

Haldia Institute of Technology
Department of Applied Science

Assignment - VI

Course: PH 301/PH 401

Module 2: Statistical Mechanics

1. Define (i) phase space, (ii) microstate (iii) macrostate and (iv) thermodynamical probability.
2. Define thermodynamical probability. Obtain the relation between entropy and thermodynamical probability.
3. Write the basic postulates of MB, BE and FD statistics.
4. What do you mean by occupation index? Write the expression for occupation index (distribution function) for MB, BE and FD statistics.
5. Three distinguishable particles, each of which can be in one of the $E, 2E, 3E$ and $4E$ energy states having total energy $6E$. Find all possible distributions of particles in energy states. Find the number of microstates in each case.
6. Distribute two particles in three different states according to (i) MB, (ii) BE and (iii) FD statistics.
7. What do you mean by degeneracy.
8. What are the fermions and bosons? Give two examples of each.
9. What do you mean by density of states. Show that how density of states depends on mass and energy.
10. Sketch the Fermi distribution for $T=0K$ and $T>0K$ and explain.
11. Express the Fermi level in a metal in terms of free electron density.
12. What do you mean by Fermi energy? Show that it is independent of temperature.
13. Prove that at $0K$ the average energy is $\frac{3}{5} \epsilon_F$.
14. Give an expression of BE statistics and hence obtain Planck's formula of black body radiation.