FIRST SEMESTER B.Sc. DEGREE EXAMINATION, JULY 2013

(CCSS)

Physics

Complementary Course—I

PHI C01—PROPERTIES OF MATTER AND THERMODYNAMICS

Time : Three Hours   Maximum : 30 Weightage

Section A

12 Objectives type questions, in bunches of 4 questions.
Each bunch carries a weightage of 1.

1. Y is the Young's modulus, K bulk modulus and η is the rigidity modulus. Then choose the false relation :

   (a) $9/Y = 3/\eta + 1/K$.   (b) $9/Y = \eta/3 + 1/K$.

   (c) $9/Y - 3/\eta = 1/K$.   (d) $Y = 9k\eta/(3K+\eta)$.

2. The value of Reynold's number for narrow tubes is :

   (a) 100.   (b) 10000.

   (c) 1000.   (d) None of the above.

3. The efficiency of a Carnote's engine works between $T_1 = 450$ K and $T_2 = 350$ K is :

   (a) 2.2 %.   (b) 22.2%.

   (c) 220 %.   (d) None of these.

4. The Clapeyron's latent heat equation is given by :

   (a) $dP/dT = L/T(V_2 - V_1)$.   (b) $dL/dT = P/T(V_2 - V_1)$.

   (c) $dV/dT = L/T\ (P_2 - P_1)$.   (d) None of these.

5. The period of torsional oscillations is directly proportional to ————.

6. The girders of bridges are ———— shaped.

7. ———— is an example of a Carnote's engine operates in the reverse direction.

8. U – TS + PV is called ———— of a system.

9. Write down a simple relation for the force which obeys Hooke's law.

10. Write down an expression for the excess pressure inside a liquid drop.

11. What is turbulent motion ?

12. What do you mean by internal energy of a system ?

(12 × ¼ = 3 weightage)

Turn over

Section B

Answer all questions, each carries a weightage of 1.

13. Explain the term 'elastic after effect'.

14. Define bending moment of a beam.

15. Obtain an expression for the total pressure inside a bubble of radius r at a depth h in a pond.

16. How does surface tension of a liquid vary with temperature ?

17. What is Brownian motion ?

18. Write down the gas equation during an adiabatic process. Explain the symbols used.

19. What is an isochoric process ?

20. Distinguish between Helmholtz and Gibb's functions.

21. What do you mean by 'enthalpy' of a system ?

$(9 \times 1 = 9$ weightage$)$

Section C

Answer any five questions, each carries weightage of 2.

22. Derive the relation for the geometrical moment of inertia of a cylindrical wire of radius r.

23. A wire 3 m long and 0.625 sq.cm in cross-section is found to stretch 0.3 cm under a tension of 1200 Kg. What is the Young's modulus of the material of the wire ?

24. Obtain an expression for the terminal velocity of a small sphere falling through a highly viscous medium.

25. Prove that surface tension is numerically equal to surface tension.

26. Derive an expression for the force required to separate two glass plates containing a thin layer of liquid between them. Surface tension of the liquid is T.

27. 'Heat and work are path functions'. Explain.

28. A reversible heat engine of efficiency 2/5 has its efficiency increased to ½ when the temperature of the sink is lowered by 50°C. Find the temperature of the source.

$(5 \times 2 = 10$ weightage$)$

Section D

Answer any two questions, each carries a weightage of 4.

29. Derive an expression for the couple/unit twist on a cylindrical wire.

30. Derive Poiseuille's expression for the rate of flow of a liquid through a capillary tube.

31. With the help of suitable diagrams explain various cycles of operation of a Carnot's reversible engine. Obtain the expression for efficiency.

$(2 \times 4 = 8$ weightage$)$