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 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.

($10 \times 1 = 10$ 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.

$(7 \times 2 = 14$ 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.

$(3 \times 4 = 12$ 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 1.45×10^{-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 1.25×10^{-2} m^2 is separated from a large plate by a layer of Glycerin of thickness 1×10^{-3} m. If the viscosity of glycerin is 1.6 Nsm^{-2}. Calculate the force required to keep the plate moving with a velocity of 2.5×10^{-2} ms^{-1}.

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 = 335×10^3 J/kg.

$(3 \times 4 = 12$ marks)

Section E

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

28. Describe an experiment to determine the Youngs 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)