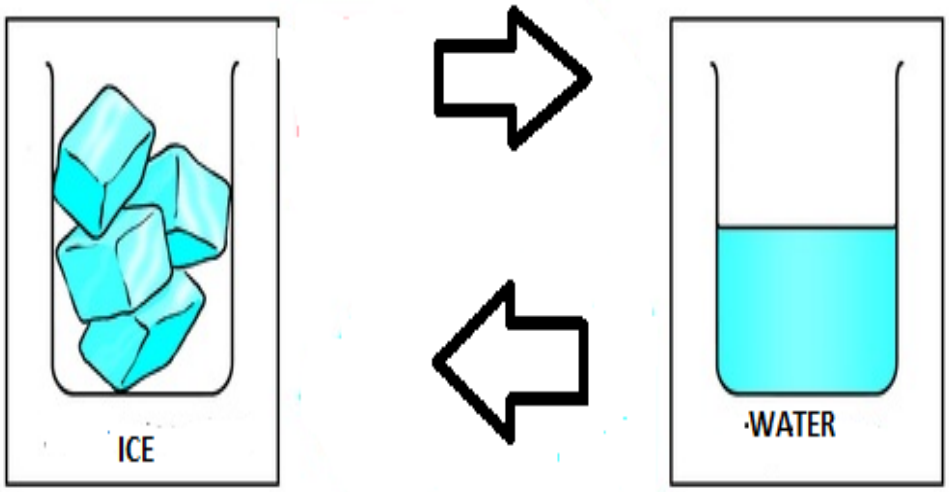
i. Aluminium is used in food industries and making cooking utensils. [1]

ii. Solid sodium chloride does not conduct electricity. [1]

iii. Invar is used in making measuring instruments. [1]

iv. Transition metal ions are usually colored. [1]

c) Observe the figure given below and answer the questions that follow:



If heat is applied to the above system, in which direction will the equilibrium shift? Why? [1]

d) Write the IUPAC name for the given structure: $CH_3CH = CH_2$ [1]

Question 4

a) A sample of hydrogen has an initial temperature of 50°C.When the temperature is lowered to 10°C, the volume of hydrogen becomes 2L. What was the initial volume of hydrogen? [2]

b) The electronic configuration of an element 'X' is:

K	L	M
2	8	7

i. What will be the chemical formula of the compound when magnesium combines with X? [1]

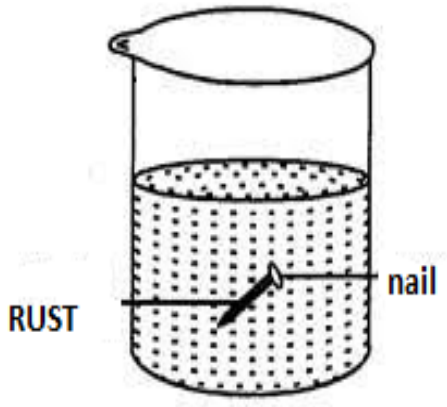
ii. Is the element 'X' electropositive or electronegative? Why? [1]

c) Name the catalyst used in the following processes: [2]

i. Haber's process

ii. Contact process

d) The diagram below shows a chemical reaction. Explain whether the reaction is reversible or irreversible reaction. [2]



e) If 16.4 gram of calcium nitrate is heated as shown in the reaction:

$2Ca(NO_3)_2 \longrightarrow 2CaO + 4NO_2 + O_2$

i. Calculate the volume of nitrogen dioxide produced at STP. [1]

ii. Calculate the weight of calcium oxide obtained. [1]

Question 5

a)

i. Calculate the relative molecular mass of $CuSO_4.5H_2O$ (Atomic mass of Cu = 64) [1]

