

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

2017

(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) Explain Maxwell's law of distribution of molecular velocities. What is the effect of temperature on distribution of molecular velocities? 4
- (b) State the law of corresponding states and derive the reduced equation of state. 3
- (c) Calculate the root-mean-square velocity of oxygen molecule at 27 °C.
(Given : $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) 2

(2)

OR

2. (a) Discuss the principle of equipartition of energy. 3
- (b) What is— 3
- (i) collision diameter;
- (ii) collision frequency? 3
- (c) Estimate the critical temperature of *n*-hexane if its boiling point is 68.9 °C. 2
- (d) What is Boyle temperature? 1
3. (a) Define surface tension of a liquid. Describe the capillary rise method for determining surface tension of a liquid. 4
- (b) The parachors of ethane and propane are 110.5 and 150.8 respectively. What value of parachor is expected for hexane? 2

OR

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

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(Continued)

(3)

5. (a) Derive Bragg's equation for X-ray diffraction by crystals. 3
- (b) Define the following elements of symmetry : 3
- (i) Plane of symmetry
- (ii) Axis of symmetry
- (iii) Centre of symmetry

OR

6. (a) Explain Frenkel defect and Schottky defect. 3
- (b) Calculate the angle at which first-order reflection will occur in an X-ray spectrometer, when X-rays of wavelength 1.50 Å are diffracted by the atoms of a crystal. Given that the interplanar distance is 4.04 Å. 3
7. (a) Define chemical potential. How does chemical potential vary with pressure and temperature? 4
- (b) Derive Gibbs-Duhem equation for a mixture consisting of *i* number of components. 3

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(Turn Over)

OR

8. (a) Explain Nernst heat theorem. How does it lead to the enunciation of the third law of thermodynamics? 4
- (b) What do you understand by partial molar quantities? Write the general expression for partial molar quantities of a component i in a mixture. 3
9. (a) Derive Michaelis-Menten equation for an enzyme-catalyzed reaction. 4½
- (b) Discuss the transition state theory of bimolecular reactions. 4½

OR

10. (a) Write a short note on 'acid-base catalysis' and obtain an expression for rate constant for such reactions. 5
- (b) Write notes on : 2+2=4
- (i) Consecutive reactions
- (ii) Chain reactions
