

❖ Problems

- Q 1. State and explain the third postulate of quantum mechanics.
- Q 2. Why should the function representing a quantum mechanical state be continuous, single-valued and finite?
- Q 3. Why don't we report non-eigenvalues directly? What is the need for their expectation values?
- Q 4. Derive Schrodinger wave equation from the postulates of quantum mechanics.
- Q 5. What is the Max-Born interpretation of "wave function"? Explain in detail by taking the example of one-dimensional systems.
- Q 6. What is position-time uncertainty? How would you prove it for the photons passing through a slit of length d ?
- Q 7. What is operator commutation? Evaluate $[\hat{x}^2, \hat{p}_x]$.
- Q 8. Explain the energy-time uncertainty for a particle traveling along x -axis. Also, support your argument from the results of operator algebra.
- Q 9. What are Hermitian operators? Prove that the operators for linear momentum and angular momentum are Hermitian in nature.
- Q 10. Can the average value for the square of the Hermitian operator be negative? If not, explain why?
- Q 11. Derive and solve the Schrodinger wave equation for a particle moving in a one-dimensional box.
- Q 12. Prove the Heisenberg's uncertainty principle for the particle trapped in a one-dimensional box of length a . Also, comment on its validity in other systems.
- Q 13. Give the pictorial representation of the first three quantum mechanical states of a particle in a one-dimensional box. Also, formulate the corresponding symmetry and number of nodes.
- Q 14. Derive the relation between the box length and the wavelength of the particle in the 1-dimensional box.
- Q 15. What is zero-point energy? How is it created by a particle of mass m which is trapped in a one-dimensional box of length a .
- Q 16. What is the average position? How is it different from the "most probable position"?
- Q 17. State and explain the Bohr's correspondence principle.

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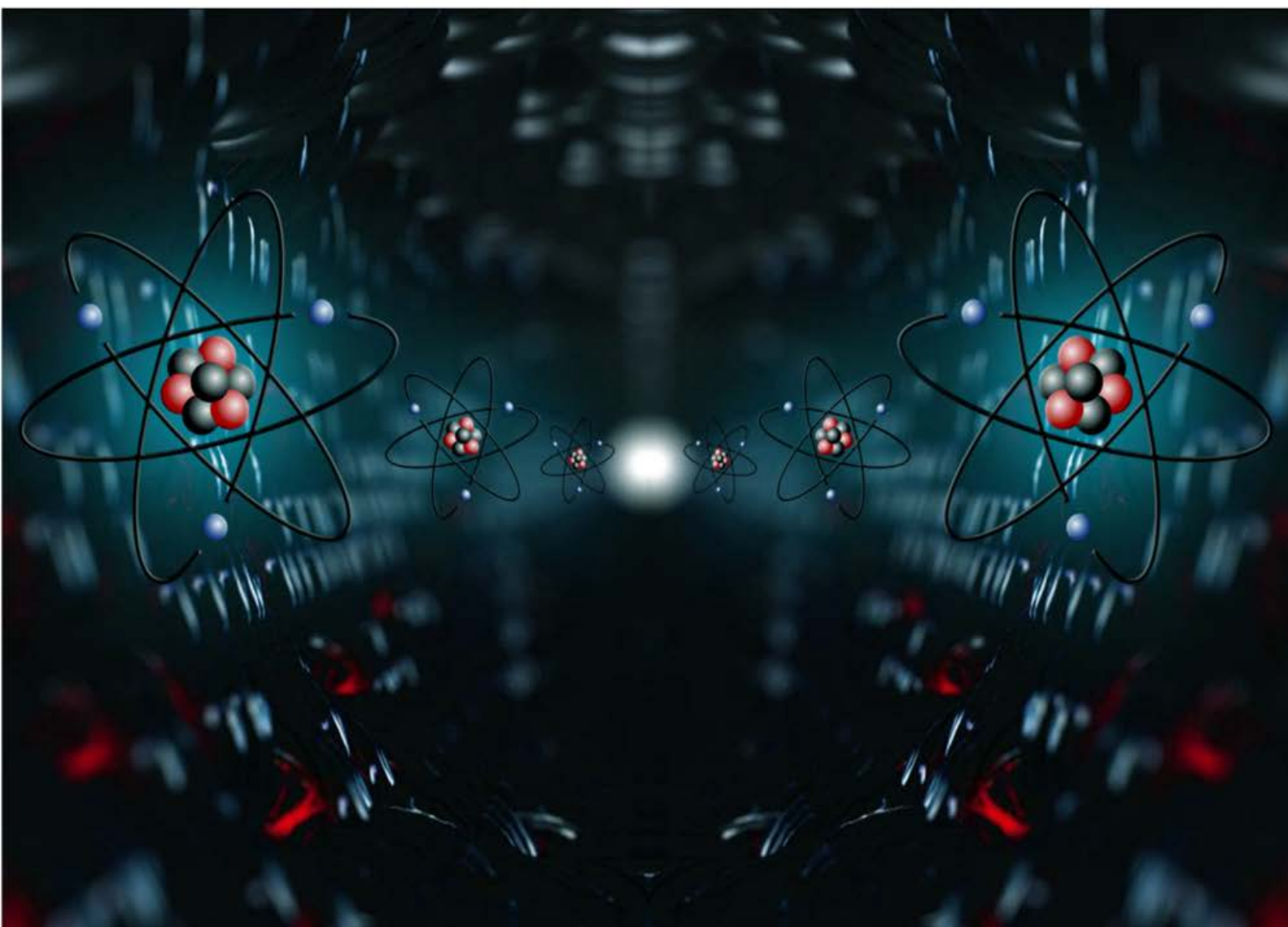
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A TEXTBOOK OF PHYSICAL CHEMISTRY

Volume I

MANDEEP DALAL



First Edition

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