Where to look for energy levels for various potential wells

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Potential wells where energy is known exactly:

Harmonic Oscillator: $E_n = \hbar\omega(n+½)$ n = 0, 1, 2, 3, …

Coulomb Potential: $E_n = - m(ke^2)^2/2\hbar^2n^2$. n = 1, 2, 3, 4, …

Note that for both of these wells, there are an infinite number of energy eigenstates, but we will need to stop counting at some point. For the Coulomb potential, we will just need to set some arbitrary number, since the lines just get closer and closer together forever. Set that arbitrary number to 10 for now, but make it easy to change. For the harmonic oscillator, if possible, you should stop counting when you reach 20 eV above the bottom of the well. The number of energy levels within this range will be $n = 20eV/\hbar\omega + ½$.

Potential wells where energy is not known exactly:

Square well (single and multiple)

Asymmetric well

Multiple Coulomb wells

For square and asymmetric wells, start looking for energy eigenstates at $E = C - U_0$ and stop looking at E = C.

For multiple Coulomb wells, the ground state should be somewhat lower than -13.6 eV, but we should be able to determine empirically where to start without too much trouble. The number to stop looking for energy states for multiple Coulomb wells should be equal to the number for a single well times the number of wells.

Constants set in code:

$\hbar = 0.658$

$ke^2 = 1.44$

Variables controlled by user:

ω – angular frequency

m – particle mass

C – offset

U_0 – depth.