

D 93763

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Name.....

Reg. No.....

**FIRST SEMESTER B.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION
NOVEMBER 2015**

(UG—CCSS)

Complementary Course

PH 1C 01—PROPERTIES OF MATTER AND THERMODYNAMICS

Time : Three Hours

Maximum : 30 Weightage

I. Answer *all* questions :

Choose the correct alternative :

1 An example of a nearly perfectly elastic body is :

- (a) Putty. (b) Quartz fiber.
(c) Steel wire. (d) Rubber.

2 The SI unit of coefficient of viscosity is :

- (a) Nsm^2 . (b) Nsm^{-1} .
(c) Nm^{-1} . (d) Nsm^{-2} .

3 In an irreversible process, the entropy :

- (a) Increases. (b) Decreases.
(c) Remains constant (d) First increases then decreases

4 When NaCl is dissolved in water, the surface tension

- (a) Increases. (b) Decreases.
(c) Remains constant. (d) May increase or decrease.

Fill in the Blanks :

5 The physical quantity that remains constant across a section of a tube when a gas flows through it is _____.

6 Within elastic limit, the ratio of lateral strain to longitudinal strain is known as _____.

7 The work done in blowing a bubble of radius 'r' is _____.

8 The melting point of ice _____ with increase in pressure.

Give *One word* answers :

- 9 Line of intersection of the plane of bending with the neutral surface is known as ?
- 10 What is the name of the process in which the deviation from thermodynamic equilibrium is infinitesimal ?
- 11 What is the work done in an isochoric process ?
- 12 A system which can be described by a set of thermodynamic co-ordinates is known as ?

(12 × ¼ = 3 weightage)

II. Answer all *nine* questions :

- 13 State Carnot's Theorem.
- 14 Define entropy. What is its physical significance ?
- 15 What is an adiabatic process ? Write the gas equation for an adiabatic process.
- 16 Find the efficiency of a Carnot engine working between 300 K and 400 K.
- 17 Write the Clausius-Claypyron equation.
- 18 Explain the term 'terminal velocity'.
- 19 Define coefficient of viscosity and write its dimensional formula.
- 20 What are the forces acting on one half of a liquid drop in equilibrium ?
- 21 Write the expression for the period of a torsion pendulum and explain the terms.

(9 × 1 = 9 weightage)

III. Answer any *five* questions :

- 22 Define modulus of rigidity. Describe an experiment to determine the modulus of rigidity of a steel wire.
- 23 A cantilever of length 0.4m is loaded at the free end and the depression at the free end is 2cm. Find the depression at a distance 0.03m from the fixed end.
- 24 Find the work done in spraying a spherical water drop of radius 1mm into 10^6 smaller drops of equal radii. Surface tension of water is 0.072Nm^{-1} .
- 25 Derive an expression for the terminal velocity of a solid falling through a viscous medium.
- 26 Calculate the change in entropy when 1kg of ice at -10°C is converted into water at 0°C . Specific heat of ice = $2.1 \times 10^3 \text{ J/kg/K}$, Latent heat of ice = $3.36 \times 10^5 \text{ J/kg}$.

- 27 Derive an expression for the work done in an isothermal process. What is the work done when one mole of air at STP is compressed isothermally such that the resulting pressure is 0.5 atm
 $R = 8.315 \text{ J/mol/K}$?
- 28 State the first law of thermodynamics. Calculate the change in internal energy of a gas when 320 J of heat is given to it at a constant pressure of $1.013 \times 10^5 \text{ Nm}^{-2}$. Initial and final volume of the gas are 0.0035 and 0.0042 m^3 respectively.

(5 × 2 = 10 weightage)

IV. Answer any *two* questions :

- 29 Derive the relations connecting the moduli of elasticity and Poisson's ratio.
- 30 What are the assumptions made while deriving an expression for the rate of flow of a liquid through a capillary tube ? Derive Poiseuille's equation.
- 31 Define enthalpy, Helmholtz function and Gibb's function. Using these functions, derive Maxwell's thermodynamic relations.

(2 × 4 = 8 weightage)