

## Scanning Probe Homework

- 1.) Imagine a particle in a box, which has the following potential:

$$V = \infty \quad x < 0$$

$$V = -V_0 \quad 0 \leq x \leq a$$

$$V = 0 \quad x > a$$

The wavefunction is

$$\psi = B' \sin k'x \quad \hbar k' = \sqrt{2\mu(E + V_0)}$$

and  $\psi = C' e^{-Kx} \quad \hbar K = \sqrt{-2\mu E}$

where  $E$  is the energy of the bound state and  $\mu$  is the particle mass

- a.) sketch  $V$  and  $\psi$
  - b.) describe how this model might be adapted to describe a scanning tunnelling microscope tip.
- 2.) Describe under what conditions a magnetic scanning tip might be used as a write head and a read head
- 3.) What three characteristics of a vibrating tip on a cantilever might change as a tip moves from material A to material B.