

Modern Atomic Theory

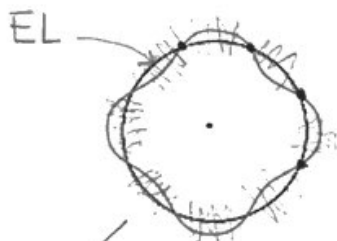
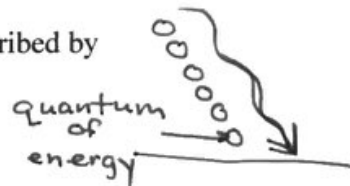
There are two big questions about atoms:

- 1) Where are the electrons located?
- 2) How do electrons move around the nucleus?

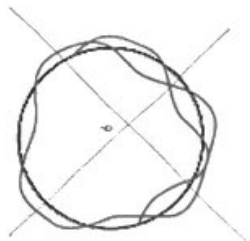
Electrons in atoms can be treated as Waves more effectively than as small compact particles traveling in circular orbits.

- Large objects (golf balls and moving autos) obey the laws of classical mechanics (Isaac Newton's laws)
- Very small particles (molecules, atoms, electrons) are best described by quantum mechanics

The motion of the electron is best thought of as a series of standing wave



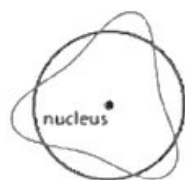
This wave fits perfectly on the circle



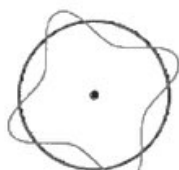
This wave, however, doubles over on itself

does not happen!

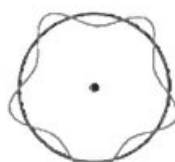
All math!



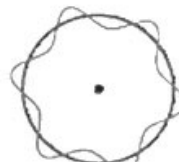
n = 3



n = 4



n = 5



n = 6

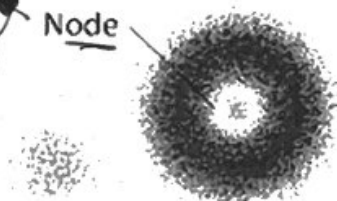
Always an even number of wave-lengths

0% probability of finding the electron

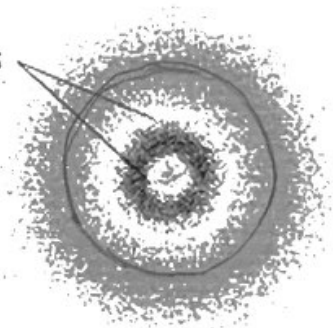
Nodes

Spaces in-between the energy levels

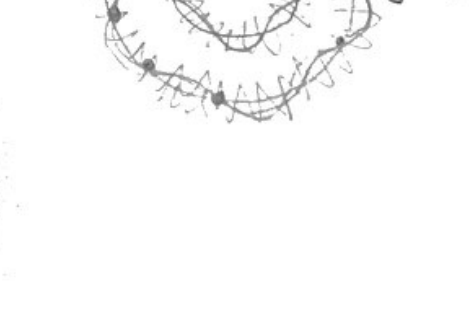
Node



1s



2s



3s

One of the underlying principles of quantum mechanics is that we cannot determine precisely the paths that electrons follow as they move about the nucleus.

Heisenberg Uncertainty Principle - It is impossible to simultaneously determine both the position and the momentum of an electron (or any other very small particle)

So, we resort to a statistical approach and speak of the probability of finding an electron within a specified area of space around the nucleus.

* [Bohr's energy levels are divided into orbitals. An orbital is an area where there is a 90% probability of finding an electron. An orbital is not a well-defined space or path. Instead think of it as a cloud - more dense in the middle and thinner at the edges. The more dense regions represent areas where the probability of finding an electron is the greatest.] *

Basic Ideas of Quantum Mechanics

Quantum Model

