Problems discussed in the videos:

Videos (1) – (8)

Consider the "particle in a box" model in which a particle is trapped in an infinitely deep potential well, with the ends of the box at x=0 and x=L. Then the allowed wave functions are:

$$\psi_n = \sqrt{\frac{2}{L}}\sin\left(\frac{n\pi x}{L}\right),$$

where n=1 is the ground-state wave function, n=2 is the first excited state, etc.

Here is a useful integral:

$$\int \sin^2(kx)\,dx = \frac{x}{2} - \frac{1}{4k}\sin(2kx) + C$$

(A) If the particle in the box is in the second excited state (i.e., n=3), what is the probability P that it is between x=L/3 and x=L?

(B) If the particle is in the first excited state, what is the probability that it is between x=0.1L and x=0.2L?

(C) If the particle is in the ground state, what is the probability that it is in a window Δx=0.0002L wide with its midpoint at x=0.700L? Since Δx is so small, you should be able to answer this part without evaluating any integrals!

(D) Assume a window Δx as in part (C). Compared to a particle in the ground state, is a particle in the first excited state more, less, or equally likely to be found in the window Δx?

Videos (9) – (10)

Consider the "particle in a box" (infinite potential well) model. Find the wavelength λ_n of the photon that must be absorbed by an electron to move it from the nth state of a box to the (n+1)th state. Assume that the box has length L and that the electron has mass m. Express your answer in terms of n, L, $\hbar$, the speed of light c, and m.

Video (13)

Consider the six hypothetical electron states listed in the table.

	n	l	m_l	m_s
A	3	1	-1	0
B	3	1	0	-½
C	3	0	1	-½
D	2	2	0	½
E	2	-1	0	-½
F	2	0	0	½

Which, if any, of these states are not possible?