LONG QUESTION NO. 5

- ✓ What is mass spectrometer? How it is used to determine the relative atomic mass?
- ✓ Write down various steps to calculate the empirical formula of a compound.
- ✓ Explain combustion analysis of an organic compound along with diagram.
- ✓ What is stoichiometry? Give its assumptions? Mention two important laws, which help to perform the stoichiometric calculations?
- ✓ What is a limiting reactant? How does it control the quantity of the product formed?
- ✓ What are the factors which are mostly responsible for the low yield of the products in chemical reactions?
- ✓ Helium gas in a 100 cm^3 container at a pressure of 500 torr is transferred to a container with a volume of 250 cm^3. What will be the new pressure if not change in temperature occurs?
- ✓ A sample of krypton with a volume of 6.25 dm3, a pressure of 765 torr and a temperature of 20 ^oC is expanded to a volume of 9.55 dm3 and a pressure of 375 torr. What will be its final temperature in oC?
- ✓ Working at a vacuum line, a chemist isolated a gas in a weighing bulb with a volume of 255 cm^3, at a temperature of 25^oC and under a pressure in the bulb of 10.0 torr. The gas weighted 12.1 mg. What is the molecular mass of this gas?
- ✓ A sample of nitrogen gas in enclosed in a vessel of volume 380 cm^3 at 120 ^oC and pressure of 101325 Nm^{-2}. This gas is transferred to a 10 dm3 flask and cooled to 27 ^oC. Calculate the pressure in Nm-2 exerted by the gas at 27 ^oC.
- ✓ Helium gas in a 100 cm3 container at a pressure of 500 torr is transferred to a container with a volume of 250 cm^3.What will be the new pressure if its temperature changes from 20^o C to 15^o C?
- ✓ One mole of methane gas is maintained at 300K. Its volume is 250cm^3 calculate the pressure exerted by gas considering that it is behaving as non-ideal. a = 2.253 atm. dm6.mol-2 b = 0.0428 dm3mol-1
- ✓ A sample of krypton gas with a volume of 6.25 dm3, a pressure of 765 torr and temperature of 20 ^oC is expanded to a volume of 9.55 dm3 and a pressure of 375 torr. What will be the new temperature in ^oC?

LONG QUESTION NO. 6

- ✓ Explain hydrogen bonding in NH3, H2O and HF. How is it helpful in explaining the structure of ice?
- ✓ What is boiling point? What is the effect of external pressure on the boiling point? Why the temperature remains constant at boiling point although heat is continuously supplied.
- ✓ What are ionic solids? Give their properties in details.
- ✓ What are liquid crystals? Give their uses in daily life.
- ✓ What are molecular solids? Give their important characteristics?
- ✓ What is vapor pressure of a liquid? Also discuss its measurement by Manometric method and draw diagram.
- ✓ Give Postulates of Kinetic Molecular theory (K.M.T).

- ✓ Define and explain Hess's law and give its applications.
- ✓ State Hess's Law of constant heat summation. Explain it giving two examples.
- ✓ State 1st law of thermodynamics. Prove that $\Delta H=q_v$
- ✓ State 1st law of thermodynamics. How does it explain that $\Delta H=q_p$?
- ✓ Define Enthalpy of reaction. How is it measured by Glass Calorimeter?
- ✓ Explain Bomb Calorimetric method for the measurement of enthalpy of reaction. Also draw diagram.
- ✓ Explain the following terms;
  a. Standard heat of neutralization
  b. standard enthalpy of solution

LONG QUESTION NO. 7

- ✓ Write four defects of Bohr's atomic model.
- ✓ Derive an expression to determine the radius of an orbit using Bohr Model.
- ✓ Describe Millikan's oil drop method for the measurement of charge on electron.
- ✓ Define Quantum numbers. Discuss briefly Azimuthal quantum number.
- ✓ Give properties of neutron in detail (any four).
- ✓ Write down the experiment how neutron was discovered.
- ✓ Describe J.J Thomson's experiment for determining e/m value of electron.

- ✓ Calculate the pH of buffer solution in which 0.11 molar $H_3CCOONa$ and 0.09 molar acetic acid solutions are present Ka for $H_3CCOONa$ is 1.85×10^{-5}.
- ✓ $N_{2(g)}$ and $H_{2(g)}$ combine to give $NH_{3(g)}$. The value of K_c in this reaction at $500C^o$ is 6.0×10^{-2} calculate the value of K_p for this reaction.
- ✓ Benzoic acid, C_6H_5COOH, is a weak mono basic acid ($K_a = 6.4 \times 10^{-5} moldm^{-3}$).What is the pH of a solution containing 7.2 g of sodium benzoate (C_6H_5COONa) in one dm^3 of 0.02 mol dm^{-3} benzoic acid? (Atomic masses Na: 23, C:12)
- ✓ $Ca(OH)_2$ is a sparingly soluble compound. Its solubility product is 6.5×10^{-6}. Calculate the solubility of $Ca(OH)_2$. (Atomic mass: Ca = 40).
- ✓ The solubility of CaF_2 in water at 25^oC is found to be 2.05×10^{-4} mole dm^{-3}. What is the value of K_{sp} at this temperature?

LONG QUESTION NO. 8

- ✓ Write the main postulates of VSEPR theory and explain the structure of Ammonia on the basis of this theory.
- ✓ Explain the structure of ethyne according to hybridization concept.
- ✓ Explain sp^3 hybridization by taking example of Methane (CH_4).
- ✓ What is sp^2 hybridization. Explain the structure of ethene?
- ✓ Explain the molecular orbital structure of following molecules on the basis of MOT. N_2 and O_2

- ✓ Define electrochemical series? Explain its any three applications.
- ✓ How electrochemical series is helpful in the prediction of feasibility of chemical reaction and relative chemical reactivity of metals?
- ✓ Explain the structure and function of voltaic or galvanic cell.
- ✓ How can you measure electrode potential of an element using standard hydrogen electrode (SHE)?

molecule.
- ✓ Define dipole moment. Give its units. How is it used to determine the geometry of molecule? Give an example.
- ✓ Define ionization energy. Write factors affecting. Define factors affecting it and trends in the periodic table.
- ✓ What is standard hydrogen electrode (SHE)? How it is used to measure the electrode potential of Zinc.
- ✓ Describe the electrolysis of molten sodium chloride and a concentrated aqueous solution of sodium chloride.

LONG QUESTION NO. 9

- ✓ Define Solubility curves. Explain continuous and discontinuous solubility curves. 2021,2022
- ✓ Give graphical explanation of boiling point elevation of solution.
- ✓ What are Colligative properties of solutions? Explain elevation of boiling point.
- ✓ State and explain Raoult's law in three forms.
- ✓ State different forms of Raoult's law. How can this law help us to understand the ideality of a solution?
- ✓ What are ideal solutions? Explain the fractional distillation of ideal mixture of two liquids.
- ✓ Differentiate between ideal and non-ideal solutions.
- ✓ Explain the energy of activation.
- ✓ How does Arrhenius equation help us to calculate the energy of activation of a reaction?
- ✓ Define half life period. Describe half life method for the determination of order of reaction.
- ✓ Define order of reaction and explain 2nd order and zero order reactions.
- ✓ Define Order of reaction. Describe it with three examples.
- ✓ Write a brief note on the following:
- ✓ Homogeneous catalysis
- ✓ Heterogeneous catalysis
- ✓ What are enzymes? Write any four characteristics of enzyme catalysis.