

1. The ground state energy of a harmonic oscillator is 1.4 eV  
of the following energies can be the energy of an excited state?

$$E_{\text{pot}}(x) = \frac{1}{2} C \cdot x^2; \quad \omega = \sqrt{\frac{C}{m}};$$

$$u = \alpha x = \sqrt{\frac{\sqrt{Cm}}{\hbar}} x; \quad A_n = \sqrt{\frac{\alpha}{\sqrt{\pi} 2^n n!}}$$

$$E_n = \hbar \omega \left( n + \frac{1}{2} \right), \quad n = 0, 1, 2, \dots$$

$$|\psi_n(x)\rangle = A_n H_n(u) \cdot e^{-\frac{u^2}{2}};$$

$$H_0(u) = 1; \quad H_1(u) = 2u; \quad H_2(u) = 4u^2 - 2; \dots$$

$$|\psi_n(x, t)\rangle = A_n H_n(u) \cdot e^{-\frac{u^2}{2}} \cdot e^{-j \frac{E_n}{\hbar} t};$$