

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 Helmholtz 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 Claius-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 $8 \times 10^{10} \text{ Nm}^{-2}$.
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 $1.21 \times 10^{-3} \text{ kg.m}^{-3}$?
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. $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$.
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 $3.35 \times 10^5 \text{ J kg}^{-1}$; Latent heat of steam is $2.268 \times 10^6 \text{ J kg}^{-1}$ and Specific heat capacity of water is $4.2 \times 10^3 \text{ Jkg}^{-1} \text{ K}^{-1}$.

(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)