

**CITY COLLEGE**  
**Internal Examination 2021–2022**  
**Physics (Hons.) CBCS Semester 5**  
**Paper: CC12 (Statistical Physics)**  
**Time: 1 Hour; Full Marks: 20**

Answer any ten questions from the following:

10×2 = 20

1. What do you mean by macrostate? Give example.
2. What are canonical and grand canonical ensembles?
3. Calculate the number of microstates for a linear harmonic oscillator (L.H.O.) within an energy interval  $E_1$  to  $E_2$ ?
4. What do you mean by phase space?
5. If a system having  $N$  non-interacting particles of spin half, then what will be its maximum entropy at equilibrium state?
6. Explain briefly about Gibb's paradox?
7. Evaluate the partition function for a one-dimensional classical oscillator at a temperature  $T$  and hence find the mean energy of the oscillator.
8. What do you mean by super fluid? Give an example.
9. At what condition quantum statistics reduces to classical statistics?
10. What do you mean by Fermi energy?
11. What is Rayleigh- Jeans Law?
12. What is chemical potential?
13. What do you understand about Bose-Einstein condensate?
14. The temperature of a cavity of fixed volume is doubled. How black-body radiation inside the cavity changes?
15. Consider a system whose three energy levels are given by  $0$ ,  $\epsilon$  and  $2\epsilon$ . The energy level  $\epsilon$  is two-fold degenerate and the other two are non-degenerate. Find out the partition function of the system with  $\beta = \frac{1}{k_B T}$ .

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Answer scripts must be emailed to [sem5hcityphysics@gmail.com](mailto:sem5hcityphysics@gmail.com) within 30 minutes of the end of the examination.