

Sr. No 322101

December 2023

B.Sc. (Chemistry) B.Sc. - I SEMESTER

Physical Chemistry-I (BCHT-DS-101)

Time: 3 Hours

Max. Marks: 75

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
  2. Answer any four questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

**PART -A**

- Q1 (a) How does viscosity vary with temperature? (1.5)
- (b) Calculate the translational kinetic energy of 3 moles of an ideal gas at 300K. (1.5)
- (c) Calculate the vibrational and rotational degree of freedom for  $C_2H_4$ . (1.5)
- (d) Explain diagrammatically how the molecular velocities changes with increase in temperature. (1.5)
- (e) Define Guldberg's rule and Troton's rule. (1.5)
- (f) Define Bravais lattices. How many Bravais lattices present in orthorhombic crystal. (1.5)
- (g) Calculate the hydrogen ion concentration in mole per litre of solution whose pH is 6.4. (1.5)
- (h) Calculate the solubility in gram per litre of  $Al(OH)_3$  in water at 25 °C if  $K_{sp}=8.5 \times 10^{-32}$ . (1.5)
- (i) Crystal plane cut through the crystal area at (3a, 2b, c) and (a, 2b, c). What are their Miller indices? (1.5)
- (j) Both NaCl and KCl have similar structure, yet their X-ray diffraction pattern are different, Explain. (1.5)

**PART -B**

- Q2 (a) Derive the relation between mean free path and coefficient of viscosity of gas. Explain the effect of temperature and pressure on coefficient of viscosity of gas. (10)
- (b) What is boyle temperature? Using van der Waals equation, derive the expression for Boyle temperature in terms of van der Waals constants. (5)
- Q3 (a) Explain the 'term viscosity' and 'coefficient of viscosity'. Discuss at least one method for measurement of viscosity of liquid. (5)
- (b) Define buffer capacity and buffer range. Derive the expression for pH of acidic buffer and basic buffer using Henderson-Hasselbalch equation. (10)
- Q4 Derive Bragg's equation for X-ray diffraction by crystal. Write down significances and applications of Bragg's equation. (15)

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