



Mahila Vikas Sanstha's

**INDRAPRASTHA NEW ARTS  
COMMERCE & SCIENCE  
COLLEGE,** AT POST NALWADI, DIST. WARDHA (M.S.)

Accredited 'B' by NAAC

Approved by government  
of Maharashtra

Affiliated to Rashtrasant Tukadoji  
Maharaj Nagpur University, Nagpur

Recognised by U.G.C New Delhi  
under section 2 (f) & 12 (b) of  
UGC act 1956

## QUESTION BANK

### PAPER III (*PHYSICAL CHEMISTRY*)

2022 - 2023

### M.SC 2<sup>nd</sup> SEMESTER

1. For an atom like Hydrogen give the expression for Hamiltonian in Polar coordinates. Separate then equation in Radial and Angular/Azimuthal Part and discuss their significance.
2. What is quantum mechanical tunneling ? Prove that there is a definite probability for a particle to cross a potential barrier of definite thickness quite in contradiction to classical predictions.
3. Derive the expression for energy of rigid rotor.
4. What are thermodynamic functions of mixing ? Derive the expression for free energy of mixing.
5. Define the excess thermodynamics functions. Derive the expressions for Excess chemical potential and excess Gibbs free energy.
6. What is lattice constant ? Derive the relation between lattice constant and density.
7. Write notes on :
  - (i) Color centers.
  - (ii) Non-stoichiometry in crystals.
8. Using the Lagrange's method of undetermined multipliers derive the Maxwell-Boltzmann distribution.
9. Write descriptive notes on :—

**(i) Radiometric titration**

**(ii) GM Counter.**

**10. Derive the expression for linear momentum operator of a particle moving in the x-direction.**