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Name :

Reg. No :

SECOND SEMESTER INTEGRATED M.Sc. GEOLOGY DEGREE EXAMINATION, APRIL 2026

(FYIP)

CC25CHE2MN107 - STATES OF MATTER AND NUCLEAR CHEMISTRY

(Chemistry - Minor Course)

(2025 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. Explain the term most probable velocity of a gas. [Level:2] [CO1]
2. Explain the effect of temperature on the viscosity of a gas. [Level:2] [CO1]
3. Discuss the relationships connecting the van der Waals' constants and the critical constants. [Level:2] [CO2]
4. Give the relations for the average translational kinetic energy (1) per mole and (i) per molecule of an ideal gas. [Level:2] [CO1]
5. Explain the application of Henry's law? [Level:2] [CO3]
6. Explain reverse osmosis and its two applications. [Level:2] [CO3]
7. Explain cholesteric liquid crystals. Give one example. [Level:2] [CO3]
8. Discuss how N/P ratio related to stability of nucleus. [Level:2] [CO4]
9. Explain the release of a large amount of energy during nuclear fission. [Level:2] [CO4]
10. Explain the compressibility factor (Z) and state its significance. [Level:2] [CO2]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

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

11. (i) Give a short note on viscosity of gases and explain coefficient of viscosity. [Level:2] [CO1]
(ii) Derive the relationship connecting coefficient of viscosity and mean free path of a gas.
12. Explain the term critical compressibility factor. [Level:2] [CO2]

13. Discuss the unit of vander waals constants. [Level:2] [CO2]
14. Derive a relationship between elevation in boiling point and molecular mass of solute - Determination of molecular mass of solute. [Level:2] [CO3]
15. Explain the variation of vapour pressure of a liquid with temperature and derive the equation of dependence of vapour pressure on temperature. [Level:2] [CO3]
16. Explain the term positive deviation from ideal behaviour. Draw a diagram showing the variation of vapour with mole fractions of components for a binary miscible liquid system showing positive deviations from Raoult's law. [Level:2] [CO3]
17. Write a short note on Geiger-Muller counter. [Level:2] [CO4]
18. Explain the normal modes of decay found among radioactive elements. [Level:2] [CO4]
- (Ceiling: 36 Marks)**

Part C (Essay questions)

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

19. i) Explain the terms collision number, collision frequency and mean free path of a gas. Discuss the effect of pressure and temperature on the mean free path. [Level:2] [CO1]
ii) Calculate the mean free path of a gas at STP. Collision diameter = 3×10^{-10} m.
20. Discuss the principles and salient features of nuclear reactors. [Level:2] [CO4]
- (1 × 10 = 10 Marks)**
