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AKTU B.Tech 1st Year · Syllabus 2026-27 · CSE Stream

AAS101E / AAS201E

Quantum Physics & Applications

Complete Unit-wise Notes · Premium

263	5	53	5 yrs
pages	units, full syllabus	topics explained	AKTU PYQs solved (2021-22 → 2025-26)

1. Fundamentals of Quantum Mechanics
2. Quantum Theory of Solids
3. Quantum Computing and Communication
4. Photonics (Fibre Optics and Lasers)
5. Superconductors and Nanomaterials

This free sample includes: cover, full contents and one real page (Unit 1 · Topic 7 · Particle in a 1-D box, AKTU's most-asked question)

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All 5 units and 53 topics of the AKTU 2026-27 syllabus. Page numbers are PDF pages in the full notes (263 pages).

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Every topic follows the same 3 steps:
① **Before you start** — what you should already know
② **Let's understand it** — simple words, diagrams, solved examples
③ **AKTU PYQs with solutions** — real questions from 2021-22 to 2025-26, fully solved

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Topic 7 · Particle confined in a one-dimensional box

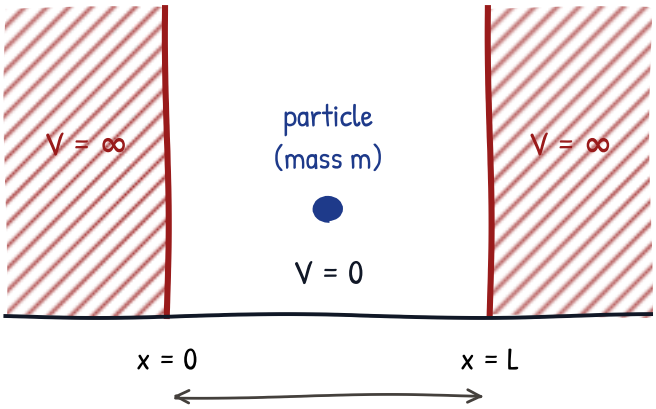
Before you start

- **TISE** (Topic 6): $\frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2}(E - V)\psi = 0$.
- **A standard maths result:** the equation $\frac{d^2y}{dx^2} + k^2y = 0$ has the solution $y = A\sin kx + B\cos kx$.
- **Sine facts:** $\sin 0 = 0$, $\cos 0 = 1$, and $\sin\theta = 0$ only when $\theta = n\pi$ (n = 0, 1, 2, …).
- **Useful integral:** $\int_0^L \sin^2\frac{n\pi x}{L}dx = \frac{L}{2}$.
- **$|\psi|^2$ = probability density** and total probability must be 1 (normalisation, Topic 8).

Let's understand it

The set-up. A particle of mass m moves freely along a straight line between two hard walls at x = 0 and x = L. The walls are infinitely high, so the particle can never get out. Think of a ball bouncing between two walls, but now we treat it as a quantum wave.

$$V(x) = 0 \text{ inside } (0 < x < L), \qquad V(x) = \infty \text{ outside}$$



Infinite potential well (the "box").

Solving it in 6 easy steps

1. **Outside the box** V = ∞, so the particle can't be there: ψ = 0 outside. Since ψ is continuous, **ψ(0) = 0 and ψ(L) = 0**. These are the boundary conditions.
2. **Inside the box** V = 0, so the TISE becomes $\frac{d^2\psi}{dx^2} + k^2\psi = 0$, where $k^2 = \frac{2mE}{\hbar^2}$.
3. **General solution:** $\psi(x) = A\sin kx + B\cos kx$.
4. **Use ψ(0) = 0:** $A\sin 0 + B\cos 0 = B = 0$. So $\psi(x) = A\sin kx$.

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The full AAS101E / AAS201E notes cover every unit the same way: from the basics, step by step, to fully solved AKTU questions.

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