D 92867 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS–UG)

Complementary Course

PHY 1C 01—PROPERTIES OF MATTER AND THERMODYNAMICS

Time : Three Hours Maximum : 64 Marks

Section A (One Word)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. As the temperature increases the Young's Modulus of a steel wire ———.
2. The dimensions of surface tension are ———.
3. The angle of contact for pure water and clear glass is ———.
4. The viscosity of gases ——— with increase in temperature.
5. The type of modulus of elasticity of gases is ———.
6. When the pressure increases, the boiling point of water ———.
7. When work is done by an isolated system its internal energy ———.
8. The change in Helmoltz free energy function during an isothermal isochoric process is ———.
9. During an adiabatic process the enthalpy of the system ———.
10. The efficiency of a Carnot's engine working between temperatures 500 K and 300 K is ———.

(10 × 1 = 10 marks)

Section B

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

11. Define the terms angle of twist and angle of shear.
12. What is a cantilever ?
13. What is meant by Brownian motion ? How does temperature affect this movement ?
14. Assuming the expression for excess of pressure on a curved liquid surface, deduce the excess of pressure inside a liquid spherical drop and bubble.
15. State Carnot's theorem.
16. How does the pressure affect the boiling point of a liquid and melting point of ice ?
17. State and explain second law of thermodynamics.

(7 × 2 = 14 marks)

Turn over

Section C

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

18. What is an I-section girder ? Why are I-section girders preferred ?
19. Define the term surface tension. Derive an expression for finding the work done in blowing a liquid bubble.
20. Derive Stoke's formula for the velocity of a small sphere falling through a viscous liquid.
21. Derive Clasius-Cleyperon equation.
22. Derive an expression for work done during an adiabatic expansion process.

(2 × 4 = 8 marks)

Section D

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

23. Calculate the work done in twisting a steel wire of radius 10^{-3} m. and length 0.25 m. through an angle of 45°. Given the rigidity modulus of wire is 8×10^{10} Nm^{-2}.
24. Calculate the radius of the drop of water falling through air, if the terminal velocity of the drop is 0.012 ms^{-1} ; viscosity of air is 1.81×10^{-5} SI units and density of air is 1.21×10^{-3} $kg.m.^{-3}$?
25. A Carnot's engine works between two temperatures whose difference is 100° C. If it absorbs 746 J of heat from source and gives 546 J to sink, calculate the temperature of source and sink.
26. Calculate the work done if one mole of an ideal gas is compressed very slowly at 27° C. to one fourth of the original volume. R = 8.314 J $mol.^{-1}$ K^{-1}.
27. Calculate the change in entropy when 10 g of ice at 0° C. is converted into steam at 100° C. Latent heat of fusion of ice is 3.35×10^5 J $kg.^{-1}$; Latent heat of steam is 2.268×10^6 J $kg.^{-1}$ and Specific heat capacity of water is 4.2×10^3 $Jkg.^{-1}$ K^{-1}.

(3 × 4 = 12 marks)

Section E

Answer any **two** *questions.*
Each question carries 10 *marks.*

28. A rectangular bar of iron is supported at its two ends of knife edges and a load is applied at the middle point. Derive an expression for the depression at the middle. Describe an experiment to determine Young's modulus of a bar using this arrangement.
29. Derive Poiseulli's formula for the flow of a liquid through a capillary tube. Describe an experiment to measure the viscosity of a liquid using the formula.
30. Describe the working of a Carnot's engine. Define efficiency of a heat engine. Derive an expression for efficiency of a Carnot's engine.

(2 × 10 = 20 marks)