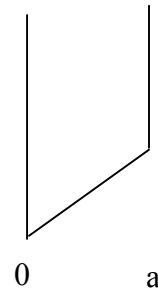


Homework # 5 Chem. 1410 Spring 2001
Assigned, Feb 17, due Feb 27.

1. Consider an electron in a box with a sloping bottom.
(Assume the box sides extend to infinity, that the box width is a , i.e., that x ranges from 0 to a , and that the slope of the bottom is 1. In other words the potential varies from 0 at $x = 0$ and to a at $x = a$.)



- a) Using the ground state wavefunction $\sin(\pi x/a)$ for the standard particle in the box problem, calculate the energy of this system. (You'll have to include the normalization factor.) How does your energy compare with that of the standard particle in the box problem?
- b) Now consider a trial wavefunction of the form $c_1 \sin(\pi x/a) + c_2 \sin(2\pi x/a)$. What values of c_1 and c_2 give the lowest energy, and what is the value of this energy? How does it compare to your result from part (a).
2. Consider a harmonic oscillator in the presence of an electric field. The field adds a term $e\epsilon x$ to the Hamiltonian, where ϵ gives the strength of the electric field. Is there a first-order correction to the energy? If so, what is it? Is there a second-order correction to the energy? If so, what is it?