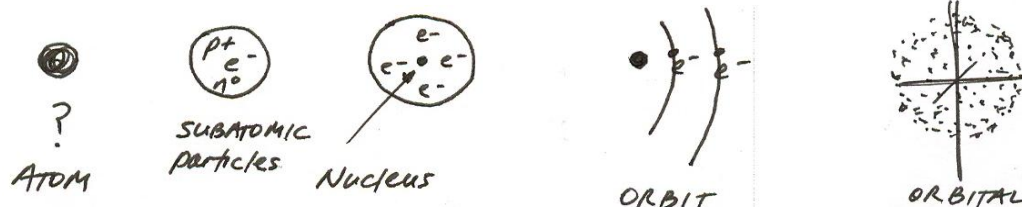
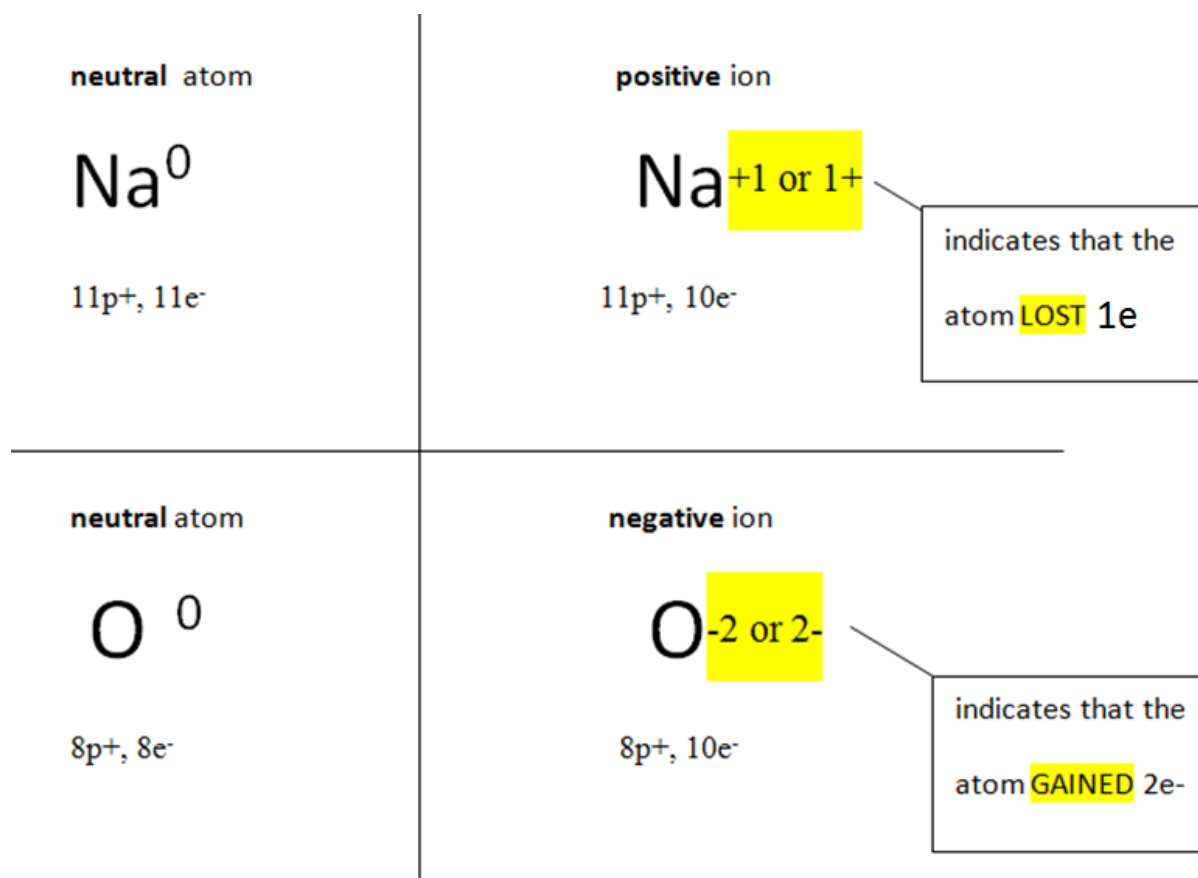


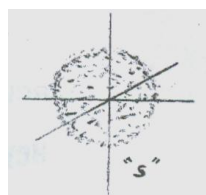
Let's cover some loose ends to finish up this unit.

An **ion** – is a charged particle that results from the **gain or loss of electrons** in a chemical reaction.



Chemists no longer think of electrons as orbiting the nucleus at fixed distances. Instead, according to the **Wave Mechanical Model**, they say an electron spins around its own axis and can be found **most probably** in a region around the nucleus called an **orbital (electron cloud)**. These orbitals can differ in size, shape & orientation. See handout.

