**24U211** (Pages: 2) Name : .....

Reg. No : .....

**SECOND SEMESTER UG DEGREE EXAMINATION, APRIL 2025**

(FYUGP)

**CC24UCHE2CJ101 - PHYSICAL CHEMISTRY - I: STATES OF MATTER**

(Chemistry - Major Course)

(2024 Admission - Regular)

Time: 2.0 Hours Maximum: 70 Marks

Credit: 4

**Part A** (Short answer questions)

Answer ***all*** questions. Each question carries 3 marks.

1. Define the terms mean free path and collision diameter. How are they related ? [Level:2] [CO1]
2. Show that the K.E of an ideal gas is a function of its absolute temperature, independent of its volume or pressure and molar mass or type of the molecule. [Level:3] [CO1]
3. What are the characteristic features of the liquid state? [Level:4] [CO2]
4. What are hydrophobic surfaces and superhydrophobic surfaces? [Level:2] [CO2]
5. Explain the anomalous expansion of water on freezing. [Level:4] [CO2]
6. Unit cells can be classified into primitive and centred unit cells. Differentiate between primitive and centred unit cells. [Level:4] [CO3]
7. Define packing fraction and packing efficiency with regard to close-packing of spheres. What are the values of packing efficiency in (i) hcp and (ii) ccp? [Level:2] [CO3]
8. Arrive at a relationship between the depression of freezing point for a dilute solution of a solute and the molar mass of the solute. [Level:2] [CO4]
9. What is meant by a semipermeable membrane ? Name two artificial semipermeable membranes. [Level:3] [CO4]
10. Mention the limitations of Henry's law. [Level:4] [CO4]

**(Ceiling: 24 Marks)**

**Part B** (Paragraph questions/Problem)

Answer ***all*** questions. Each question carries 6 marks.

11. Write a short note on the use of molecular beams in the verification of Maxwell-Boltzmann law of distribution of molecular velocities. [Level:2] [CO1]
12. How are molar refraction measurements useful in the structural elucidation of molecules? [Level:3] [CO2]
13. Discuss the mechanism of crystallization of a substance from its solution. [Level:2] [CO3]

14. What are lattice planes and Miller indices? Explain how the Miller indices of a lattice plane are calculated. [Level:3] [CO3]

15. Discuss the method of low energy electron diffraction and two of its applications. [Level:3] [CO3]

16. Calculate (derive) the packing efficiency in face-centred cubic structures. [Level:2] [CO3]

17. Explain the differences between the terms sol, emulsion and gel with suitable examples. [Level:2] [CO4]

18. What are substitutional solid solutions? Discuss the significance of the Hume-Rothery rules with regard to the formation of substitutional alloys. [Level:2] [CO4]

**(Ceiling: 36 Marks)**

**Part C** (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

19. Discuss Andrews experiments on the isotherms of CO2 and bring out the idea of continuity of states. [Level:3] [CO1]

20. Derive the relationship between van der Waals' constants and critical constants. [Level:2] [CO1]

**(1 × 10 = 10 Marks)**

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