Earlier in the course, you solved for the bound state of a delta-function potential well located at $x = 0$:

$$E = -2m\gamma^2/\hbar^2$$

$$\psi(x) = \begin{cases} \sqrt{\frac{m\gamma}{2\hbar^2}}\, e^{x\sqrt{\frac{m\gamma}{2\hbar^2}}} & x \leq 0 \\ \sqrt{\frac{m\gamma}{2\hbar^2}}\, e^{-x\sqrt{\frac{m\gamma}{2\hbar^2}}} & x \geq 0 \end{cases}$$

1. Consider two delta function potential wells located at $x = a$ and $x = -a$ respectively.

   a) Write down an equation for the potential.

   b) For each well, sketch the bound energy eigenstate state of that well alone.

   c) For each well, adjust the energy eigenstate equation for a single well so that it is centered on the well.

   d) For each well, what is the energy eigenvalue equations for the bound state?

2. Using an LCAO approach, write an expression for the molecular states of the pair of wells.

3. Using the ground state of each well as a basis state, what are the elements of the Hamiltonian?

4. What are the molecular energy eigenvalues and energy eigenstates?