

Reflective Homework

- (1) Without doing any calculations, explain what should be the allowed energies of a half harmonic oscillator $V(x) = 1/2m\omega^2x^2$ for $x > 0$ and $V(x) = \infty$ for $x < 0$.

- (2) For both infinite square well and simple harmonic oscillator calculate the following:
 $\lim_{n \rightarrow \infty} (E_{n+1} - E_n)/E_n$ and interpret your result conceptually.

- (3) A person is given a non-stationary state wave function at time $t = 0$ for a simple harmonic oscillator (SHO) potential energy. He is asked to find the wave function at a future time t . The person says that he does not know how to find the wave function at time t because the time-development of the wave function was only discussed in the context of an infinite square well and it was not discussed in the context of a SHO. Explain how you can provide some guidance to the person.

- (4) An electron is initially (at $t = 0$) in the first excited state in a 1D infinite square well (well boundaries between $x = 0$ and $x = a$). Explain whether the expectation value of position, momentum and energy should depend on time.