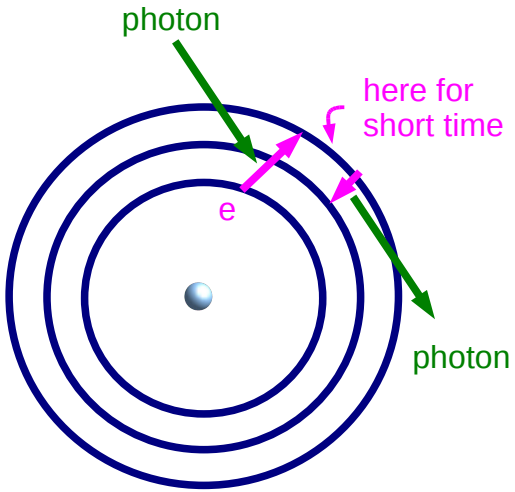
PHY100 — Recitation #6

1) Two jugglers toss batons back and forth. How are they like a chemical bond?
   Are they more like a ionic bond or a covalent bond?

2) A 142 gram baseball is thrown at 92 mph (41 m/s). Suppose you measure the velocity of the baseball to a precision of 0.000000001 m/s = 10^{-9} m/s, how well could you measure the instantaneous position of the baseball if you had an instrument able to measure positions perfectly? (Assume the mass of the baseball is exactly 142 grams)

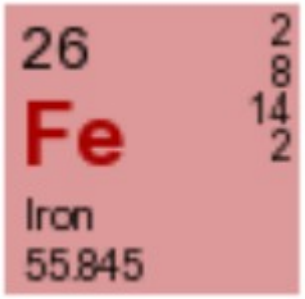
3) How well can you measure the speed of an electron in a Hydrogen atom (in principle)?



Most excited state orbitals in an atom only exist for a very short time (known as the lifetime) before the state decays emitting a photon while the electron jumps to a lower energy orbital.

What does Heisenberg's uncertainty principle tell you this will do to the color of the emitted photon?

3) In a typical entry for each element of a periodic table, you will see the various components described below.



26 = # protons (Z)

Fe = Atomic element symbol

Iron = Element name

55.845 = Average atomic mass per atom

2 8 14 2 = Electron orbital configuration

Make sure you understand each of these things... Except for the electron orbital configuration.

How many protons and how many neutrons are there in ^{56}Fe?

And in ^{57}Fe?

If the atomic mass is given in AMU (atomic mass units) and each nucleus is made of protons and neutrons (each of which add 1 AMU to the mass of the nucleus), how is it that Iron can have a mass of 55.845 as shown above?

5) What was Rutherford's contribution to our modern concept of the atom?
Describe the experiments done in Rutherford's lab and what was learned from them.

Your TA will set up an “atom” for you to explore
Your group will have a pile of “α-particles” ping pong balls.
Use the ping pong balls to explore the nature of the “atom” before you.
Can you determine what, if any, structures exist in your atom?