

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. Define the stress and strain?
2. Define the poisson's ratio?
3. Define surface tension and describe its molecular basis.
4. Describe excess pressure on a curved surface with an example.
5. 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.
6. Write the expression for the kinetic energy of a single molecule in terms of its mass and velocity. How is this related to the temperature of the gas?
7. Explain Bernoulli's equation and express it in terms of head.
8. What is viscosity in a liquid?

Section B**Answer any 4 questions. Each carry 6 marks.**

9. Derive Boyle's Law from kinetic theory. Then use it to find the new volume when a 10-litre gas at 2 atm is compressed to 5 atm.
10. A sample of gas is contained in a cylinder with a movable piston. The initial volume is 2.0 L at a pressure of 300 kPa. The gas is then compressed isothermally (at constant temperature) until its volume is 0.8 L. Assuming the gas behaves ideally:
a) What is the new pressure of the gas? b) If the temperature of the gas is 27°C, calculate the number of moles of gas in the sample.
11. What volume will 0.5 moles of an ideal gas occupy at 1.5 atm and 25°C?
12. State and prove equation of continuity.
13. Calculate the mass of water flowing in 10 minutes through a tube of 1mm diameter and 50cm long, if there is a constant pressure head of 0.35m of water. Given η of water is 10^{-3} Nsm^{-2} .

14. An airbubble of radius 1cm is allowed to rise through a long cylindrical column of a viscous liquid and travels at a steady rate of 0.21cm/s. If the density of the liquid is 1470Kg/m^3 find its viscosity. $G = 9.8 \text{ m/s}^2$, neglect density of air.

Section C

Answer any 1 questions. Each carry 14 marks.

15. Derive an expression for depression of a beam supported at its ends and loaded in the middle.
16. Derive the expression for excess pressure on the curved surface of a liquid. Apply the result to determine the capillary rise of a liquid in a narrow tube of circular cross-section.