

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2013**Fifth Semester****Core Course—STATES OF MATTER**

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

Time : Three Hours

Maximum Weight : 25

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

- I. 1. The numerical value of Avogadro's number is :
(a) $6 \times 10^{22} \text{ mol}^{-1}$. (b) $6.02 \times 10^{23} \text{ mol}^{-1}$.
(c) $6.02 \times 10^{22} \text{ mol}^{-1}$. (d) $6.02 \times 10^{25} \text{ mol}^{-1}$.
2. The molecules at the surface possess ————— energy than those in the bulk.
(a) Equal. (b) Greater.
(c) Lower. (d) None of these.
3. $\text{CH}_2 = \text{CH}_2$ molecule belongs to the point group.
(a) C_{3v} . (b) C_{3h} .
(c) D_{2h} . (d) D_{3h} .
4. Cesium chloride exhibits the defects :
(a) Frankel defect. (b) Schottky defect.
(c) Metal excess defect. (d) None of these.
- II. 5. Freundlich adsorption isotherm $a = \text{—————}$.
6. Liquid showing different physical properties in different direction is called —————.
7. The reciprocal of viscosity is called —————.
8. Van der Waals' equation for n molecule of gas 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 on R. Going through the following instruction 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: At constant temperature, the mean kinetic energy per molecule of any gas remains constant. Reason R: Mean Kinetics energy is proportional to absolute temperate.
10. A: The viscosity of a liquid generally decreases with rise in temperature.
R: The coefficient of viscosity falls appreciatly with rise in temperature.
11. A: Frenkel defect appears generally in compounds in which the negative ions are larger than the positive ion.
R: The radius ratio is high.
12. A: The smetic liquid crystals do not flow as normal liquids.
R: Smetic liquid crystals is non-Newtonian.

IV. 13-16 state whether true or false :

13. The turbidity of the liquid crystal is due to the scattering of light.
14. Arsenic doped germanium exhibits *p*-type semiconduction.
15. About S_3 axis, there can be only one genuine improper rotation operation possible.
16. The total energy of vibration per molecule per vibrational degree of freedom is $\frac{1}{2} kT$.

(4 × 1 = 4)

Section B

*Answer any five questions.
Each question carries a weight of 1.*

17. Write down the kinetic gas equation. Explain the symbols.
18. Define mean freepath.
19. What is meant by Boyle temperature ?
20. What is effect of temperature on the viscosity of a liquid ?
21. Define improper axis of rotation.
22. What is meant by space lattice ?
23. How are liquid crystals classified ? What are they ?
24. What is BET theory of adsorption ?

(5 × 1 = 5)

Section C

*Answer any four questions.
Each question carries a weight of 2.*

25. What is the principle of equipartition of energy ? Explain how this principle helps in estimating the energy of different types of molecules.
26. Express the Maxwell law of distribution of molecular velocity and draw the major conclusions.
27. Explain the term viscosity. How it determined ?

28. What are semi-conductors ? Discuss on n and p type semi-conductors.
29. Represent diagrammatically the unit cells for :
- (a) Simple cubic lattice. (b) Face centred cubic lattice.
- (c) Body centred cubic lattice.
30. Explain the term : Adsorption. Discuss the various factors which affect the adsorption of a gas on a solid adsorbent.

(4 × 2 = 8)

Section D

*Answer any two questions.
Each question carries a weight of 4.*

31. Define critical constants. Explain their significance and how are they determined.
32. Write briefly on different types of point defects in crystals.
33. What are miller indices and Bravais lattices ? Sketch the planes in a cube having the miller indices :
- (a) 0 1 0. (b) 3 1 2. (c) 1 1 1.

(2 × 4 = 8)