

Bachelor of Science (B.Sc.) (Part – I) Second Semester Old
2SChe-T2 – Chemistry Paper – II (Physical Chemistry)

P. Pages : 2

Time : Three Hours



GUG/W/18/1233

Max. Marks : 50

- Notes : 1. All **five** questions are compulsory and carry equal marks.
2. Draw diagrams and give equations wherever necessary.

1. a) Calculate using log table : $\frac{0.0518 \times (4.68)^2}{0.0055 \times 1.23 \times (23)^{1/2}}$. 5

- b) Discuss Bohr – Wheeler theory of nuclear fission. Explain any two medicinal applications of radioisotopes. 5

OR

- c) Find the equation of line passing through the points P(1, -1) and Q(6, 6) write slope and y – intercept of this line. 2½

- d) The collision frequency of a gas is $3.222 \times 10^{32} \text{ cm}^{-3} / \text{hour}$. Convert it into SI unit. 2½

- e) Explain shell model of nucleus. 2½

- f) Define mass defect and binding energy of nucleus. Calculate B.E. per nucleon for $^{39}_{27}\text{Co}$, if its mass defect is 0.5358 amu. 2½

2. a) What are the postulates of kinetic theory of gases? State and deduce Avogadro's Law from the kinetic gas equation. 5

- b) Starting with Van der Waals equation of state, derive reduced equation of state. Write its significance. State the law of corresponding states. 5

OR

- c) Critical temperature and critical density of CO_2 gas are 304 K and 0.45 g cm^{-3} respectively. Calculate Van der Waals constants for the gas. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) 2½

- d) Explain the deviations of real gases from ideal behaviours. 2½

- e) Define mean free path. Explain its variation with pressure and temperature. 2½

- f) Calculate RMS velocity of hydrogen gas at N.T.P. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) 2½

3. a) Discuss the structural difference between solid, liquid and gaseous state? Explain kinetic molecular theory for liquids. 5

- b) Define surface tension. Describe drop number method for the determination of surface tension. 5

OR

- c) Define liquid crystals. Discuss nematic liquid crystal. 2½
- d) Explain seven segment cell and role of liquid crystals in it. 2½
- e) Define : 2½
 i) Relative Viscosity and
 ii) Intrinsic Viscosity
 Explain the effect of temperature on viscosity.
- f) What is refractive index? Calculate the molar refraction of carbon tetrachloride if its density is 1.595 gcm^{-3} and refractive index for D – line of sodium is 1.4573 (mol.wt of $\text{CCl}_4 = 154$.) 2½
4. a) What is second order reaction? Derive integrated rate expression for rate constant of second order reaction when initial concentrations of reactants are same. 5
- b) Define Catalysis. Explain homogeneous and heterogeneous catalysis with suitable examples. Give the characteristics of catalyst. 5
- OR**
- c) Describe half life period method for the determination of order of reaction. 2½
- d) For a reaction $A \rightarrow B$, the rate constants are $1.11 \text{ mol}^{-1} \text{ s}$ at 550°C and $6.41 \text{ mol}^{-1} \text{ s}$ at 625°C . Calculate the energy of activation for this reaction. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) 2½
- e) Discuss Transition state theory of reaction rates? 2½
- f) Derive Eyring equation for rate constant. 2½
5. Attempt **any ten**. 10
- i) Differentiate $2x^3 - 8x^2 + 12x - 10$ w.r.t. x .
- ii) Define permutation and find 6P_4
- iii) Give any two limitations of liquid drop model.
- iv) Write an expression for Maxwell's distribution law of molecular velocities.
- v) Define collision number and collision diameter.
- vi) What is compressibility factor?
- vii) Draw well labelled diagram of Ostwald Viscometer.
- viii) Define Thermography.
- ix) What is Parachor value?
- x) Define steric effect.
- xi) Explain autocatalysis with suitable example.
- xii) What is pseudo – unimolecular reaction give one example?
