

- 1) A particle is confined in a 1-dimensional 'box'; $0 \leq x \leq L$. $\phi_n(x) = \sqrt{\frac{2}{L}} \sin(k_n x)$,
 $k_n = n \frac{\pi}{L}$, $E_n = \frac{\hbar^2 k_n^2}{2m} = n^2 E_1$.

At $t=0$, $\psi(x, t=0) = \frac{1}{\sqrt{2}} (\phi_1(x) - \phi_2(x))$.

a) What is $\psi(x, t)$ for $t > 0$?

b) Compute average position, $\langle x(t) \rangle$.

c) Compute $\langle x^2(t) \rangle$.

d) Compute average energy.

Assume you are given a table of all relevant integrals.

2) What is the probability that the electron in a ground state hydrogen atom will be found at greater than $1m$ from the proton?

3) What are the electronic configurations for $Z = 1$ through 12 ?