

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



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

**THIRD SEMESTER – NOVEMBER 2011**

**PH 3505/PH 3503 - THERMODYNAMICS**

Date : 03-11-2011

Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**SECTION –A**

**Answer ALL questions**

(2x10=20 Marks)

1. Define mean free path of a gas.
2. State the principle of equipartition of energy.
3. State the first law of thermodynamics.
4. Give the Mayer's relation and explain the terms used.
5. Calculate the change in entropy when 1 kilogram of water at  $100^{\circ}\text{C}$  is converted to steam at the same temperature assuming the latent heat of vapourisation of steam to be 540 cal/gm.
6. Distinguish between Helmholtz and Gibb's function.
7. Explain a reversible change with a suitable example.
8. What is Joule Kelvin effect?
9. Draw the black body spectrum and label the axes.
10. Define solar constant and give the S.I unit for the same.

**SECTION –B**

**Answer any FOUR Questions**

(4x7.5=30 Marks)

11. Show that the coefficient of thermal conductivity of a gas is directly proportional to the square root of the absolute temperature.
12. Discuss Andrew's experiments on  $\text{CO}_2$ . Hence give the results of the experiments. (5+2.5m)
13. Derive Clausius -Clayperon latent heat equation. Mention one application. (6+1.5m)
14. Show that the maximum work done between two equilibrium states at the same temperature is equal to the decrease in the Helmholtz function.
15. Distinguish between microstates and macro states. What is phase space? Show that the volume of phase space is proportional to the cube of the Planck's constant. (2+2+3.5m)

**SECTION –C**

**Answer any FOUR Questions**

(4x12.5=50 Marks)

16. Give two important postulates of the kinetic theory of gases. Hence derive an expression for the pressure exerted by a gas. (2+10.5 marks)
17. Explain how regenerative cooling can be used to reach low temperatures in Linde's liquefier. Discuss superfluidity in Helium. (8+4.5 marks)
18. What is meant by phase change? Derive Ehrenfest's relations of phase transitions. (4+8.5marks)
19. Derive four Maxwell's relations from first principles.
20. Explain the theory of black body emission. Give the Planck's law of radiation. Derive the Wien's displacement law from the Rayleigh Jean's law. (3+3+6.5marks)

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