

**FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2018**

(CUCBCSS—UG)

Complementary Course (Physics)

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. A and B are two wires. The radius of A is twice that of B. If same force is acting on them, the stress on A is \_\_\_\_\_ that on B.
2. The energy stored per unit volume of a stretched wire is \_\_\_\_\_.
3.  $YI/R$  of a beam is called \_\_\_\_\_.
4. In an oil lamps, the oil rises up in the wicks due to \_\_\_\_\_.
5. The excess pressure inside a soap bubble is  $40 \text{ N/m}^2$ . The excess pressure inside another soap bubble having radius twice the first one is \_\_\_\_\_.
6. A steel ball falls through castor oil more slowly than through water because castor oil has greater \_\_\_\_\_.
7. An adiabatic process occurs at constant \_\_\_\_\_.
8. The equation  $dQ=dU$  represents \_\_\_\_\_ process.
9. Equilibrium state is a state of \_\_\_\_\_ Entropy.
10. Water expands on solidification. The melting point of ice will \_\_\_\_\_ with pressure.

(10 × 1 = 10 marks)

**Section B***Answer all questions.**Each question carries 2 marks.*

11. Steel is more elastic than rubber. Explain the statement.
12. Explain, why the iron girders have the cross-section in the shape of I ?
13. Explain the effect of temperature on surface tension.
14. Distinguish between stream line flow and turbulent flow. Define critical velocity.

**Turn over**

15. What are isothermal, adiabatic, isobaric and isochoric process ? Represent them on the same PV diagram.
16. Show that Gibb's function remains a constant during reversible isothermal isobaric process.
17. Distinguish between entropy and enthalpy of a system.

(7 × 2 = 14 marks)

### Section C

*Answer any **three** questions.  
Each question carries 4 marks.*

18. Show that theoretical limiting values of Poisson's are -1 and 0.5.
19. Derive Stokes formulae for the velocity of a small sphere falling through a viscous fluid.
20. Define surface tension and surface energy. Show that surface tension is numerically equal to surface energy.
21. What is meant by quasistatic process ? Derive an expression for work done during an adiabatic process.
22. Derive Clausius Clapeyron equation from Maxwell's equations.

(3 × 4 = 12 marks)

### Section D

*Answer any **three** questions.  
Each question carries 4 marks.*

23. A gold wire 0.32 mm in diameter elongates by 1 mm when stretched by a force 3.23 Newton and twists through 1 radian, when equal and opposite torque of  $1.45 \times 10^{-7}$  N-m are applied at its ends. Find the value of Poisson's ratio for gold.
24. Calculate the loss of energy if 1000 drops of water of diameter 2 mm coalesce To form one large drop. Surface tension of water = 0.07 N/m.
25. A metal plate of area  $1.25 \times 10^{-2}$  m<sup>2</sup> is separated from a large plate by a layer of Glycerin of thickness  $1 \times 10^{-3}$  m. If the viscosity of glycerin is 1.6 Nsm<sup>-2</sup>. Calculate the force required to keep the plate moving with a velocity of  $2.5 \times 10^{-2}$  ms<sup>-1</sup>.
26. One mole of a gas at 27°C expands adiabatically until its volume is doubled. Calculate the work done  $\gamma = 1.4$ .
27. Calculate the change in entropy when 5 kg of ice is completely converted into Water at its melting point 273 K. Latent heat of ice =  $335 \times 10^3$  J/kg.

(3 × 4 = 12 marks)

**Section E**

*Answer any two questions.  
Each question carries 8 marks.*

28. Describe an experiment to determine the Young's modulus of the material of the bar using the bar as a cantilever.
29. Obtain an expression for Volume of liquid flowing per second through a narrow tube of circular cross-section.
30. Explain Carnot engine. Derive an expression for efficiency of Carnot engine.
31. Explain, what do you mean by the entropy of a substance. Show that for any Reversible cyclic change of a system the total change in entropy is zero. Explain, why this statement is not true for irreversible changes.

(2 × 8 = 16 marks)