Recitation #7a
Quantum 521

1. Neutron absorption can be modeled as a collision with a step down potential.

   $V(x) = 0 \qquad x < 0$
   $V(x) = -V_0 \quad x > 0$

   Calculate the neutron absorption probability as the probability for transmission through the barrier. Take E = 4 MeV and V_0 = 12 MeV.

2. Consider the square double well potential shown in the figure. Sketch the ground state and first excited state wave functions for the two cases $b \approx a$ and $b \gg a$. Based on the curvature of the wave function, argue that the symmetric state is the ground state.

   $$\mathrm{KE} = \frac{-\hbar^2}{2\mathrm{m}} \langle \frac{\mathrm{d}^2}{\mathrm{dx}^2} \rangle$$

   Sketch the corresponing energies E_1, E_2 as functions of b on the same graph.

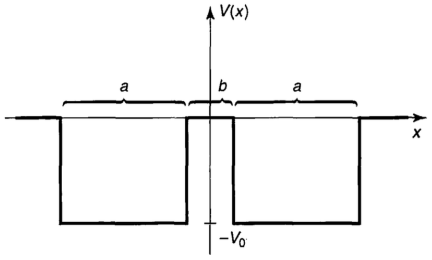

Figure 1: square double well potential (from Griffiths)

3. For an electron in a simple harmonic oscillator with a ground state energy of 1 eV calculate the classical turning point for the ground state.

4. Prove that for a simple harmonic oscillator energy eigenstate the expectation value of the momentum is zero.