

D 13819

(Pages : 3)

Name.....

Reg. No.....

**FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2016**

(CUCBCSS—UG)

Complementary Course

**PHY 1C 01—PROPERTIES OF MATTER AND THERMODYNAMICS**

Time : Three Hours

Maximum : 64 Marks

**Section A**

*Answer all questions.*

*Each question carries 1 mark.*

- ✓ 1. The type of modulus of elasticity of gases is \_\_\_\_\_.
- ✓ 2. Angle of contact for pure water and clear glass is \_\_\_\_\_.
- ✓ 3. The limiting values of Poisson's ratio are \_\_\_\_\_ and \_\_\_\_\_.
- ✓ 4. The viscosity of liquids \_\_\_\_\_ with increase of pressure.
- ✓ 5. When Sodium chloride is added to water, the surface tension of water \_\_\_\_\_.
- ✓ 6. The SI unit of entropy is \_\_\_\_\_.
- ✓ 7. The change in enthalpy during a reversible isobaric adiabatic process is \_\_\_\_\_.
- ✓ 8. The thermodynamic process during which the entropy remains constant is called \_\_\_\_\_.
- ✓ 9. The efficiency of a Carnot's engine working between temperatures  $100^{\circ}\text{C}$  and  $0^{\circ}\text{C}$  is \_\_\_\_\_.
- ✓ 10. When the pressure increases, the melting point of wax \_\_\_\_\_.

(10 × 1 = 10 marks)

**Section B**

*Answer all questions.*

*Each question carries 2 marks.*

11. What is torsional rigidity of a wire ?
12. How does the temperature and pressure affect the viscosity of a liquid ?
13. Explain why liquids possess surface tension ?
- ✓ 14. Define the term modulus of rigidity ? Write down the relation Connecting the three moduli of elasticity.
- ✓ 15. State and explain the principle of increase of entropy ?
- ✓ 16. What do you mean by quasi-static process ?
- ✓ 17. Distinguish between isothermal process and adiabatic process ?

(7 × 2 = 14 marks)

Turn over

## Section C

*Answer any two questions.*

*Each question carries 4 marks.*

18. Derive an expression for the excess of pressure inside a liquid bubble ?
19. Show that a hollow shaft of the same length, mass and material is Comparatively Stronger than a solid shaft ?
20. Derive stoke's law for the motion of a body in a viscous medium from dimensional considerations ?
21. What do you mean by entropy ? Show that the entropy remains constant in reversible process but increase in irreversible process ?
22. Derive an expression for work done during an adiabatic process ?

(2 × 4 = 8 marks)

## Section D

*Answer any three questions.*

*Each question carries 4 marks.*

23. A rectangular bar 2 cm breadth and 1 cm depth and 100 cm in length is supported at its ends and a load of 2 kg is applied at its middle point. Calculate the depression at the middle point, if Young's modulus of the bar is 200 GPa ?
24. Water flows through a horizontal capillary tube of 1 mm internal diameter and length 70 cm under a pressure of a column of water 30 cm in height. If the viscosity of water is  $1 \times 10^{-3} \text{ N s m}^{-2}$ , find the rate of flow of water through the Capillary tube ?
25. Find the efficiency of a Carnot's engine working between  $127^\circ\text{C}$  and  $27^\circ\text{C}$ . If it absorbs 840 J of heat from the source, Calculate the amount of heat rejected to the Sink ?
26. Calculate the change in temperature of boiling water when the pressure is increased by 27.12 mm of Hg. The normal boiling point of water at atmospheric pressure is  $100^\circ\text{C}$ . Given latent heat of steam =  $2.268 \times 10^6 \text{ J kg}^{-1}$  ; Specific volume of steam =  $1.674 \text{ m}^3 \text{ Kg}^{-1}$  and specific volume of water at  $100^\circ\text{C} = 1 \times 10^{-3} \text{ m}^3 \text{ Kg}^{-1}$ .
27. Calculate the change in entropy when 0.1 kg of water at  $15^\circ\text{C}$  is mixed with 0.15 kg of water at  $50^\circ\text{C}$ . Specific heat of water =  $4.2 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$ .

(3 × 4 = 12 marks)

**Section E**

*Answer any two questions.  
Each question carries 10 marks.*

28. What is a torsion pendulum ? Derive an expression for its time period. Using the pendulum how will you determine the rigidity modulus of a wire.
29. Derive Poiseuille's formula for the flow of a liquid through a Capillary tub. Mention its limitations.
30. Deduce Maxwell's four thermodynamical relations. What are the importance of these relations ?

(2 × 10 = 20 marks)

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