

Solutions

2.1 C Energy scales as n^2 .

Compare the rejected options: 3; 6; The boundary conditions determine no energies; Replace $\hbar$ with h without changing the coefficient. Use the stated model and conditions.

2.2 B The modulus squared gives density.

Compare the rejected options: ψ ; the energy alone; The boundary conditions determine no energies; Replace $\hbar$ with h without changing the coefficient. Use the stated model and conditions.

2.3 8. $E_2=4E_1=8$ eV.

2.4 True. Integrating its probability density over the full domain gives one.

3.1 Results are E_1 with probability $1/5$ and $9E_1$ with probability $4/5$. $\langle E \rangle = 37E_1/5$; $\langle E^2 \rangle = 65E_1^2$. $\text{Var}(E) = 65E_1^2 - (37E_1/5)^2 = 256E_1^2/25$. The mean $7.4E_1$ is not a well eigenvalue. Award results, probabilities, mean, second-moment/variance calculation and interpretation.