NORTH GAUHATI COLLEGE

SESSIONAL EXAMINATION-2025

FYUGP SEMESTER-IV
SUB: CHEMISTRY Major
Paper name: Theoretical Chemistry-1
Paper code: CHE0400304

TOTAL MARKS: 30 **TIME: 1½ Hr**

The figures in the margin indicate full marks for the questions.

1. What are causes of failure of classical mechanics? 2
2. What is black body radiation? 2
3. Calculate the value of the Rydberg constant of hydrogen atom in eV. 3
4. Calculate the de-Broglie wavelength of an electron (m=9.1 $\times 10^{-31}$ kg) moving at 1% speed of light. (h-6.626 × 10-34 kgm^2S^{-1}) 3
5. What do you mean by zero point energy of a linear harmonic oscillator? 2
6. What will happen if the walls of one-dimensional box are suddenly removed? 2
7. Write an expression for Schrodinger wave equation. Explain the significance of the terms involved. 3
8. An electron in 1-D box of length 10 nm undergoes transition from the ground state to the first excited state. Calculate wavelength of the photon absorbed. 3
9. Using the principle of LCAO for the wave function for H_2^+ ion, obtain the normalized wave functions for the bonding molecular orbitals. 2
10. What are the postulates of valence bond theory? 3
11. What type of intermolecular forces exist between the following substances: 3
    N2, HCl, NaCl
12. For a particle of 3-D box, calculate the degeneracy of energy level $14h^2/8ma^2$. 2

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