(i) Printed Pages : 4] Roll No. .....

(ii) Questions : 9] **Sub. Code : 0 4 5 3**

Exam. Code : 0 0 0 5

B.A./B.Sc. (General) 5th Semester Examination

1127

CHEMISTRY

(Physical Chemistry–A)

Paper : XIX

(Same for B.Sc. Microbiology and food Technology)

Time : 3 Hours] **[Max. Marks : 22**

Note :– Attempt *one* question form each Unit. All questions carry equal marks (Unit I–IV). Q. No. **9** is compulsory (6 marks).

Unit–I

1. (a) What is Compton Effect ? What is "Comptons shift"? Write expression for Compton shift and explain the results obtained for scattering angles of 0°, 90° and 180°. How does is explain the results of Heisenberg's uncertainty principle ?

(b) What are the postulates of quantum mechanics ? Based on the postulated of quantum mechanise, derive Schrodinger wave equation. 2,2

2. (a) What is an operator ? When are the operators said to commute ? Explain with an example that the operators usually do not commute. What is the commutator of the two operators $\hat{A}$ and $\hat{B}$? What is its value when the operators commute ?

(b) What is the ground state energy for an electron which is confined to a potential well (one-dimensional) bar having a width of 0.5 nm ? 2,2

Unit–II

3. (a) Using LCAO-MO method, derive expressions for molecular orbital wave functions. Compare the calculated value of energy with the experimental value on the energy versus inter-nuclear distance diagram.

(b) Apply quantum mechanical principles to calculate coefficients of atomic arbitals in sp^3 hybrid orbitals. 2,2

4. (a) H-Cl has about 18% ionic character. What function of contribution of ionic structures will be towards the valence bond wave function ?

(b) Compare the main features of the Valence Bond Model with those of the Molecular Orbital Model. 2,2

Unit–III

5. (a) Define 'Photochemistry'. Give *two* examples of photo physical processes and *two* examples of photochemical reactions. Give at least three points in which photochemical reactions differ form thermochemical reactions.

   (b) Find the value of an Einstein of energy for the radiation of wavelength 4680 Å. 2,2

6. (a) What do you understand by the terms spin multiplicity, singlet states and triplet states. Explain the phenomenon of fluorescence and phosphorescence using Jablonshi diagram.

   (b) State and explain first and second law of photochemistry. 2,2

Unit–IV

7. (a) What do you mean by quantum yield of a photochemical reaction ? Explain why photosynthesis of HCl has very quantum yield while that of photosynthesis of HBr is very low ?

   (b) What is a chemical actiometer ? Explain the working of uranyl oxalate actiometer. 2,2

8. (a) Explain the "Photosensitization" with at least three examples about their mechanism.

(b) What mechanism has been proposed to explain photolysis of acetone ? 2,2

Unit–IV

(Compulsory Question)

9. (a) Write the expression for the angular and the radial wave function. What do different symbols signify ?

(b) How do spectral distribution curves of black body radiation prove Wien's displacement law ?

(c) What is Born-Oppenheimer approximation in Quantum Mechanics ?

(d) What are grade and ungrade molecular orlitals ? Explain with suitable examples.

(e) What are Photo-inhibitors ? How do they work ?

(f) What is the physical significance of molar extinction coefficient or molar absorpitivity ? 6×1=6