MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

REG NO										

DEPARTMENT OF SCIENCES, M.Sc (PHYSICS)

FOURTH SEMESTER M.Sc (PHYSICS) END SEMESTER EXAMINATION, JUNE 2021

SUB: THERMODYNAMICS AND STATISTICAL PHYSICS (PHY- 5202)

(REVISED CREDIT SYSTEM)

TIME: 2 HRS. DATE: 10-06-2021 **MAX. MARKS: 40**

NOTE: NOTE: (A) ANSWER ANY FOUR FULL QUESTIONS. (B) EACH QUESTION CARRIES 10 MARKS.

1A. What do you mean by entropy?. **[2+3 =5]**

Show that for a reverible process

$$(S_f - S_i) = C_V \log_e\left(\frac{P_f}{P_i}\right) + C_P \log_e\left(\frac{V_f}{V_i}\right)$$

Where symbols have their usual meanings.

1B. Calculate the change in the boiling point of water when it is subjected to a pressure of 100 atmospheres. Density of water = 1.01 g/cm^3 and Latent heat of water= 540 cal/g**.** **[5]**

2A. Obtain Gibbs-Helmholtz energy relations. What is the significance of these relations in Thermodynamics? **[5]**

2B. Obtain TdS relations, where symbols have their usual meanings. **[5]**

3A. Define chemical potential. Obtain expressions for chemical potential in terms of entropy, Helmholtz free energy and Gibbs free energy. **[5]**

3B. State and prove H-theorem. **[5]**

4A. Derive an expression for statistical entropy with reference to a microcanonical ensemble. **[5]**

4B. Obtain conditions for (a) thermal (b) particle equilibrium in terms statistical thermodynamic parameters**.** **[5]**

5A. What do you mean by a partition function? Obtain an expression for partition function of a gas molecule in a canonical ensemble. **[1+4=5]**

5B. Obtain an expression for the grand partition function of perfect/ideal gases. **[5]**

6. Give an account of Bose-Einstein Condensation and show that pressure exerted by the Bose particles in the excited state is about the half of the pressure exerted by Boltzmann gas**.** **[10]**