

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2011

Fifth Semester

Core Course—STATES OF MATTER

(Common for B.Sc. Chemistry Model I and Model II B.Sc. Petrochemicals and B.Sc. Chemistry Environment and Water Management)

Time : Three Hours

Maximum Weight : 25

Section A

*Answer all questions.**A bunch of four questions carries a weight of 1.*

I 1. Which has the maximum viscosity ?

- (a) Water. (b) Glycol.
(c) Glycerol. (d) Acetone.

2. A liquid rises in the capillary tube is due to :

- (a) Surface Tension. (b) Viscosity.
(c) Osmosis. (d) Effusion.

3. A defect in which equal number of cation and anion vacancies are present is known as :

- (a) Frenkel defect. (b) Schottky defect.
(c) Metal excess defect. (d) Metal deficient defect.

4. BF_3 molecule belongs to the Point Group :

- (a) C_{3v} . (b) C_{3h} .
(c) D_{3d} . (d) D_{3h} .

II. Fill in the blanks :

5. Mathematical expression of Bragg's law is _____.
6. In packing of spheres, there are number of vacant spaces known as _____.
7. The term _____ implies the presence of excess of concentration of any particular component on the surface of liquid or solid as compared to that in the bulk.
8. Mathematical expression of RMS velocity is _____.

III. Question 9–12 (In this bunch of four questions, two statements are given former, an assertion which is Labelled as A and the latter a reason statement, labelled as R. Going through the following instruments mark the correct choice .

- (a) If A and R are correct and if R is the correct reason for A.
(b) If A and R are correct and if R is not the correct reason for A.
(c) If A is correct, R is not the correct.
(d) If A is not correct R is correct.
(e) If A and R are not correct.

Turn over

9. Assertion A : For H_2 and He compressibility factor Z is always greater than one.
Reason R : This means that gases are more compressible than expected from ideal behaviour.
10. A : The kinetic theory assumes that the molecules of a gas have no mutual repulsion.
R : This is not correct because gases liquefy at very low temperatures and high pressures.
11. A : Frenkel defects arise from the shifting of ions from their own lattice site to interstitial positions between lattice point.
R : Their presence causes a decrease in the overall density.
12. A : Liquid crystals find wide use in LCDS.
R : Due to the strongly anisotropic optical properties of certain nematic liquid crystals.
- IV. 13 – 16 State whether true or false :
- 13 The average distance covered by a molecule between two successive collision is called collision frequency.
- 14 For H_2 and He compressibility factor Z is always greater than one.
- 15 All linear molecules have C_∞ axis.
- 16 Germanium is a Intrinsic semiconductor.

(4 × 1 = 4)

Section B

Answer any five questions.

Each question carries a weight of 1.

- 17 Why are liquid drops spherical ? Explain.
- 18 Define coefficient of viscosity. How does it vary with temperature ?
- 19 Distinguish between Critical temperature and Boyle temperature.
- 20 Write BET equation and explain the terms in it.
- 21 Explain proper and improper axes of symmetry.
- 22 Calculate the effective number of particles associated with a unit cell of face centred cubic lattice and body centred cubic lattice.
- 23 Calculate the mean free path of methane gas at 27°C and low pressure. If the collision diameter of methane is $3.40 \times 10^{-10} \text{ m}$.
24. Express the Poiseuille's law applied in the viscosity measurement of liquid by Oswald method.

(5 × 1 = 5)

Section C

Answer any four questions.

Each question carries a weight of 2.

25. Identify symmetry elements present in H_2O and BF_3 molecule and assign their Point Groups. Illustrate two properties of a mathematical Group.

26. How is van der Waals, equation applied to the critical state. Give expression for the critical constants of a gas.
27. What are semiconductors ? Discuss on n and p type semiconductors.
28. What are liquid crystals ? Discuss briefly on the structure of different liquid crystals.
29. Distinguish between Cubic and Hexagonal close packing in three dimensions in detail.
30. Write Maxwell's equation for distribution of molecular velocities. Deduce equations for average velocity, most probable velocity and RMS velocity using the equation.

(4 × 2 = 8)

Section D

Answer any two questions.

Each question carries a weight of 4.

31. Derive vander Waals equation for n moles of a gas. Deduce vander Waals equation in virial form and How can this be used to determine the Boyle temperature.
32. Briefly discuss the postulates of Langmuir adsorption theory and derive Langmuir adsorption equation. What are the limitations of the above isotherm ?
33. Write Briefly on different types of point defects in crystals.

(2 × 4 = 8)