

DEPARTMENT OF SCIENCES, IV SEMESTER M.Sc., (PHYSICS)

END SEMESTER EXAMINATION

SUBJECT: STATISTICAL MECHANICS; Subject Code: PHY 6201

Time: 3 Hrs Date: 02-05-2022 MAX. MARKS: 50

Note: Answer ALL questions. Any missing data may suitably be assumed.

 (a) What are Thermodynamic potentials? Obtain Maxwell's Thermolynamics. (b) Using Maxwell's second Thermodynamic equation, obtain Clausius latent heat equation. 	modynamic [06] -Clapeyron [04]
2. (a) Obtain Gibb's Helmholtz energy relations.	[04]
(b) Show that The pressure of a system of nonrelativistic, non-interacting precisely equal to two-thirds of its energy density.	particles is [03]
(c) Explain briefly microcanonical, canonical and grand canonical ensembles. [03]	
3. (a) State and prove Liouville's Theorem.	[05]
(b) What is Gibb's paradox? Obtain Sackur-Tetrode equation.	[05]
4. (a) Show that for a system in canonical ensemble, Thermodynamical entropy $S = k \log Z + (U/T)$, where Z is partition function, U is the internal energy and T is the absolute temperature of the system. [03]	
(b) Obtain expressions for the partition function z of a perfect monatomic gas in ensemble.	a canonical [03]
(c) Obtain expressions for Helmholtz free energy and statistical entropy of perfect gas in a canonical ensemble.	t monatomic [04]
5. (a) Explain with the help of necessary theory the phenomenon of Bose-Einstein condensation. [05]	

(b) Discuss the Pauli's theory of Para magnetism of an ideal Fermi gas and derive expressions for the magnetic susceptibility. [05]

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