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SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION APRIL 2025

(CHEMISTRY)

CHE2MN103: PHYSICAL PROPERTIES OF SOLUTIONS, GASES AND COLLOIDS

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	State Raoult's law and Henrys Law.
2	Which among the three aqueous solutions will boil at a higher temperature? Explain 1M NaCl, 1M acetic acid and 1M glucose.
3	What will happen if red blood cells are placed in hypotonic solution?
4	Write any three postulates of kinetic theory.
5	Describe how the kinetic theory of gases explains the observed increase in pressure inside a bicycle tyre when it is pumped up.
6	Calculate the root mean square (rms) velocity, average velocity, and most probable velocity for hydrogen gas at 500 K.
7	A research lab is studying the stabilization of gold nanoparticles in a colloidal solution for medical applications. The researchers want to compare the protective abilities of two different polymers, Polymer A and Polymer B, in preventing the coagulation of the gold sol. They have to add 0.05 g of Polymer A to 10 mL of the gold sol to remain stable without coagulation. Also, they have to add 0.1 g of Polymer B to 10 mL of the gold sol to remains stable without coagulation. Calculate Gold number of polymer A and B and compare the protective action of polymer A and B.
8	What is coagulation? If you have to coagulate a negatively charged colloid which among the following is more effective and why? NaCl, $CaCl_2$ or $AlCl_3$.
9	Explain the cleaning action of soap.
10	Distinguish between true solution, colloid and suspension.

Section B

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

11	Why sea water boils at a higher temperature than pure water? Explain with a graph.
12	Calculate the freezing point of a solution prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in

	500 g of water. The molal freezing point depression constant for water is 1.86 K kg/mol, and the molar mass of glucose is 180 g/mol.
13	Write any six characteristics of gases. How is it useful in daily life?
14	Analyze the Maxwell-Boltzmann distribution of molecular velocities.
15	Explain the significance of expressing the van der Waals equation in virial form. How does this form help in understanding the behavior of real gases?
16	Calculate the Boyle temperature for a gas with given van der Waals constants a and b. Why is the Boyle temperature important for real gases?
17	Discuss the continuity of states for real gases and its implications for phase transitions.
18	How does the van der Waals isotherm explain the phenomenon of liquefaction of gases?
Section C	
Answer any ONE. Each Question carries 10 marks (1×10 = 10 Marks)	
19	Explain with specific examples how association and dissociation of solutes change colligative properties.
20	Write an essay explaining optical, kinetic and electrical properties of colloids.