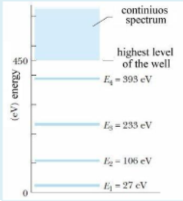
Infinite potential well

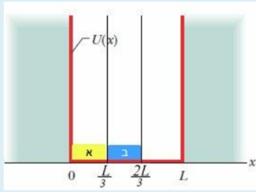
Problem 3-1
An electron is trapped in an infinite one-dimensional potential well, whose width is $L = 90\,[pm]$.
What should be the wavelength of light that provides the electron with the required energy to move from the first energy level E_1 (basic level) to the third level E_3 ?

Problem 3-2
The graph on the right shows the energy levels of the electron trapped in a one-dimensional potential well whose depth is $450\,[eV]$.
If the electron is in energy state $n = 3$,
what is its kinetic energy?



Problem 3-3
What should be the width L of an infinite one-dimensional potential well, so that the energy of the electron trapped in this well at the energy level $n = 3$ will be $E = 4.3\,[eV]$?

Problem 3-4
An electron is trapped in a potential well of width $L = 100\,[pm]$ at the ground state.
a) What is the probability that it will be found in the left third of the well (from $x_1 = 0$ to $x_2 = \frac{L}{3}$)?
b) What is the probability that it will be discovered in the third third of the well?



Problem 3-5
An electron is at a certain energy level in an infinite one-dimensional potential well between $x = 0$ and $x = L = 220\,[pm]$. The probability density of the electron is equal to 0 at the points $x = 0.30L$ and $x = 0.40L$, and it is not equal to 0 for intermediate values of x.
The electron moves to the next lower energy level and emits light.
What is the change in electron energy?

Problem 3-6
An electron is trapped in an infinite one-dimensional potential well of width $109\,[pm]$;
The electron is in the basic energy level (ground level).
What is the probability that the electron can be found in the area of $\Delta x = 3\,[pm]$

a) around $x = 22\,[pm]$ b) $x = 58\,[pm]$ c) $x = 90\,[pm]$?

Hint: Δx is so narrow that it can be assumed that the probability density is constant within it.

Problem 3-7
Graph A shows the energy levels of the electron trapped in a finite one-dimensional potential well.
A continuous spectrum starts at the level $E_4 = 475\,[eV]$. Graph B shows an absorption spectrum of the electron when it is at a ground state - it can absorb the following wavelengths:
$\lambda_a = 14.5\,[nm]$, $\lambda_b = 4.934\,[nm]$ and at any wavelength smaller than $\lambda_c = 2.911\,[nm]$.
Calculate the energy of the first excitation level.