

NAME:  _____	Quiz #11b: Phys270
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1. [10 pts] An electron is confined in a harmonic potential well that has a spring constant of 1.5 N/m.

a. [7 pts] What are the first two energy levels of the electron?

$$E_n = (n - 1/2) \frac{h}{2\pi} \omega$$

where  $\omega = \sqrt{K/m} = \sqrt{1.5/(9.11 \cdot 10^{-31})} S^{-1} = 1.28 \cdot 10^{15} S^{-1}$ ,  $n = 1, 2, \dots$

$$E_1 = 1/2 * \frac{h}{2\pi} \omega = 6.7 \cdot 10^{-20} J = .42 eV$$

$\Rightarrow$

$$E_2 = 3/2 * \frac{h}{2\pi} \omega = 1.26 eV$$

b. [3 pts] What wavelength photon is emitted if the electron undergoes a transition from the  $n=2$  to  $n=1$  state?

$$h\nu = E_2 - E_1, \nu = \text{frequency} = c / \lambda$$

$$\Rightarrow hc / \lambda = (h / 2\pi) \omega$$

$$\Rightarrow \lambda = 2\pi c / \omega = 2 * 3.14 * 3 * 10^8 / (1.28 * 10^{15}) m = 1.47 * 10^{-6} m$$