To help you understand this, imagine having a "super-duper" camera that can photograph electrons (it's impossible, but let's pretend). Now, imagine taking photos of a electron repeatedly as it moves in its orbital. When you put all of the photos together, you get a picture of an orbital.



"s" orbitals have a spherical shape, "p" orbitals are dumbbell shaped, "d" & "f" orbitals are more complicated. You'll learn more about this in college chemistry. **For now, just remember the definition of an orbital.**

Let's go to the sample test on Atomic Concepts.

Orbital – a region in the space around the nucleus of an atom where an electron can be found within 90% probability; also known as an **electron “cloud”**; this is the most modern (wave-mechanical) model of the atom.

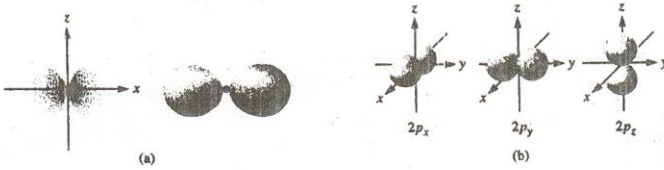


Figure 7.14
Representation of the 2p orbitals.
(a) The electron probability distribution and the boundary surface for a 2p orbital. (b) The boundary surface representations of all three 2p orbitals.

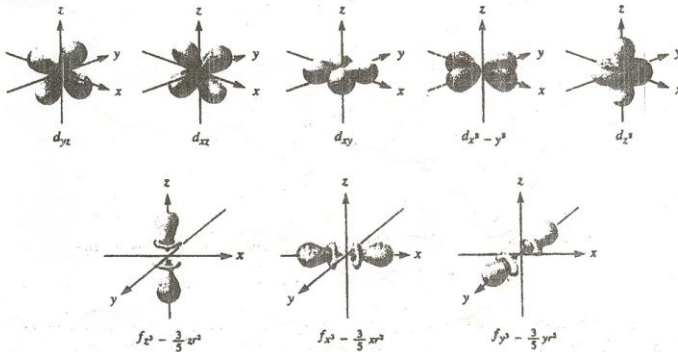


Figure 7.16
Representation of the 3d orbitals in terms of their boundary surfaces.

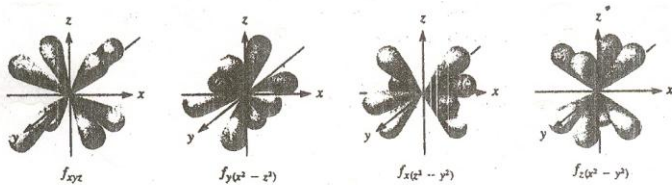


Figure 7.17
Representation of the 4f orbitals in terms of their boundary surfaces.

- Which sequence represents a correct order of historical developments leading to the modern model of the atom?
 - most of the atom is empty space → the atom is a hard sphere → electrons exist in orbitals outside the nucleus
 - the atom is a hard sphere → most of the atom is empty space → electrons exist in orbitals outside the nucleus
 - most of the atom is empty space → electrons exist in orbitals outside the nucleus → the atom is a hard sphere
 - the atom is a hard sphere → electrons exist in orbitals outside the nucleus → most of the atom is empty space
- Which of these phrases *best* describes an atom?
 - a hard sphere with negative particles uniformly embedded
 - a hard sphere with positive particles uniformly embedded
 - a positive nucleus surrounded by a hard negative shell
 - a positive nucleus surrounded by a cloud of negative charges
- The region that is the most probable location of an electron in an atom is
 - an orbital
 - the nucleus
 - an ion
 - the excited state

More on the next page.

- 4) In the wave-mechanical model, an orbital is a region of space in an atom where there is
- A) a circular path in which neutrons are found
 B) a high probability of finding an electron
 C) a high probability of finding a neutron
 D) a circular path in which electrons are found

- 5) Compared to a calcium atom, the calcium ion Ca^{2+} has
- A) fewer electrons
 B) fewer protons
 C) more protons
 D) more electrons

Ca
 20pt, 20e⁻

20pt, 18e⁻

- 6) What is the total number of electrons in an S^{2-} ion?
- A) 10
 B) 14
 C) 18
 D) 16

18
 16pt, 16e⁻

- 7) An oxide ion (O^{2-}) formed from an oxygen-18 atom contains exactly
- A) 8 protons, 10 neutrons, 10 electrons
 B) 8 protons, 10 neutrons, 8 electrons
 C) 8 protons, 8 neutrons, 10 electrons
 D) 10 protons, 8 neutrons, 8 electrons

18
 -2
 8pt 8e⁻ 10e⁻
 10n⁰