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SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2025

CHEMISTRY

CHE2CJ101 - PHYSICAL CHEMISTRY 1: STATES OF MATTER

2024 Admission onwards

Maximum Time: 2 Hours | **Maximum Marks: 70**

Section A

All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)

1	Show that the mean free path of a gas molecule increases by decrease in pressure.
2	Write the virial equation of state of a real gas. Comment briefly.
3	Discuss the applications of supercritical carbon dioxide.
4	Discuss with suitable examples the dipole-dipole and dipole-induced dipole interactions.
5	Explain the properties of a crystalline solid.
6	Explain the different types of close packing.
7	NaCl has a f.c.c. structure and CsCl has a b.c.c. structure. How many Na^+, Cs^+ and Cl^- ions are there in each unit cell?
8	Covalent bonding occurs in both molecular and covalent network solids. Why do these two kinds of solids differ so greatly in their boiling points.
9	Explain briefly about electron diffraction.
10	Illustrate different types of colloids with suitable examples.

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)

11	Discuss the postulates of kinetic theory of gases.
12	a) Give the relationship between critical constants and van der Waals constants b) Explain the Poiseuille's equation. c) Name the seven crystal systems.
13	Write a note on liquids on solid surfaces.
14	Discuss the relevance of hydrogen bonding in water in biological systems.
15	What do you mean by colligative properties? Briefly explain relative lowering of vapour pressure and elevation of boiling point. With suitable equations show that these two are colligative properties.
16	What is meant by reverse osmosis? Mention any one of its applications.

17	Calculate (a) root mean square velocity (b) average velocity and (c) most probable velocity of hydrogen gas at 0°C.
18	Calculate the interplanar spacing (d_{hkl})for a cubic system between the following sets of planes : (a) 110 (b) 111 (c) 222. Assume that a is the edge length of the unit cell.
Section C	
Answer any ONE. Each Question carries 10 marks (1×10 = 10 Marks)	
19	Derive the van der Waals equation for describing the *P-V-T* relationship in real gases. How this equation- satisfactorily explains the departure of real gases from ideal behaviour at different pressures and temperatures.
20	Explain the determination of the structure of NaCl by powder method.