

1. Identify a close physical example which matches with the theoretical concept of step potential.
2. What is quantu flux? On what factors does it depend?
3. How is the uncertainty principle applicable for particle in a step potential?
4. Write a note on frustrated total internal reflection.
5. When a particle tunnels through a barrier (even when it does not have enough energy) its energy remains unchanged. Explain why?
6. On what factors does the tunneling probability depend?
7. Exactly which idea brought in the concept of quantization in the process of the solution?
8. What is parity? Is it conserved always? Give examples.
9. What is a quantum dot?
10. Show that the Eigen energy values refer to states of standing waves.
11. How do the Eigen energy levels of the finite well compare with those of the infinite well of same width?
12. Outline the mathematical process of obtaining the Eigen values and Eigen functions for a particle in a finite well.
13. Give physical exapmles of a quantum linear harmoin oscillator.
14. Write a note on Hermite polynomials.
15. What is the potential used for a hydrogen atom model?
16. Why is the model solved in spherical polar coordinates?
17. How do different quantum numbers emerge in the solution?
18. What do you understand by degeneracy of energy states?
19. Derive expressions to count the number of energy states upto an energy  $E$  in 2D and 3D boxes.
20. Describe the Fermi Dirac distribution function.
21. What are Fermions? Give examples.
22. What is a Bose Einstein condensate?
23. Energy quantization for particle in a box and the application of Pauli exclusion principle are the defining features of a quantum free electron gas. Explian.
24. Write the differences between Fermions and Bosons.
25. Derive an expression for Fermi energy using the concept of density of states.

