LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

THIRD SEMESTER – **NOVEMBER 2013**

PH 3505/PH 3503 – THERMODYNAMICS

Date : 08/11/2013 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

PART – A

Answer **ALL** the questions: **(10x2=20)**

1. State the basic assumption made in the kinetic theory of gases.
2. Calculate the average kinetic energy of an air molecule at $27^{o}C$.
3. Write down the equation of state for an ideal gas when it undergoes a reversible, (i) isothermal and (ii) adiabatic changes.
4. Define Super fluidity.
5. The internal energy of an ideal gas does not change with its volume. why?
6. State the second law of thermodynamics.
7. Define Helmholtz and Gibbs functions.
8. State the condition for two phases to be in equilibrium.
9. Define thermodynamic probability.
10. State Wien's displacement law.

PART – B

Answer **ANY FOUR** questions: **(4x7.5=30)**

11. (a) Define mean free path. [2]
    (b) Obtain an expression for the mean free path. State your assumptions clearly. [5.5]

12. Discuss Andrew's experiment on CO_2. Cooling.

13. a) Define intensive and extensive variables with examples. [3]

    b) One mole of a gas, assumed to be perfect, at $0^{o}C$ is heated at constant pressure till its volume is twice its initial value. Calculate the amount of heat absorbed. Given C_V = 20.9J/mol.-K and R=8.3J/mol.-K. [4.5].

14. Obtain the following expression for the Joule-Kelvin coefficient,
    $\mu = \frac{T^2}{C_P}(\frac{\partial}{\partial T}(\frac{V}{T}))_P$.

15. a) Define phase space, microstate and macrostate. [4.5]

    b) How many ways can 3 particles be distributed among 4 states according to the two statistics. [3]

PART – C

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

16. a) Define Brownian motion. [2]

b) Discuss the Langevin's theory of Brownian motion. [10.5]

17. a) Explain Clement and Desormes method for determining $\gamma = \frac{C_P}{C_V}$. [9.5]

b) Given C_V = 20.3J/mol.-K and R =8.3J/mol.-K, calculate γ the ratio of specific heats. [3.0]

18. a) Derive the Clausius-Clayperon equation involving the latent heat. [6]

b) Derive the Clausius inequality. [6.5]

19. a) Obtain the expression for the change in the entropy of an ideal gas. [7.5]

b) One moles of an ideal gas occupies 10 liters of volume at 4 atm. The gas is heated at constant volume till its pressure is 8atm. Then it is allowed to expand at constant pressure. If its final volume is 40 liters, calculate the change in its entropy. Given C_V = 3 cal/mol-K and R = 2 cal/mole-K. [5]

20. Outline the Plande's quantum theory & Black body radiation. Hence establish wien's displacement law and Stefan's law.

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