

ECE/Mat 162 A, Fall 2008

Assignment 2

Due Tuesday, Oct 14, 2 pm, In Class

1. Derive the Bragg Condition for diffraction of electrons in a crystal of inter-atomic spacing 'd'.
2. General two slit diffraction/interference experiments do not result in patterns with uniform intensity. Can you explain why?

Hint:

Interference pattern varies as though a diffraction pattern was superimposed on it. Slits have a finite size 'a' and finite distance 'b' between them. Discuss qualitatively.

Bonus: Can you draw the interference/diffraction pattern for multiple (N) slits.

3. Given

$$\Delta x \text{ for atom of size } R \text{ (not radius)} = R/2$$

$$\text{Momentum variation } \Delta p = p \quad (p - \text{momentum of electron})$$

$$\text{Potential function} = -e^2 / 4\pi\epsilon R$$

Using the idea that the sum of kinetic and potential energies should be minimum (for a size R)

For the stability of the atom, can you determine the size 'R' in terms of constants for a stable atom?

Bonus: Can you see how the requirement of energy indicates the size of a stable atom. Does this show that uncertainty is the reason for stability of the atom?

4. Explain why ψ and its derivative have to be continuous and finite.