6213

M.Sc. (CHEMISTRY) 1ST SEMESTER EXAMINATION, 2019
Paper – III
PHYSICAL CHEMISTRY

Time: Three Hours

Maximum Marks: 80

PART – A (खण्ड – अ)   [Marks: 20]

Answer all questions (50 words each).

All questions carry equal marks.

सभी प्रश्न अनिवार्य हैं। प्रत्येक प्रश्न का उत्तर 50 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART – B (खण्ड – ब)   [Marks: 40]

Answer five questions (250 words each).

Selecting one from each unit. All questions carry equal marks.

प्रत्येक इकाई से एक–एक प्रश्न चुनते हुए, कुल पाँच प्रश्न कीजिए।

प्रत्येक प्रश्न का उत्तर 250 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART – C (खण्ड – स)   [Marks: 20]

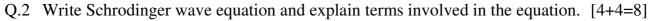*Answer any two questions (300 words each).*

All questions carry equal marks.

कोई दो प्रश्न कीजिए। प्रत्येक प्रश्न का उत्तर 300 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART – A

Q.1 (i) What is the significance of wave function ψ? [2]

(ii) What do you mean by orthogonal wave functions? [2]

(iii) What do you mean by Eigen functions? [2]

(iv) Determine the ground state term symbol for carbon atom. [2]

(v) What do you mean by rate law for any chemical reaction? [2]

(vi) What do you mean by steady state condition? [2]

(vii) Define a catalyst. [2]

(viii) Give one characteristic feature of fast reactions. [2]

(ix) Give an example of electrically conducting polymer. [2]

(x) Give an example of liquid crystal polymer. [2]

PART – B
UNIT –I

Q.2 Write Schrodinger wave equation and explain terms involved in the equation. [4+4=8]

OR

Q.3 (i) Explain degenerate and non – degenerate states.

(ii) What is variation theorem?

UNIT –II

Q.4 (i) If $\cos \theta = \frac{m\ell}{\sqrt{\ell \, (\ell+1)}}$, then find the values of θ between L_z and L for $\ell = 1$. [3+5=8]

(ii) If π – electron energy of ethylene is $2\alpha + 2\beta$ and π-electron energy of butadiene is $4\alpha + 4.472\beta$, then calculate the delocalization energy of butadiene.

OR

Q.5 (i) What do you mean by anti-symmetric principle?

(ii) Write Huckel approximations to solve the secular determinant for Molecular orbitals.

UNIT –III

Q.6 (i) Describe half – life method for determination of order of a chemical reaction. If half – life of a reaction under an initial pressure of 1 atm. is 2 seconds and when initial pressure is reduced to 0.1 atm., the half – life becomes 20 seconds. Determine the order of reaction. [4+4=8]

(ii) A reaction is 20% complete in 15 minutes at 40°C and in 3 minutes at 60°C. Calculate its activation energy.

OR

Q.7 (i) What are the characteristic features of complex reactions and explain the steady state principle?

(ii) Give the demerits of collision theory and what do you mean by the steric factor?

UNIT –IV

Q.8 Describe the differences between thermal and photochemical reactions. [4+4=8]

OR

Q.9 Describe the features of Oscillatory reactions.

UNIT –V

Q.10 (i) Describe the mechanism of polymerization. [4+4=8]

(ii) Describe the light scattering method for determination of molecular mass of polymer.

OR

Q.11 Write a short note on –

(a) Conducting polymers and

(b) Fire resistant polymer

PART – C

Q.12 (i) Derive the expression for normalized wave function of a particle in one – dimensional box of length 'a'. [6+4=10]

(ii) A particle of mass 'm' is confined in a one – dimensional box of length 'a'. Calculate the probability of finding the particle in the region $0 \leq x \leq \frac{a}{2}$.

Q.13 Using Huckel approximations, calculate the energies of MOs of allyl radical. [10]

Q.14 What do you mean by homogeneous and heterogeneous catalysis. Explain kinetics of enzyme reactions. [10]

Q.15 Give mechanism of chain reaction and compare the kinetics of Hydrogen – bromine and Hydrogen – chlorine reactions. [10]

Q.16 Write short notes on the followings – [5+5=10]

(a) Number and mass average molecular mass of a polymer.

(b) Describe Sedimentation and Viscometry techniques for determination of mass of a polymer.