B.Sc. (Hons) Physics,
Class: VI Sem, Sec.-A
Paper: Statistical Mechanics
Teacher: Dr. Arpita Vajpayee

As we have started the "Bose-Einstein Statistics". Following topics will be discussed in this week:

1) Radiation as a photon gas
2) Partition function and Thermodynamic functions of photon gas
3) Bose derivation of Planck's law

Please read the above mentioned topics.

I am available for discussion on the class WhatsApp group at the time of our scheduled class according to the timetable. You can post your doubts/queries on this group. E-books have already been shared on the class WhatsApp group.

Numerical problems:

Q-1) Blackbody radiation in an enclosure is made to undergo adiabatic change at a pressure of 1.49×10^{-2} Nm^{-2}. Calculate the final pressure, if the volume of the enclosure (a) increases by a factor of 2 and (b) decreases by a factor of 2.

Q-2) Four weakly interacting particles are confined to a cubical box of volume V, with the energy of any one particle of the form –

$$E = \pi^2\hbar^2 (n_x^2+n_y^2+n_z^2) \ / \ 2mV^{2/3}$$

Where n_x, n_y and n_z are natural numbers. What is the energy of the system at absolute zero if the system is Bosonics? Ignore spin.

Q-3) Consider a system of two weakly interacting particles. Each particle can be in one of two states with the energies 0 and ε respectively. Calculate the partition function of the system if the system is Bosonic.

Please send your solutions by e-mail.

Assignment problem:

A-1) How many photons are present in 1 cm^3 of radiation at 727 ^oC? What is their average energy? { Given $\int \frac{x2dx}{ex-1} = 2.405$ }