Jashore University of Science and Technology

Department of Physics

Bachelor of Science with Honours in Physics

1st semester of 3rd year, Academic session: 2023–2024

Course code.: PHY 3103 **Course title: Quantum Mechanics I**

Assignment no.: 01 **Date: July 27, 2025**

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1. What is the basic postulate of the Bohr model regarding electron orbits? Why does the electron not spiral into the nucleus in Bohr's model?

2. What does it mean when we say "energy is quantized"? Why do atoms emit photons of only specific wavelengths?

3. What does the correspondence principle state? Why is the correspondence principle important in quantum mechanics?

4. What does the complementary principle mean in quantum mechanics? Can we observe both wave and particle nature at the same time? Explain briefly.

5. Why are expectation values useful in quantum mechanics? What is the difference between a measurement result and an expectation value?

6. What is the momentum space wave function? Can a wave function be normalizable in both position and momentum space?

7. What is meant by the conservation of probability? Why must the total probability be conserved?

8. State Ehrenfest's theorem for position and momentum. What does Ehrenfest's theorem imply in the classical limit?

9. State the condition for an observable $\hat{A}$ to be conserved in time. If $[\hat{A}, \hat{H}] = 0$, what can you say about $\hat{A}$?

10. Prove that the product of two Hermitian operator is a Hermitian operator if they commute.