

D 12653

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Name.....

Reg. No.....

**FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION, NOVEMBER 2021**

Physics/Applied Physics

PHY 1C 01—PROPERTIES OF MATTER AND THERMODYNAMICS

(2021 Admissions)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A (Short Answer Type)***Answer at least **eight** questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 24.*

1. What do you mean by modulus of rigidity ? Give an expression for the work done per unit volume when a body undergoes a strain.
2. Write down the relation connecting Young's modulus, Bulk modulus and rigidity modulus.
3. Draw a diagram to illustrate the terms angle of twist and angle of shear.
4. What are the two forces that govern the shape of a liquid drop ? Why a smaller drop assumes spherical shape ?
5. What do you mean by a viscous force ?
6. What are the basic assumptions used while arriving at the Poiseuille's formula ?
7. What is Brownian motion ?
8. What are the essential conditions for a process to be reversible ?
9. What are the basic processes in a Carnot's cycle ?
10. Give Clausius statement of the second law of thermodynamics.
11. Explain the principle of increase of entropy.
12. Explain the Clausius-Clapeyron equation.

(8 × 3 = 24 marks)

**Section B (Paragraph/Problem Type)***Answer at least **five** questions.**Each question carries 5 marks.**All questions can be attended.**Overall Ceiling 25.*

13. A bar of width 2.5 cm and thickness 2.5 mm is supported symmetrically on two knife edges kept 1 m apart. When the bar is loaded with weight 200 g at each end, projected 10 cm from the knife edges, the centre is elevated by 4 mm. Estimate the Young's modulus of the material of the bar.

**Turn over**

14. Water flows through a pipe of radius 0.04 m and length 2 km at the rate of 100 litres/min. If the co-efficient of viscosity of water is  $10^{-3} \text{ Nsm}^{-2}$  and the atmospheric pressure is  $1.01 \times 10^5 \text{ Pa}$ , determine the pressure required to maintain the flow.
15. What is the pressure inside a drop of a liquid of radius 3 mm at room temperature, if the surface tension of the liquid at room temperature is 0.465 N/m ?
16. A carnot engine working between 300 K and 600 K has a work output of 800 J per cycle. Determine the amount of heat energy supplied to the engine from the source per cycle.
17. lg of water at  $100^\circ\text{C}$  is boiled at a pressure of 1 atm to steam at the same temperature. If the specific latent heat of steam is  $226 \times 10^4 \text{ J/kg}$  and the specific volume of water and steam at  $100^\circ\text{C}$  are  $1 \text{ cm}^3/\text{g}$  and  $1671 \text{ cm}^3/\text{g}$ , determine the work done and increase in internal energy in the process.
18. Prove that the slope of an adiabatic is  $\gamma$  times the slope of the isothermal, where  $\gamma$  is the ratio of the specific heat capacities at constant pressure and constant volume.
19. Discuss the working principle of a Carnot's refrigerator.

(5 × 5 = 25 marks)

**Section C (Essay Type)**

*Answer any one question.*

*The question carries 11 marks.*

20. Obtain an expression for the bending moment of a beam.
21. Explain the term entropy. Obtain an expression for the change of entropy in a reversible isothermal process.

(1 × 11 = 11 marks)