(Modern Physics) **Quiz 4 - PHY244**

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Giving or receiving aid is cause for dismissal from the university.

$m_e c^2 = 511000$ eV , $c = 3 \times 10^8$ m/s , $hc = 1240$ nm·eV , $e = 1.6 \times 10^{-19}$ C .

♠ An electron is confined in a one-dimensional box of a size a with a ground state energy 0.15 eV (relative to the bottom of the potential well). It jumps down from the first excited state to the gound state by emitting a single photon. Find the wavelength (in nm) of the photon.

$E_1 = 0.15\,eV$

$E_2 = n^2 E_1$ with $n=2$

$= 4E_1 = 0.6\,eV$

$E_2 - E_1 = 0.45\,eV$

$$\lambda = \frac{hc}{\Delta E} = \frac{1240\,eV\cdot nm}{0.45\,eV} = 2756\,nm$$

♠ If the box size is reduced to 0.7 a Find the photon wavelength (in nm) of the corresponding transition from the first excited state to the gound state.

E_1 becomes $= \frac{0.15\,eV}{0.7^2} = 0.3061\,eV$

E_2 become $\frac{0.6\,eV}{0.7^2} = 1.224\,eV$

$E_2 - E_1 = 0.918\,eV$

$$\lambda = \frac{1240\,eV\cdot nm}{0.918} = 1351\,nm.$$