

Reg. No .....

Name .....

23U640

**B. Sc. DEGREE END SEMESTER EXAMINATION : MARCH 2023**

**SEMESTER 6 : CHEMISTRY**

**COURSE : 19U6RCHE11: PHYSICAL CHEMISTRY – III**

*(For Regular - 2020 Admission and Supplementary - 2019 Admission)*

Time : Three Hours

Max. Marks: 60

**PART A**

**Answer All (1 mark each)**

1. What is the rotational energy contribution to the total energy of a carbon dioxide molecule?
2. How collision frequency of a gas at a given T and P changes on increasing collision diameter?
3. The SI unit of surface energy is -----.
4. Give the number of  $C_2$  axis perpendicular to the principal axis for ammonia.
5. The inverse of  $\sigma$  is -----.
6. What are Miller indices?
7. Write two examples for AX type ionic compounds?
8. What happens to the rate of adsorption of carbon dioxide on charcoal as the temperature increases?

**PART B**

**(1 x 8 = 8)**

**Answer any 6 (2 marks each)**

9. At What temperature would the average velocity of methane molecules be the same as the RMS velocity of ethane molecules at 127 °C.
10. Obtain a relationship between Boyle temperature and critical temperature.
11. How will viscosity of a liquid vary with temperature?
12. What is improper axis?
13. What is meant by crystal lattice or lattice points?
14. Explain the law of constancy of interfacial angles.
15. Why is physical adsorption multimolecular and chemical adsorption unimolecular?
16. Write the Freundlich adsorption isotherm and explain the terms.

**(2 x 6 = 12)**

**PART C**

**Answer any 4 (5 marks each)**

17. Explain the features of a compressibility factor vs pressure diagram for a gas at different temperatures.
18. State law of equipartition of energy and apply it to obtain the expressions for total energy per mole for a non-linear molecule.
19. Write a note on Parachor.
20. Give the point group of ethylene. Describe and represent each of the symmetry elements present in Ethylene.
21. Explain the characteristic features of nematic and cholesteric phases of liquid crystals.
22. Discuss the features of cubic crystals with examples.

**(5 x 4 = 20)**

**PART D**

**Answer any 2 (10 marks each)**

23. a) Express the virial equation of state for gases.  
b) Convert van der Waal's equation of state in virial form and obtain an expression for Boyle temperature of a gas.
24. a) Write a short note on surface tension and explain its variation with temperature.  
b) Give some effects of surface tension in daily life.  
c) Explain why surface tension of water (73 dynes/cm) is higher than that of ethyl alcohol (22 dynes/cm) at 30 °C.
25. Derive Bragg's equation. Calculate the  $d_{100}$ :  $d_{110}$ :  $d_{111}$  values of FCC structure.
26. Write a note on Langmuir and BET adsorption isotherms.

**(10 x 2 = 20)**