QP Code: U25B027

Reg. No : .....
Name : .....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

II SEMESTER (FYUGP) DEGREE EXAMINATION, MARCH 2025
B.A/B.Sc/B.Com/BSW
CHE2MN103 : PHYSICAL PROPERTIES OF SOLUTIONS,GASES AND COLLOIDS
2024 Admission Onwards
(Credits: 4)

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

Section A

*Answer **all**. Each question carries **3** Marks* ***(Ceiling: 24 Marks)***

1. What is Henry's law? What is its significance? [BTL1]
2. How do 'association' and 'dissociation' of solute molecules in a solution lead to abnormal colligative properties? [BTL3]
3. What is a liquid crystal? Give an example. [BTL1]
4. A sample of dinitrogen has a volume of 100 ml at a pressure of 750 torr. What additional pressure is required to reduce the volume to 300 ml at the same temperature ? [BTL4]
5. Analyze the relationship between temperature and volume for a helium gas sample, considering Charles' Law. Given that a sample of helium gas has a volume of 300 cm^3 at 100°C, calculate the temperature at which the volume will decrease to 100 cm^3. [BTL4]
6. What is meant by the term viscosity? [BTL1]
7. Given that carbon dioxide behaves as a van der Waals gas with constants $a = 0.4311\ Nm^4\ mol^{-2}$ and $b = 2.19 \times 10^{-}6\ m^3\ mol^{-1}$, calculate its Boyle temperature. Analyze how the Boyle temperature influences the behavior of methane in comparison to an ideal gas. [BTL4]
8. What is the range of particle size in a true solution, colloidal solution and suspension? [BTL2]
9. Apply the principle of emulsification in the cleansing action of soaps and detergents. [BTL3]
10. What are emulsions? Give an example. [BTL2]

Section B

*Answer **all**. Each question carries **6** Marks* ***(Ceiling: 36 Marks)***

11. Sketch and explain the diagram showing variation of vapour pressure with mole fraction of components for a binary miscible non-ideal liquid system with negative deviation. [BTL5]

Turn Over

12. Explain the phenomenon ‘surface tension’ of a liquid. Discuss about the two observable consequences of surface tension. [BTL4]

13. Demonstrate how the postulates of the kinetic molecular theory of gases contribute to deriving the kinetic gas equation. [BTL3]

14. Explain the following terms [BTL1]
    i) Collision number
    ii) Collision diameter
    iii) Collision frequency.

15. How would you explain the deviation of real gases from ideal behaviour under varying pressure and temperature conditions? [BTL3]

16. Discuss Andrews' experiments on the isotherms of a real gas. [BTL2]

17. Explain: [BTL4]
    i)Why lyophilic systems are more stable than lyophobic systems.
    ii)Electrodialysis method for purification of sols.

18. Explain electrical double layer, zeta potential and electrophoresis. [BTL2]

Section C

*Answer **any one**. Each question carries **10** Marks* ***(1x10=10 Marks)***

19. (a)Explain the following terms. [BTL3]
    (i) Osmosis
    (ii) Osmotic pressure
    (iii) Isotonic solution
    (iv) Reverse osmosis
    (b)Calculate the osmotic pressure of an aqueous 5% solution of urea (molar mass = 60 g/mol) at 298 K. R = 0.0821 L atm K^{-1} mol^{-1}

20. Explain the significance of critical temperature and critical pressure in gas behavior. Describe how the critical constants of a gas can be determined experimentally. [BTL2]

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