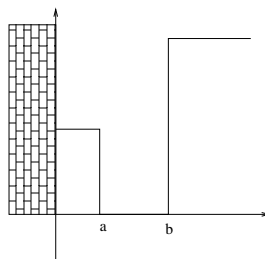


Question A particle of mass m moves in one dimension in a potential $V(x)$, (see figure).

$$V(x) = \begin{cases} \infty, & \text{for } x < 0; \\ V_0, & \text{for } 0 < x < a; \\ 0, & \text{for } a < x < b; \\ 2V_0, & \text{for } x > b. \end{cases}$$



- (a) What is the range of energies for which bound states may exist?
- (b) What is the degeneracy of continuous energy states?
- (c) For $0 < E < V_0$, write the solution of the Schrodinger equation in different regions and applicable boundary conditions.
- (d) Obtain the quantization condition for bound state energies. [2+2+6+2]

Category A: Marks 10/12

- **Category B: Marks 3/6**

Use of boundary condition on wave function at $x = 0$ is wrong.

$$\psi_{II}(x) = A_2 \exp(k_1 x) + A_2 \exp(-k_2 x); A_1, A_2 = 0$$

- **Category C : Marks 2/6**

- Wave functions computed correctly; Boundary conditions not applied.

- **Category F: Marks zero**

Regions R_1, R_2, R_3 .. not defined; Only three regions

Wave function for $x < 0$ is not set equal to zero;

Wrong expressions for α, k .

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