LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIRST SEMESTER – November 2009

PH 1500 - PROP.OF MAT.& THERMAL PHYSICS

Date & Time: 10/11/2009 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

PART – A

Answer ALL questions (10 x 2 =20 marks)

1. **State the Newton's law of gravitation.**
2. **Calculate the work done in stretching a uniform metal wire of area of cross-section 10^{-6} m^2 and length 1.5 m through $4x10^{-3}$m. Given $E=2 x10^{11} Nm^{-2}$.**
3. **Define co-efficient of viscosity and give the dimensional formula for it.**
4. **Give an example of cohesive forces and adhesive forces.**
5. **State Graham's law of diffusion.**
6. **What are thermodynamic variables of a system?**
7. **What is a reversible process in thermodynamics?**
8. **Give the Clausius statement of II law of thermodynamics.**
9. **Define latent heat of vaporization and write its unit.**
10. **Define Joule-Kelvin Coefficient.**

PART –B

Answer any FOUR questions (4 x 7.5 =30 marks)

11. **a) Explain gravitational field and gravitational potential. (3)**

    b) Discuss the variation of acceleration due to gravity with rotation of earth. (4.5)

12. **a) Derive Poiseuille's formula for the rate of flow of liquid through a capillary tube. (4)**

    b) Derive Poiseuille's correction for pressure head. (3.5)

13. **a) State the main assumptions of the kinetic theory of gases. (4)**

    b) Derive the expression for mean free path. (3.5)

14. **a) Calculate the change in entropy when 10^{-3}kg of water at 273 K is heated to 373 K (specific heat capacity of water = 4200 $Jkg^{-1} k^{-1}$). (2.5)**

    b) Derive Classius-Clapeyron equation for liquid and vapour equilibrium. (5)

15. **a) Derive Ehrenfest's equation for second order phase transition. (5.5)**

    b) Give two examples of second order phase transition. (2)

PART –C

Answer any FOUR questions **(4x12.5=50 marks)**

16. a) Define a cantilever. Obtain an expression for the depression produced at its free end when the weight of the beam is negligible. (5.5)

b) Describe Koenig's method for the determination of young's modulus of a beam. (7)

17. a) In an experiment for determining the surface tension of water by capillary rise a capillary tube of diameter 1mm is used. The height of water in the capillary tube was found to be 3 cm. Calculate the surface tension of water. (Take density of water as $10^3 kg/m^3$). (5)

b) Give the theory and experimental details for determining the angle of contact and surface tension for mercury by Quinke's method. (7.5)

18. a) State and explain first law of thermodynamics. (5)

b) Discuss the Langevin theory of Brownian motion. (7.5)

19. Deduce Maxwell's thermodynamic relations. (12.5)

20. Explain Joule-Kelvin effect with an experiment and obtain an expression for temperature of inversion. (12.5)

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