

**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2014****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**

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

1. The rate of diffusion of a gas is inversely proportional to :  
(a) Volume. (b) Mass.  
(c) Square root of the density. (d) Thickness of the container.
2. A sphere has \_\_\_\_\_ surface area for a given volume.  
(a) Maximum. (b) Minimum.  
(c) Zero. (d) None of these.
3.  $\text{PF}_5$  molecule belongs to the point group :  
(a)  $C_3V$ . (b)  $C_3h$ .  
(c)  $D_2h$ . (d)  $D_3h$ .
4. Schottky defect is due to :  
(a) Ions in interstitial positions. (b) Missing of ions.  
(c) Metal excess. (d) Metal deficiency.

II. Fill in the blanks :

5. The curve showing the effect of temperature in the extent of a adsorption at a given pressure is called an \_\_\_\_\_.
6. Liquid showing same properties in all directions is called \_\_\_\_\_.
7. Viscosity implies \_\_\_\_\_.
8. At the inversion temperature, there is no \_\_\_\_\_ effect.

**Turn over**

III. Questions 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 E. Going through the following instructions, mark the correct choice) :

- (a) If A and E are correct and if R is the correct reason for A.
  - (b) If A and E are correct and if R is not the correct reason for A.
  - (c) If A is correct, R is not correct.
  - (d) If A is not correct, R is correct.
  - (e) If A and R are not correct.
9. Assertion A : Molecular velocities increase with rise in temperature.  
Reason R : Kinetic energy varies as square of velocity.
10. A : The viscosity of a liquid increases with increase in pressure.  
R : This is due to decrease of number of 'holes'.
11. A : Schottky defect appears generally in ionic compounds.  
R :  $\frac{r_+}{r_-}$  is far below unity.
12. A : Liquid crystals find wide use in LCDs.  
R : Due to the strong anisotropic optical properties of certain nematic liquid crystal.

IV. (13–16) State whether True or False :

- 13. Most of the industrial lubricants exist in the mesomorphic state.
- 14. Substance permitting movement of positive 'hole' is called *n*-type semiconductors.
- 15. For H<sub>2</sub> and He compressibility factors *z* is always greater than one.
- 16. Decrease of temperature and increase of pressure both tend to decrease adsorption.

(4 × 1 = 4)

### Section B

Answer any **five** questions.

Each question carries a weight of 1.

- 17. Give the expression for root mean square velocity. Explain the symbols.
- 18. Define Collision diameter.
- 19. What is meant by Joule-Thomson effect?
- 20. What happens when oil is added to turbulent sea? Why?
- 21. Define Symmetry operation.



22. Distinguish between Anisotropy and Isotropy.
23. What are cholesteric liquid crystals? Give one example.
24. Name two factors which influence adsorptions.

(5 × 1 = 5)

### Section C

*Answer any four questions.*

*Each question carries a weight of 2.*

25. What do you understand by continuity of state? Explain with the help of isotherm of carbon dioxide.
26. How is Van der Waal's equation applied to the critical state? Give expression for the critical constants of a gas.
27. Explain the terms : Surface tension and Surface energy. How are they related to each other?
28. Write short note about super conductivity.
29. Distinguish between cubic and hexagonal close packing in three dimension in detail.
30. State and explain BET equation for multilayer adsorption.

(4 × 2 = 8)

### Section D

*Answer any two questions.*

*Each question carries a weight of 4.*

31. Derive the Van der Waal's equation of state and explain the application of it for real gas behaviour.
32. What are semiconductors? Explain what is *n*-type and *p*-type semiconductor. What is the effect of temperature on semiconductors?
33. Derive Langmuir adsorption equation. What are the postulates of Langmuir theory? Give the limitations of the isotherm.

(2 × 4 = 8)