

25U210

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Name :

Reg. No :

SECOND SEMESTER UG DEGREE EXAMINATION, APRIL 2026

(FYUGP)

(Regular/Supplementary/Improvement)

CC24UCHE2CJ101 - PHYSICAL CHEMISTRY - I : STATES OF MATTER

(Chemistry - Major Course)

(2024 Admission onwards)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

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

1. Distinguish between an ideal gas and a real gas. [Level:2] [CO1]
2. Explain the term compressibility factor. [Level:2] [CO1]
3. Explain the anomalous expansion of water on freezing. [Level:4] [CO2]
4. What are hydrophobic surfaces and superhydrophobic surfaces? [Level:2] [CO2]
5. Explain the major type of intermolecular forces present in (i) HCl and (ii) Br₂. [Level:4] [CO2]
6. Give sketches of the (i) (222) planes of a bcc lattice, and (ii) (220) planes of a fcc lattice. [Level:4] [CO3]
7. How does a covalent solid differ from a molecular solid? [Level:2] [CO3]
8. State and explain Charles-van't Hoff law for solutions. [Level:2] [CO4]
9. Explain the principle of the functioning of ultramicroscope. [Level:3] [CO4]
10. Explain how the pressure affects the solubility of a gas in a given liquid. [Level:4] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

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

11. Define the terms collision diameter, collision frequency and mean free path of a gas. [Level:2] [CO1]
Explain how mean free path varies with pressure.
12. The refractive index of a liquid having molar mass 123 g mol⁻¹ is 1.5552. The [Level:3] [CO2]
density of the liquid is 1.203 g cm⁻³. Calculate its molar refraction.

13. Explain the term structure factor with regard to X-ray diffraction by crystals. [Level:2] [CO3]
14. Discuss neutron diffraction method and its applications. [Level:3] [CO3]
15. Name the Bravais lattices observed among the cubic system of crystals and sketch their unit cells. [Level:3] [CO3]
16. Calculate (derive) the packing efficiency in face-centred cubic structures. [Level:2] [CO3]
17. What are solid solutions? Explain their classification with suitable examples. [Level:2] [CO4]
18. Define molal depression constant. Explain the principle behind the determination of molar mass of a solute from depression in freezing point. [Level:2] [CO4]

(Ceiling: 36 Marks)

Part C (Essay questions)

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

19. Discuss the significance of Maxwell's equation for the distribution of molecular velocities and the effect of temperature on such distribution. [Level:3] [CO1]
20. Derive the van der Waals' reduced equation of state. State the law of corresponding states and explain its significance. [Level:2] [CO1]

(1 × 10 = 10 Marks)
