K25FY4584 Pages: 2 Reg No:.....
Name:.....

First Semester FYUGP Degree (Reg/Sup) Examination
November 2025
KU1DSCPHY111 - PROPERTIES OF MATTER
2024 Admission onwards

Time : 1.5 hours Maximum Marks : 50

Section A

Answer any 6 questions. Each carry 2 marks.

1. Distinguish between streamline and turbulent flow of liquid.
2. State Bernoulli's theorem.
3. Explain elastic after effect?
4. Describe the stress-strain diagram.
5. Define surface tension and describe its molecular basis.
6. Describe the process of liquid rise in a capillary tube.
7. Define root mean square velocity. Write the expression for the root mean square velocity of gas molecules in terms of the temperature of the gas.
8. State Van der Waal's equation for real gases. Explain the significance of the terms 'a' and 'b' in the equation.

Section B

Answer any 4 questions. Each carry 6 marks.

9. What amount of energy will be liberated , if 1000 droplets of water each 10^{-6} cm in diameter coalesce to form one large spherical drop? Assume surface tension of water is 0.072 N/m.
10. If a bubble expands from a radius of 2 cm to 5cm in a liquid with a surface tension of 0.072 N/m, calculate the work done during this process.
11. For a specific liquid, the angle of contact is measured to be 30^0 , and the surface tension is 0.07 N/m. If the radius of the capillary tube is 2 mm, calculate the height to which the liquid rises.
12. Calculate the root mean square velocity of oxygen at 27°C. Given $R = 8.314$ J/mol-K.
13. For 1 mole of carbon dioxide at 300 K, calculate the pressure using the Van der Waals equation if the volume is 1 L. Given: For CO_2, $a = 3.592$ L^2.atm/mol^2, $b = 0.0427$ L/mol

14. Compare the pressure of 2 moles of an ideal gas with that of 2 moles of nitrogen behaving as a Van der Waals gas, both at 400 K and 5 L volume. Given: For Nitrogen, $a = 1.39\ \mathrm{L}^2 \cdot \mathrm{atm/mol}^2$, $b = 0.0391\ \mathrm{L/mol}$.

Section C

Answer any 1 questions. Each carry 14 marks.

15. Derive Stoke's equation. Mention the assumptions made by Stoke.

16. Derive an expression for work done per unit volume in deforming a body in three cases of strains, longitudinal strain , volume strain and shearing strain.