

RAN-2103000206021004

T.Y.B.Sc. (Semester-VI) Examination March - 2026

Physics (Paper-609) (Old)

Statistical Mechanics and Theory of Relativity

Time: 2 Hours]

[Total Marks: 50

સૂચના : / Instructions (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fill up strictly the above details on your answer book. (2) Question paper carries total five questions. Numbers on right indicate full marks of the question. (3) Draw neat diagram wherever necessary. (4) Symbols used in paper have their conventional meanings..	Seat No.: <table border="1"> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> Student's Signature						

- Q-1. Answer in short as directed: 10**
- 1) In relativity can we accelerate a particle to infinite speed?
 - 2) Define the thermodynamic probability.
 - 3) What do you mean by partition function?
 - 4) What is the value of C_v of hydrogen gas at room temperature?
 - 5) Electrons are (Fermions, Bosons)
 - 6) Give the transformation equations for the component of momentum.
 - 7) Why the value of potential energy of an ideal gas is zero?
 - 8) Write a four or five sentences on mass in relativity.
 - 9) Explain how the kinetic Energy varies with velocity.
 - 10) What is the difference between kinematics and dynamics?
- Q-2. a) Attempt any one of the following: 07**
- 1) Derive the expression for thermodynamic probability of N-distinguishable particles for a classical statistics.
 - 2) Derive the Bose-Einstein distributive law.
- Q-2. b) Attempt any one of the following: 03**
- 1) The system consisting of three particles which can exist in four different energy states. Calculate the number of ways in which these particles can be distributed in a given state for Fermi-Dirac statistics.
 - 2) Write a short note on comparison of different distribution function.
- Q-3. a) Attempt any one of the following: 07**
- 1) Derive the equation of internal energy for an ideal gas.
 - 2) What is Gibb's paradox? Explain in detail.

Q-3. b) Attempt any one of the following: 03

- 1) Explain stimulated emission with diagram.
- 2) Derive the expression $S = Nk_B \ln z + \beta k_B U$.

Q-4. Attempt any one of the following: 10

- 1) Explain in detail why the redefining of momentum in relativity is required.
- 2) Derive relativistic expression of total energy of particle.

Q-5. Attempt any one of the following: 10

- 1) Derive the equation for electric field of a uniformly moving charge.
- 2) Prove that in relativity acceleration is not parallel to applied force.
