

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2012**Fifth Semester****Core Course—STATES OF MATTER**

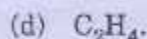
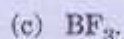
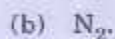
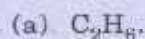
(Common for B.Sc. Chemistry Model I and Model II, B.Sc. Petrochemicals and B.Sc. Chemistry Environment and Water Management)

Time : Three Hours

Maximum Weight : 25

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

I. 1. Which among the following molecules does not have a centre of symmetry :



2. Doping silicon with Arsenic gives rise to :

(a) *n*-type conductor.(b) *p*-type conductor.

(c) Intrinsic conductor.

(d) None of the above types.

3. With increase in temperature the Physisorption of a gas on the surface of a solid :

(a) Increases.

(b) Decreases.

(c) Either increase or decrease depending on the nature of the gas or the solid.

(d) Not affected.

4. Coefficient of viscosity is related to pressure as :

(a) Directly proportional to pressure.

(b) Inversely proportional pressure.

(c) Not depended on pressure.

(d) Proportional to pressure only at high temperature.

II. Fill in the blanks :

5. The NaCl unit cell consists of an interpenetration of the _____ cubic lattices of the Na^+ ions and Cl^- ions.

6. The substance getting adsorbed is called _____.

7. The critical temperature of a substance is the temperature above which _____.

8. A graph between the extent of adsorption and pressure at constant temperature is called _____.

Turn over

III. Questions 9 – 12 (Two statements are given, former, an assertion (A) and the latter, a reason statement (R), mark the correct choice)

- (a) If A and R are correct and R is the correct reason for A.
- (b) If A and B 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. A In an insulator, the valence band is completely filled and energetically separated from the conduction band by large band gap R. Thermal conduction of electrons into the conduction band is not possible.
10. A : Nematic liquid crystals appear opaque.
B : They scatter light strongly.
11. A : Silicon and Germanium are Intrinsic semi conductor.
B : Pure materials have semiconducting properties.
12. A : Schotky defects arise due to missing of atoms.
R : They do not affect stoichiometry of the crystal.

IV. State whether True or False :

13. For real gases compressibility factor is always greater than one.
14. In Nomatic liquid crystals there is orientational order neither is there any positional order nor are the molecules arranged in layers.
15. A Group in which all elements commute with each other is called Abelian Group.
16. The total energy of vibrations 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. What is a Point Group ? To which point group does the XeF_4 molecule belong ?
18. What does schoenflies symbol denotes ?
19. Define mean free path. How is it related to coefficient of viscosity ?
20. Explain the term surface energy.
21. Define miller Indices sketch the (222) plane in a unit cell.
22. Calculate the average velocity of Helium gas at 25°C.
23. What are the symmetry elements present in CHCl_3 ?
24. State and explain the law of equipartition of energy.

(5 × 1 = 5)

Section C

Answer any **four** questions

Each question carries a weight of 2.

25. Differentiate between hexagonal close packing and cubic close packing in detail.
26. What are liquid crystals? How are they classified explain. Give one uses of each.
27. Define critical constants. Explain one method for the liquefaction of gases.
28. Derive Bragg's equation.
29. Calculate the mean free path of methane gas at 27°C and later pressure if the collision diameter of methane is $3.40 \times 10^{-10}\text{m}$.
30. Write briefly on *n* and *p* type semiconductors. What is an *n-p*-junction?

(4 × 2 = 8)

Section D

Answer any **two** questions.

Each question carries a weight of 4.

31. How can the crystal structure of NaCl deduced from X-ray diffraction studies. Discuss the powder diffraction pattern of NaCl and correlate with its crystal structures.
32. How and why do real gases deviated from ideal behaviour. How are these derivations accounted for in van der waals equation. Deduce vander waals equation in Virial form.
33. Derive Langmuir adsorption isotherm. How can BET equations used for the determination of surface area. Explain.

(2 × 4 = 8)