

**M.Sc Chemistry - 2nd Semester**  
(2721)

**Paper: Course-X Physical Chemistry - Quantum Chemistry**

Time Allowed: 2 hrs.

Max. Marks: 50

**Note: There are EIGHT questions of equal marks. Candidates are required to attempt any FOUR questions.**

**Section-A**

1. Write a note on
 

(a) Heisenberg's Uncertainty principal	3.5
(b) Compton effect	4.5
(c) Rydberg relation	4.5
2. (a) Explain the solution of classical wave equation by separation of variable method. 9  
 (b) Calculate the short and long wave length limits of Lyman series in the spectrum of hydrogen atom. ( $R_H = 109691 \text{ cm}^{-1}$ ) 3.5

**Section-B**

3. Write a note on
 

(a) Unity operator	(b) eigen value equation	(c) Hamiltonian operator	2.5+5+5
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4. (a) Write postulates of quantum mechanics. 9  
 (b) Show that commutator  $\left[x, \frac{d}{dx}\right] = -1$ . 3.5

**Section-C**

5. Derive the solution of Schrodinger wave equation for particle in three-dimensional box. 12.5
6. (a) Write a note on transformation of cartesian coordinate into polar coordinate. 8  
 (b) Show that  $[\hat{L}_y, \hat{L}_z] = i\hbar\hat{L}_x$  4.5

**Section-D**

7. Explain charge density calculation for ethylene molecule. 12.5
8. Explain Variation method for Helium atom. 12.5