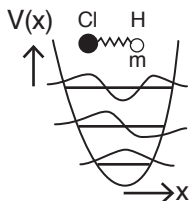


Last time we saw that the vibrating molecule has many eigenstates, with energies $E_n = \hbar\omega(n+1/2)$:



Today, we'll discuss two important property of eigenfunctions, proved in your Math 285 class: 1) they are orthogonal (meaning $\int dx \Psi_n^*(x)\Psi_m(x) = 0$ if $n \neq m$) if they correspond to different eigenvalues. 2) Any wavefunction $\Psi(x,t)$ can be written as a sum over the stationary states $\Psi_n(x)$: $\Psi(x,t) = c_0\Psi_0(x) + c_1\Psi_1(x) \exp(-i/\hbar E_1 t) + \dots$ This is analogous to Taylor expanding any function $y(x)$ as $c_0y_0(x) + c_1y_1(x) + c_2y_2(x) + \dots$ where $y_0(x)=1$, $y_1(x)=x$, $y_2(x)=x^2$, and so forth. Thus the time-dependent and time-independent Schrödinger equations **contain the same information**. If you can solve one of them, you've solved the other one.