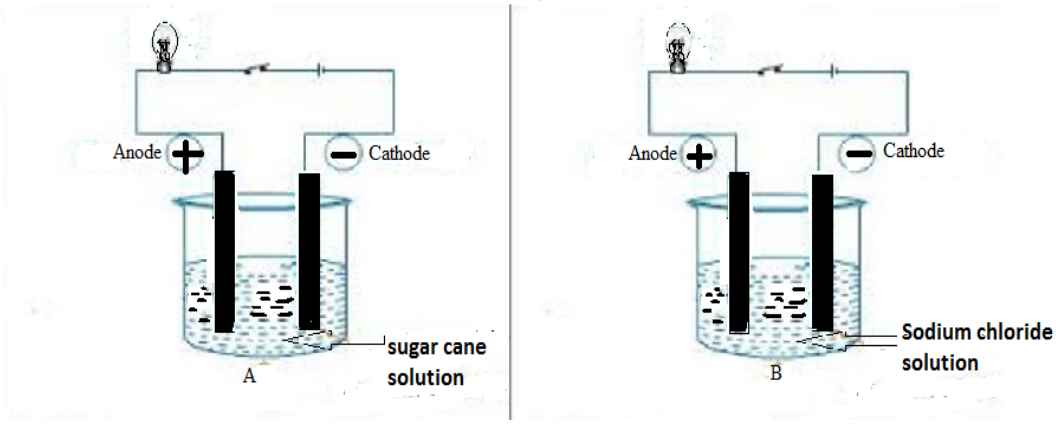
ii. 6.2 L of an ideal gas is present at 3.0 atm and 37°C in a container. How many moles of this gas is present in the container? [Use R=0.08 L atm K^{-1} mol^{-1}] [2]

b) Two reagent bottles A and B containing solutions of potassium chloride and potassium iodide respectively have lost their labelling. Devise a chemical test to identify the solutions. [2]

c) Define heat of solution. [1]

d) Sonam a 13 year old boy was made fun of by his friends for not drinking alcohol. He later joined the friends to please them. Did Sonam make a wise decision? Justify. [2]

e) An experiment was conducted as shown in the figure:



What would happen to the bulbs in set up A and B? Give reasons for your answers. [2]

Question 6

a) Silver nitrate and aluminum chloride react according to the following equation. [2]

$3AgNO_3 + AlCl_3 \longrightarrow 3AgCl + Al(NO_3)_3$

Calculate the amount of silver chloride formed from 200g of alumium chloride.
(Atomic weight of Ag = 108)

b) Although halogens and their compounds can be toxic, some are essential for human consumption and are also used in everyday products. Which halogen is used to manufacture non-stick cooking pans? [1]

c) Two different chemical reactions take place in two separate test-tubes. The effects of the reactions are shown below:

Test Tube	Effect of the reaction
A	Test-tube becomes warm
B	Test-tube becomes cold

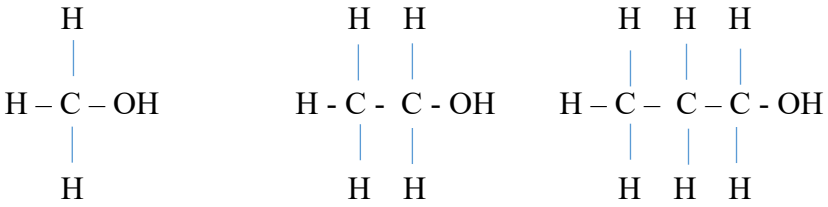
i. Based on the information provided, identify the thermo chemical reaction taking place in the test-tubes A and B. [1]

ii. Give **ONE** difference between the two reactions identified in the question i. [1]

d) Draw a graph to show a reversible reaction of formation and decomposition of ammonium chloride. [2]

$NH_4Cl(s) \leftrightarrow NH_3(g) + HCl(g)$

e) The following are structures of the first three members of a homologous series of alcohols. Based on the given structures, answer the following questions:



I II III

i. Write the general formula of alcohols. [1]

ii. Arrange the three structures in decreasing order of their boiling points. [1]

iii. Write the molecular formula of a compounds having 5 carbon atoms. [1]

Question 7

a) Calculate the following in 14g of nitrogen.

i. Number of moles [1]

ii. Number of molecules [1]

b) Study the thermo chemical equations and answer the following questions.

i. $HCl + NaOH \longrightarrow NaCl + H_2O \quad \Delta H = -13.7$ Kcal

ii. $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O \quad \Delta H = -530.60$ Kcal

1. What is the significance of ΔH value in the reactions? [1]

2. Classify the reactions into types of heat reaction. [1]

c)

i. The qualitative influence of various factors on a system in equilibrium was generalized by Le Chatelier. Based on this context state Le Chatelier's principle. [1]

ii. For a reaction: $H_2(g) + I_2(g) \longrightarrow 2HI(g)$, what is the effect of pressure on the equilibrium state of this reaction at a constant temperature? [1]

d) Calculate the mass of 60 mL of chlorine at STP. [2]

e) ‘With one death in two days, alcohol liver diseases (ALD) continue to be the top killer diseases in the country. In 2005, about 92 deaths were recorded which increased to 176 in 2014’. *– Source: Kuensel; January 6, 2016.*

As a responsible citizen, how would you relate the above statement with social and economic problems? [2]