

Physics 390: Homework set #2

Due Friday January 26, 2007

Reading: Tipler & Llewellyn, Chapters 4, 5

Questions:

1. Suppose we cover one slit in the two-slit electron experiment with a very thin sheet of fluorescent material that emits a photon whenever an electron passes through. We then fire electrons one at time at the double slit; whether or not we see a flash of light tells us which slit the electron went through. What effect does this have on the interference pattern? Why?
2. In both the Rutherford theory and the Bohr theory, we neglected any wave properties of the particles. Estimate the de Broglie wavelength of an electron in a Bohr atom and compare it with the size of the atom. Estimate the de Broglie wavelength of one of Rutherfords alpha particles and compare it with the size of the nucleus. Is wave behavior expected to be important in either case?
3. How might Moseley have measured the wavelengths of the X-rays in his experiments?

Problems:

Chapter 4: 3, 6, 24, 33, 45

Chapter 5: 3, 15, 18, 30, 35