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School of Basic Sciences

Master of Science in Chemistry
Mid Term Examination - Nov 2023

Duration : 90 Minutes
Max Marks : 50

Sem I - C1PK101T - Basic Concepts of Physical ChemistryGeneral Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Summarize commutator operators in quantum mechanics? K2 (2)
- 2) Why do particles at the quantum level exhibit both particle-like and wave-like behavior? K1 (3)
- 3) Illustrate the commutative property of operators in quantum mechanics with an example K2 (4)
- 4) Explain the concept of a particle in a one-dimensional box. What is its significance in quantum mechanics? K2 (6)
- 5) utilize concept of normalization in quantum mechanics to find normalization constant of a wave function $\Psi(x, t) = \sin np_x$ with in limits 0-p using momentum operator? K3 (6)
- 6) Apply the phase rule to a simple binary system containing two components (e.g., water and ethanol) and explain what the resulting degrees of freedom mean for this system. K3 (9)
- 7) Compare the boundary conditions for the wave function in a 1D box to those in a 2D or 3D box? K4 (8)
- 8) Predict the behavior of a particle in a one-dimensional infinite potential well according to quantum mechanics. K4 (12)

OR

Predict how a decrease in the concentration of reactants would influence the rate of a reaction as per the collision theory. K4 (12)