

First Semester FYUGP Degree Supplementary Examination**January 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 load, stress, and strain in the context of material deformation.
2. What is viscosity in a liquid?
3. State Bernoulli's theorem.
4. What is terminal velocity?
5. What factors influence the terminal velocity of an object in a viscous medium?
6. What are molecular forces?
7. Explain why small drops of liquid are spherical in shape?
8. List three important assumptions made in the kinetic theory of gases.

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

9. What is the angle of twist and angle of shear? Obtain the relation connecting angle of twist and angle of shear of a cylindrical rod.
10. A flat plate of area 10^{-3} m^2 is separated from a large plate by a layer of glycerine 1 mm thick. If the viscous coefficient of glycerine is $2 \text{ kg/m}\cdot\text{s}$, what force is required to keep the plate moving with a velocity of 0.01 m/s ?
11. 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} .
12. Derive the expression for excess pressure across a curved surface, and apply it to real-world situations like soap bubbles.
13. Evaluate the factors that influence the shape of a liquid meniscus in a capillary tube.

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14. Calculate the root mean square velocity of oxygen at 27°C using $v_{\text{rms}} = \sqrt{(3kT/m)}$. Show your work.

Section C**Answer any 1 questions. Each carry 14 marks.**

15. Using Kinetic Theory, derive the expression for pressure exerted by gas molecules.
16. Derive an expression for restoring couple per unit twist in a cylindrical rod or wire. Show that the couple required to twist a hollow cylinder is greater than that required to twist a solid cylinder of the same material, length and mass.

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