

24U212

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Name :

Reg. No :

SECOND SEMESTER UG DEGREE EXAMINATION, APRIL 2025

(FYUGP)

CC24UCHE2MN104 - STATES OF MATTER AND NUCLEAR CHEMISTRY

(Chemistry - Minor 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. Explain the term coefficient of viscosity. [Level:2] [CO1]
2. Give a relationship between coefficient of viscosity and mean free path of a gas [Level:2] [CO1]
3. Explain the deviation of real gases from ideal gas behavior? [Level:2] [CO2]
4. Discuss the expression relating the Boyle temperature to the van der Waals' constants. [Level:2] [CO2]
5. Explain negative deviation from Raoult's law with example. [Level:2] [CO3]
6. Explain cholesteric liquid crystals. Give one example. [Level:2] [CO3]
7. State and explain Henry's law. [Level:2] [CO3]
8. State and explain Charles - vant Hoff law for solution. [Level:2] [CO3]
9. Predict the nuclear equation for (i) the emission of an α -particle from Th-232 (ii) the emission of a β -particle from Ra-228 [Level:2] [CO4]
10. Explain the term mass defect. [Level:2] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

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

11. Explain how the collision frequency of a gas is related to average velocity, temperature, pressure and collision diameter. [Level:2] [CO1]
12. Calculate the temperature at which the average speed of H₂ equals that of O₂ at 320K. [Level:3] [CO1]
13. Using (i) ideal gas equation and (ii) van der Waals' equation, calculate the pressure exerted by 2 moles of NH₃ confined in a 5 L flask at 300 K. $a = 4.17 \text{ atm L}^2 \text{ mol}^{-2}$ $b = 0.037 \text{ L mol}^{-1}$ [Level:3] [CO2]

14. Explain the following terms: (i) Critical temperature (ii) Critical pressure (iii) Critical volume. [Level:2] [CO2]
15. Explain the origin of viscosity in relation to the laminar flow of liquids. [Level:2] [CO3]
16. Derive a relationship between osmotic pressure and molecular mass of solute - Determination of molecular mass of solute. [Level:2] [CO3]
17. Discuss rock dating. [Level:2] [CO4]
18. Explain the term nuclear fusion with suitable examples. Why are fusion reactions called thermonuclear reactions ? [Level:2] [CO4]

(Ceiling: 36 Marks)

Part C (Essay questions)

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

19. (i) 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:2] [CO1]
(ii) Calculate the total K.E in joules of the molecules in 22 g of CO₂ at 27°C.
20. Discuss the classification of liquid crystals on the basis of structure and explain applications liquid crystals. [Level:2] [CO3]

(1 × 10 = 10 Marks)
