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Problem Set #6

1. A particle of mass $m$ is trapped in a rectangular infinite well with side lengths $L_1 = L$, $L_2 = L/\sqrt{2}$, $L_3 = L/\sqrt{3}$. Make a table of $n_x, n_y, n_z$ values with corresponding values of $E$ for the six lowest energy eigenvalues with $E$ measured in units of $\frac{\pi^2\hbar^2}{2mL^2}$.

Problems 2-4 refer to: An electron is trapped in a rectangular infinite well with side lengths $L_1 = L$, $L_2 = L_3 = L/10$. Let $L = 2$ nm.

2. What are the electron’s ground state and first excited state energies (in eV). Use $\frac{\pi^2(hc)^2}{2mc^2L^2}$, where all quantities are in eV, eV-nm, or nm.

3. What is the wavelength of the photon that is emitted when the electron in problem 2 makes a transition from the first excited state to the ground state?

4. Suppose the energy of the electron state $(n_x, 1, 1)$ is greater than or equal to the energy of the state $(1, 2, 1)$. What is the smallest value of $n_x$ for which this is true?