

Solutions

2.1 B Both wavefunction and first derivative are continuous at a finite step under these assumptions.

Compare the rejected options: Only $\psi=0$ at the edge; Continuous ψ' but arbitrary ψ ; Growing tails at infinity; The energy equals the wall height. Use the stated model and conditions.

2.2 C l can be 0 through 3, and $|m_l|$ cannot exceed l .

Compare the rejected options: (4,0); (3,4); (-1,0); (1,2). Use the stated model and conditions.

2.3 16. $\sum_{l=0}^3 (2l+1) = 1+3+5+7=16$.

2.4 True. Its external exponential tails are nonzero near the edges but integrable for $\kappa > 0$.

3.1 Interior norm is $A^2[a + \sin(2ka)/(2k)]$. Both tails contribute $A^2 \cos^2(ka)/\kappa$. Thus $A^{-2} = a + \sin(2ka)/(2k) + \cos^2(ka)/\kappa$ and $P_{out} = [\cos^2(ka)/\kappa]/[a + \sin(2ka)/(2k) + \cos^2(ka)/\kappa]$. Bound states require κ positive; a nondecaying threshold tail is not square integrable. Award interior integral, both tails, A , probability and threshold. The matching equation still applies.