

5/H-23 (vi) (a) (Syllabus-2015)

2019

(October)

CHEMISTRY

(Honours)

(Chem-H-502)

(Part-A : Physical)

Marks : 37

Time : 2 hours

The figures in the margin indicate full marks for the questions

1. (a) Discuss Maxwell's distribution of molecular kinetic energies. What is the effect of temperature on distribution of kinetic energies? 4
- (b) Explain the following : $1\frac{1}{2} \times 2 = 3$
- (i) Viscosity of gases
- (ii) Limiting density
- (c) Calculate the various degrees of freedom of the following molecules : 2
- H_2O and CO_2

(Turn Over)

(2)

OR

2. (a) Discuss the principle of equipartition of energy. 4
- (b) Derive relationships between most probable velocity, average velocity and root mean square velocity. 3
- (c) Calculate the reduced pressure and reduced volume of one mole of methane gas confined to a volume of 5 dm^3 under a pressure of 5 atm. The critical constants of methane are $V_c = 0.0988 \text{ dm}^3 \text{ mol}^{-1}$, $P_c = 54.6 \text{ atm}$. 2
3. (a) What is surface tension of a liquid? Describe the method for determination of surface tension by Capillary Rise Method. 1+3=4
- (b) Calculate the molar refraction of acetic acid at a temperature at which its density is 1.046 g cm^3 . The observed value of refractive index at this temperature is 1.3715. 2

OR

4. (a) Derive Clausius-Mosotti equation for non-polar molecules. 4
- (b) The bond length of H—I is 1.60 \AA and its dipole moment is 0.38 D. Calculate the percentage ionic character of the H—I bond. 2

(3)

5. (a) Derive Bragg's equation for X-ray diffraction of a crystal. 3
- (b) What is law of symmetry in a crystal? Define plane and axis of symmetry in a simple cube. 1+2=3

OR

6. (a) What are Bravais lattices? How do you calculate the number of atoms per unit cell in a cubic crystal system? 1+3=4
- (b) The second order reflection of X-rays from (100) planes of NaCl occurs at 29.3° . If the wavelength used is 1.54 \AA , calculate the distance between two successive (100) planes in NaCl. 2
7. (a) Derive phase rule equation from the concept of chemical potential. 4
- (b) Explain the following : 1½×2=3
- (i) Thermodynamic scale of temperature
- (ii) Concept of residual entropy

OR

8. (a) Derive Gibbs-Duhem equation for a mixture consisting of i number of components. 4
- (b) Explain how the absolute entropy of a substance is determined with the help of the third law of thermodynamics. 3

(Turn Over)

(4)

9. (a) Derive Michaelis-Menten equation for an enzyme-catalyzed reaction. 5
(b) Discuss the 'collision theory' for the kinetics of bimolecular reactions. 4

OR

10. (a) Obtain the rate expression for an opposing reaction in which the forward as well as reverse reactions are both first order. 5
(b) Write notes on : $2 \times 2 = 4$
(i) Homogeneous catalysis
(ii) Steady-state approximation

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