Reg. No……. Name……..

BA, B SC, B COM DEGREE END SEMESTER EXAMINATION - OCTOBER 2025

UGP (HONS.) SEMESTER - 3: DISCIPLINE SPECIFIC COURSE

COURSE: 24UCHEDSC203: PHYSICAL CHEMISTRY-I

(For Regular 2024 Admission)

Time: 2 Hours Max. Marks: 70

PART A

Answer all questions. Each question carries 1 mark

1. Write the expression for most probable velocity. (U, CO 1)
2. What is mean free path? (R, CO 1)
3. Define critical temperature. (R, CO 1)
4. Why do gases deviate from ideality more at low temperature? (A, CO 1)
5. Why is density of crystals affected more by Schottky defect than Frenkel defect? (A, CO 2)
6. Define Bravais lattices. (R, CO 2)
7. What is an intrinsic semiconductor? (U, CO 2)
8. What are nematic liquid crystals? (R, CO 2)
9. Mention any one difference between elastic and non-elastic gels. (U, CO 3)
10. Define improper axis of symmetry. (U, CO 4)

(1 x 10 = 10)

PART B

Answer any Five questions. Each question carries 3 marks

11. Calculate the most probable, average, and RMS velocities of N_2 at 300 K. (A, CO 1)
12. The Weiss indices of a lattice plane are 3,2 and 1. Calculate its Miller indices. (A, CO 2)
13. Differentiate between physisorption and chemisorption. (U, CO 3)
14. Explain how Hardy–Schulze rule applies to coagulation order of Al^{3+}, Ca^{2+}, and Na^{+}. (A, CO 3)
15. Explain any one method for the purification of colloids. (U, CO 3)
16. Assign the point group for benzene molecule and list its symmetry elements. (A, CO 4)
17. Define Abelian Group. Give an example. (U, CO 4)
18. What is the order of a group? Illustrate with C_2v point group. (A, CO 4)

(3 x 5 = 15)

PART C

Answer any Five questions. Each question carries 6 marks

19. Derive van der Waals equation of state. (U, CO 1)

20. Explain the powder method for the X-ray diffraction studies of crystals. (U, CO 2)

21. Differentiate between lyophilic and lyophobic colloids with examples. (U, CO 3)

22. Give the postulates and derive the Langmuir adsorption isotherm. (U, CO 3)

23. What are micelles? What is the significance of the critical micelle concentration in the formation of micelles? (A, CO 3)

24. Construct the group multiplication table of the C_2v point group and verify the group axioms. (An, CO 4)

25. Assign appropriate point groups to the following molecules: H_2O, NH_3, and BF_3. Describe the symmetry elements present in each molecule. (A, CO 4)

26. Write notes on (a) Screw axis, (b) Glide plane, (c) Space groups. (U, CO 4)

(6 x 5 = 30)

PART D

Answer any One question. Each question carries 15 marks

27. a) Write a note on Maxwell–Boltzmann distribution of molecular velocities and the effect of temperature.

    b) Derive the mathematical relationship between the critical constants and Van der Waals' constants. (U, CO 1)

28. a) Derive Bragg's equation for X-ray diffraction

    b) Write notes on point defects and non-stoichiometric defects in crystals. (U, CO 2)

(15 x 1 = 15)