Reg. No..... (Pages 2) **K 6127**

Name.....

FIRST YEAR B.Sc. DEGREE EXAMINATION, APRIL/MAY 2005

Part III—Physics Subsidiary

Paper I—MECHANICS, PROPERTIES OF MATTER, THERMAL PHYSICS AND STATISTICAL MECHANICS

(For Chemistry/Polymer Chemistry/Home Science Main)

Time : Three Hours Maximum : 50 Marks

Section A

Answer any **two** *questions.*

1. Describe Ostwald Viscometer and show how to compare Viscosities of two liquids on the same liquid at different temperatures.
2. Four spheres, each of diameter $2a$ and mass m, are placed with their centres on the four corners of a square of side b. Calculate the M.I. of the system about one side of the square.
3. Describe Joule-Thomson effect and give its theory. How has it been utilised in the liquefaction of gases ?
4. State the Second law of thermodynamics. Describe Carnot's cycle and deduce the efficiency of an ideal heat engine.

($2 \times 7 = 14$ marks)

Section B

Answer any **twelve** *questions.*

5. Define Moment of inertia of a particle. Define Radius of gyration of the body.
6. State Parallel axes theorem of moment of inertia.
7. Give the theory of forced harmonic oscillator.
8. Mention the modes of transverse vibrations of strings.
9. Define Intensity of wave and write the expression for it. Find intensity of spherical waves.
10. Define Strain, Stress and Young's modulus.
11. Explain what is meant by 'modulus of rigidity' and find out its dimensions.
12. Why is the upper surface of mercury in a glass capillary tube convex upward, while for water it is concave ?
13. Define Coefficient of Viscosity. Give examples of some viscous substances.
14. What do you understand by osmosis, dialysis and diffusion ?
15. Define Osmotic pressure and state its laws.
16. Explain Barton's connection.
17. What do you understand by 'specific heat' of a substance. State its unit.

Turn over

18. Give an account of Andrew's experiments on isothermals for carbon dioxide.
19. Deduce the expressions for work done in an isothermal process.
20. Find expressions for the 'critical constants' of a real gas in terms of the Vander Waals' constants 'a' and 'b'.
21. State Frinde's method for obtaining liquid air.
22. Discuss effect of pressure on melting point and boiling point.
23. Write a note on change of entropy in reversible and irreversible cycles.
24. Explain Wien's Displacement law and give its importance.

(12 × 2 = 24 marks)

Section C

Answer any **four** *questions.*

25. Find the work done in stretching a wire having cross sectional area 10^{-6} sq.m and length 2 m. through 10^{-4}m. Young's modulus of the material of the wire = 20×10^{10} N/m^2.
26. The sun rotates about its axis once in 27 days. What will be its period of revolution if the Sun were to expand to twice its present size ? Assume that the sun is a sphere of uniform density.
27. Calculate the mass of water flowing out in 10 minutes through a capillary tube of radius 5×10^4 m and 0.4 m long if there is a constant pressure head of 0.2 m of water. η of water is 0.89×10^{-3} Ns m^{-2}.
28. Calculate the work done in spraying a spherical water drop 10^{-3} m in radius into a million droplets of the same size. S.T. of water = 72×10^{-3} Nm^{-1}.
29. A given volume of gas expands isothermally to 4 times its initial volume. Calculate the change in entropy in terms of the gas constant.
30. The melting point of aluminium is 932 K and the specific latent heat of fusion is 38×10^4 J kg^{-1}. Calculate the entropy change when 5 mole of aluminium is fused. The atomic weight of aluminium = 27.
31. In a nuclear fission process the maximum temperature obtained was of the order of 10^8 K. Calculate the wavelength of maximum energy. Wien's constant = 2.898×10^{-3} mK.

(4 × 3 = 12 marks)