

B.Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER/NOVEMBER 2018**SEMESTER – 5: CHEMISTRY (CORE COURSE)****COURSE: U5CRCHE7: STATES OF MATTER***(For Supplementary - 2014 admission)*

Time: Three Hours

Max. Marks: 60

SECTION A*Answer all questions. Each question carries 1 mark*

1. The Shoenflies symbol for rotation axis is
2. Give the relationship between co-efficient of viscosity and mean free path.
3. Find the most probable velocity of gas molecules when their root mean square velocity is 5×10^4 cm/s.
4. The law explaining the distribution of gas in a column extending upward.
5. Give the co-ordination number of cation in the ionic crystal, AX when the limiting radius ratio, $\left(\frac{r_{A+}}{r_{X-}}\right)$ is 0.225
6. What is meant by chemisorption?
7. The instrument used to measure surface tension
8. How many formula mass of NaCl present in a unit cell of NaCl. (1 x 8 = 8)

SECTION B*Answer any Six questions. Each question carries 2 marks*

9. Define law of constancy of interfacial angle. Name the instrument used to measure the interfacial angle.
10. Identify the symmetry elements and predict the point group of NH₃ molecule.
11. Calculate the separation of (1 2 3) planes in orthorhombic crystal with unit cell dimension a = 0.1 nm, b = 0.2 nm, c = 0.3 nm.
12. Comment on the statement "The fact that molecules attract one another cause a gas to deviate from ideal behavior".
13. What is the mean free path of hydrogen gas at 25°C and a pressure of 1 atm. Given $d = 2.86 \text{ \AA}$, collision cross section of the molecules, $\sigma = \pi d^2$, 1 atm = $1.01325 \times 10^5 \text{ N/m}^2$, k , Boltzmann constant = $1.3806 \times 10^{-23} \text{ J/K}$.
14. Give a short note on Cholestric liquid crystals.
15. State BET theory of adsorption. Which parameter is obtained from BET equation to find the surface area of the adsorbent
16. Why does ZnO appear yellow on heating?

(2 x 6 = 12)

SECTION C

Answer any Four questions. Each question carries 5 marks

17. Copper crystallize in cubic close packing with unit cell edge, $a=3.6 \text{ \AA}$. Calculate the density of copper metal. (Atomic Weight of Cu=63.5 amu)
18. Differentiate between n -type and p -type semiconductors.
19. What are stoichiometric defects. How it affects the nature of crystal.
20. Differentiate zinc blende and wurtzite structure of zinc sulphide.
21. Write short note on Maxwell distribution of velocity.
22. Briefly discuss the factors that influence the adsorption of a gas on solid surface.

(5 x 4 = 20)

SECTION D

Answer any Two questions. Each question carries 10 marks

23. a) What are liquid crystals. Explain the different types of liquid crystals. (5)
b) Define superconductivity and give an example for superconducting material. Describe the challenges and later developments in superconducting material research. (5)
24. a) What is meant by equation of state? What is compressibility factor, Z and how it relates to molecular interactions. What is meant virial equation of state. Write the equation upto third virial coefficients. (7)
b) The molar volume of a perfect gas at 500 K and 100 bar is $V_m^0 = 0.416 \text{ dm}^3 \text{ mol}^{-1}$. The molar volume of CO_2 under the same conditions is $V_m = 0.366 \text{ dm}^3 \text{ mol}^{-1}$. Calculate the compressibility factor at 500K and comment on the type of molecular interactions. (3)
25. Derive Bragg's equation. Explain experimental methods of crystal structure analysis using Bragg method and powder method.
26. Derive the Langmuir adsorption isotherm and also mention how the BET equation is handy in the determination of surface area of adsorbents.

(10 x 2 = 20)
