LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

THIRD SEMESTER – APRIL 2010

PH 3505/PH 3503 - THERMODYNAMICS

Date & Time: 26/04/2010 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

SECTION – A

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

1. State the basic assumption made in the kinetic theory of gases.
2. Calculate the average kinetic energy of an air molecule at 27℃
3. Define the molar specific heat at constant volume and at constant pressure. Which has a greater value?
4. What is Super fluidity?
5. Define coefficient of volume expansion at constant pressure and coefficient of adiabatic compressibility.
6. State the first law of thermodynamics.
7. Define Helmholtz and Gibbs functions.
8. State Eherenfest's classification of phase transitions.
9. Distinguish between the micro and macro state of a thermodynamic system.
10. State Wien's displacement law.

SECTION – B

Answer **Any FOUR** of the questions (**4x7.5=30 marks)**

11. (a) Define mean free path. [2]

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

12. Explain liquefaction of air by Linde's process.

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 any two of the Maxwell's thermodynamic relations.

15. a) Define solar constant. (2).

    b) Obtain an expression for the solar constant in terms of the Sun's temperature, its radius, the mean Sun-Earth distance. (5.5).

(P.T.O.)

SECTION-C

Answer **Any FOUR** of the questions (4x12.5=50 marks**)**

16. What is Brownian motion? Explain Brownian motion on the basis of Langevin's theory.

17. a) From the first law of thermodynamics, obtain the relation:
$C_P - C_V = \{(\frac{\partial U}{\partial V})_T + P\}(\frac{\partial V}{\partial T})_P$ .Hence obtain the Mayer's relation. (7.5)

b) Describe the properties of He II. (5)

18. a) Obtain the Clausius inequality. (8)

b) Calculate the increase in entropy of one gram of hydrogen when its temperature is raised from -173℃ to 27℃ and its volume becomes four times its initial volume. Given C_V = 20.3J/mol.-K and R = 8.3J/mol.-K. (4.5)

19. a) Obtain an expression for the Joule- Kelvin coefficient 'μ'. (7)

b) Describe an experiment to determine the latent heat of steam. (5.5)

20. For an ideal Bose gas, obtain the Bose-Einstein distribution for the number of particles N_i in each energy level E_i.

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