

PG (CBCS)
M.SC. Semester- IV Examination, 2026
PHYSICS
PAPER: PHS 403
(STATISTICAL MECHANICS - II)

**Full Marks: 20****Time: 1 Hours**

The figures in the right-hand margin indicate full marks.
 Candidates are required to give their answers in their own words as far as practicable.

GROUP-A

Answer any **TWO** of the following questions: 2×2=4

1. Under what condition F-D statistics reduced to M-B statistics?
2. Explain why helium is called superfluid?
3. What is de Hass-van Alphen effect?
4. Determine the Bose temperature of bosons each of mass 6.65×10^{-27} kg and spin zero, their concentration being 10^{26} m^{-3} .

GROUP-B

Answer any **TWO** of the following questions: 2×4=8

5. What do you mean by triple point of a substance? Show that the triple point of a substance is unique. The coordinates of the triple point of water are $t = 0.0075^\circ\text{C}$ and $p = 0.0060$ atmosphere. Calculate the slope of the ice line in atmosphere/ $^\circ\text{C}$.
6. What is Brownian motion? Give Einstein's theory of Brownian movement.
7. Derive the expression of Pauli's paramagnetic susceptibility using F-D statistics.
8. Show the average energy of electron at absolute zero temperature, $\langle E_0 \rangle = \frac{3}{5} \frac{\hbar^2}{2m} (3\pi^2 n)^{2/3}$, where the symbols have their usual meaning.

GROUP-C

Answer any **ONE** of the following questions: 1×8=8

9. What do you mean by cooperative phenomenon? Explain Ising model. Obtain the expressions for entropy and free energy using Bragg-William approximation under this model. 2+2+4
10. Explain Bose- Einstein condensation. Hence find out the expression of Boson temperature (T_B) of a gas. Prove that for 2-D gas B.E condensation is not possible. 2+3+3

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