ote: Section I is compulsory. Attempt any THREE (3) questions from Section II.

(SECTION – I)

. Write short answers to any EIGHT questions. **(2 x 8 = 16)**

i - What is gram formula? Give example.
ii - Define stoichiometry, write down its two laws.
iii - How limiting reactant is identified?
iv - What is distribution law?
v - What is mobile phase and stationary phase?
vi - What is physical meaning of value of R?
vii - What is Avogadro's law? Give example.
viii - Where plasma is found?
ix - How pressure of dry gas is calculated?
x - Define solubility curve, give its types.
xi - Give two differences between ideal and non-ideal solutions.
xii - What is fractional crystallization?

3. Write short answers to any EIGHT questions. **(2 x 8 = 16)**

i - Explain cleavage plane is anisotropic property.
ii - Amorphous solids like glass are also called super cooled liquids. Explain.
iii - Define isomorphism by giving one example.
iv - Explain why HF is weak acid than HI?
v - Define Zeeman effect and stark effect.
vi - State Heisenberg's uncertainty principle, write down its mathematical form.
vii - What is spin quantum number? Give its significance.
viii - What is difference between orbit and orbital?
ix - Write down equilibrium constant expression for the reaction:

$$PC\ell_{5\,(g)} \rightleftharpoons PC\ell_{3\,(g)} + C\ell_{2\,(g)}$$

x - Calculate pH of 0.001 M $HC\ell$ solution.
xi - Explain the radioactive decay is 1st order reaction.
xii - Justify the statement "the unit of rate constant of a second order reaction is $dm^3\,mole^{-1}\,s^{-1}$ but the unit of rate of reaction is mole $dm^{-3}\,s^{-1}$."

4. Write short answers to any SIX questions. **(2 x 6 = 12)**

i - Name the four factors affecting ionization energies.
ii - Why ionization energy decreases down the group inspite of the increase in proton number?
iii - Why second ionization energy is higher than first ionization energy?
iv - Define electron affinity with an example.
v - Define first law of thermodynamics.
vi - Define heat and work.
vii - Calculate oxidation state of chromium in dichromate ion.
viii - What is the use of salt bridge in voltaic cell?
ix - Why voltaic cell is a reversible cell?

(SECTION – II)

5. (a) Calculate the gram atoms (moles) in (4)

   (i) 0.1 g of sodium (ii) 0.1 kg of silicon

   (b) Explain the following properties of crystalline solids. Give two examples in each case: (4)

   (i) Isomorphism (ii) Transition Temperature

6. (a) Derive an equation to find out the partial pressure of a gas knowing the individual moles of component gases and the total pressure of the mixture. (4)

   (b) Give the postulates of Bohr's atomic model. Which postulate tells us that orbits are stationary and energy is quantized? (4)

7. (a) Define electron affinity. Name the factors affecting on it. How does it vary in the periodic table. (4)

   (b) State first law of thermodynamics. Write down its mathematical expression. Prove that $\Delta H = q_p$ (4)

8. (a) What is the percentage ionization of acetic acid in a solution in which 0.1 mol of it has been dissolved per dm^3 of the solution. ($Ka = 1.85 \times 10^{-5}$) (4)

   (b) Explain half life method and large excess method to find the order of reaction. (4)

9. (a) Freezing points of solutions are depressed when non-volatile solutes are present in volatile solvents. Justify it. Plot a graph to elaborate your answer. (4)

   (b) Write down the various rules for assigning oxidation number. (4)