FIRST SEMESTER B.Sc. DEGREE EXAMINATION, JANUARY 2013

(CCSS)

Physics : Complementary

PH 1C 01—PROPERTIES OF MATTER AND THERMODYNAMICS

Time : Three Hours   Maximum : 30 Weightage

I. Answer *all* questions.

Choose the. correct alternative :

1 Theoretical value of Poisson's ratio varies between :

   (a) − 1 and + 1.   (b) — 1 and 0.5.

   (c) − 1 and O.   (d) — 0.5 and + 0.5.

   With increase of temperature surface tension of a liquid :

   (a) Always increases.   (b) Always decreases.

   (c) Remains unchanged.   (d) Changes depending on the nature of the liquid.

3 T-S diagram of a Carnot cycle is :

   (a) Ellipse.   (b) Rectangle.

   (c) Circle.   (d) Parabola.

4 Gibb's potential G =

   (a) U + PV.   (b) U−TS.

   (c) A + H − U.   (d) None of the above.

         (H–enthalpy, A–Helmholtz free energy)

Fill in the blanks :

5 Young's modulus of a material _____ with thickness.

6 Excess pressure inside a soap bubble of radius r and surface tension T is _____

7 Dimensional formula for coefficient of viscosity is _____

8 For a Carnot engine of efficiency 50 %, the ratio of source and sink temperature is _____

Give one word answers :

9 Write down a relation connecting Young's modulus and Poisson's ratio.

10 Write down a phenomenon exhibiting surface tension.

11 Give an example of a thermodynamic system.

12 Express the entropy change of an ideal gas in terms of pressure **(P)** and volume (V).

                                              $(12 \text{ X } \frac{1}{4} = 3 \text{ weightage})$

                                                                    Turn over

Answer *all* nine questions

13 Explain why steel is more elastic than rubber.

14 Derive an equation for work done in twisting a rod.

15 What is the importance of presence of dust particles in cloud formation ?

16 What happens to a soap bubble when it is electrically charged ? Explain.

17 Writs down the conditions under which Poiseuillie's formula is valid.

18 State the First law of thermodynamics. Put it in mathematical form.

19 The pressure of an ideal gas is doubled at constant temperature. Find the work done.

20 Is it possible to cool a room by keeping the refrigerator door open ? Explain.

21 How is entropy related to disorder ?

(9 X 1 = 9 weightage)

III. Answer any *five* questions

22 Show that the torsional oscillations executed by a torsion pendulum are simple harmonic an᾽ arrive at the frequency of oscillations.

23 A cantilever of length 0.4 m. is loaded at the free end. If the depression at a distance 10 cm. from free end is 1 cm., find the depression at the free end.

24 Two equal spherical soap bubbles coalesce to form a single drop at constant temperature. II is the corresponding change in volume of the contained air and 8A is the change in tot surface area show that $4T\delta A = 3P\delta V$ where T = surface tension of soap solution and P atmospheric pressure.

25 2 capillary tubes of radii a_1 and a_2 and lengths l_1 and l_2 connected in series. Find the rate flow of a liquid of coefficient of viscosity η under a pressure P.

26 One mole of. Nitrogen expands isothermally from 10 to 20 litres at 100° C. Assuming the ga be ideal, find the entropy change of the gas. R = 8.3 J mol. ⁻ K^{-1}.

27 A. Carnot engine working between two temperatures T_1 and T_2 converts 15 % of heat it useful work. When the temperature of the sink is lowered by 100 K the efficiency is double Find T_1 and T_2.

28 Two Carnot engines A and B are in series. First engine absorbs heat at 1000 K and rejets it the sink at a temperature T K. Second engine absorbs half of the heat rejected by the first a ᾽ rejects heat to its sink at 200 K. If the work performed by both engines are equal, calculate T.

(5. x 2 = 10 weightage)

IV. Answer any *two* questions

29 Define the 3 modulii of elasticity. Derive an equation for couple per unit twist on a uniform cylinder clamped at one end twisted at the other end.

30 Derive Stoke's formula. With necessry theory, explain how the coefficient of viscosity o liquid can be determined by Stoke's method.

31 Derive Clausius-Clapeyron latent heat equation. On the basis of it explain the effect of press on boiling and melting points.

(2 X 4 = 8 weighta᾽