

Lesson 2: Bohr Diagrams

Orally: *Although there are many models of the atom, we will choose to focus on two this semester; the first of which are called Bohr diagrams.*

Structure of the Bohr Model:

- Protons and neutrons are tightly packed together in a central mass called the nucleus. Due to their location, these particles are often referred to as nucleons.
- Nucleons are held together by the strong nuclear force. The strong nuclear force acts over a very small distance but is strong enough to overcome the repulsions from one proton to another.
- Electrons orbit the nucleus at specific distances called orbits. (Orbits are also called shells)

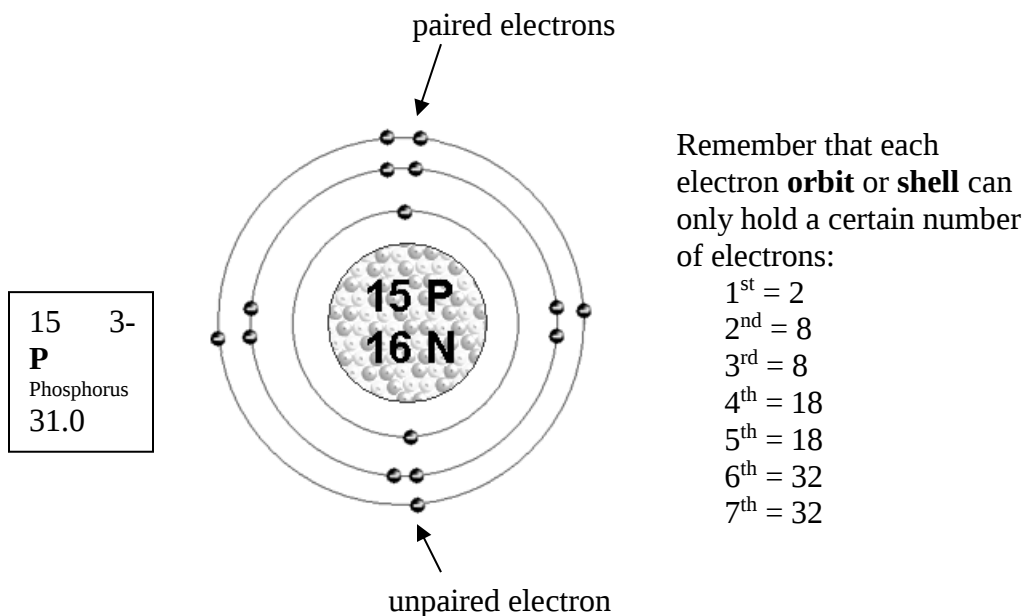
Neils Bohr discovered that the electrons must be in specific locations around the nucleus of the atom using light emission spectroscopy (this is a technique that allows one to observe the specific wavelengths of light given off by an atom). There is a relationship between the position of the electrons and their energy; the further the electron is from the nucleus the more energy the electron has.

Orally: *The specific wavelengths of light given off by a sample of atoms provided the clue that Bohr needed to prove that electron locations are “quantized”. The quantization of electron location means that electrons may only be in specific locations. For example, you can rest yourself on a specific stair on a staircase but you may not be at rest at potential energies between stairs on a staircase.*

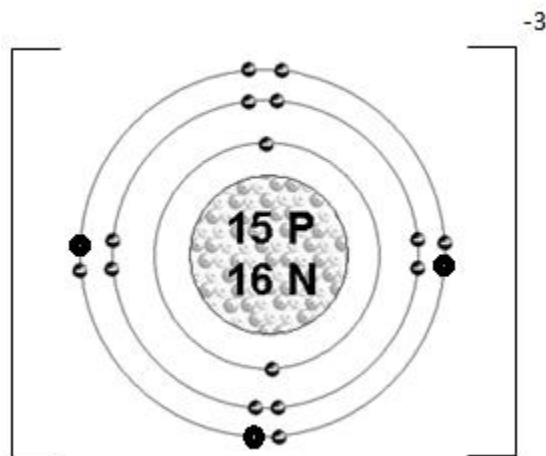
Question: What’s the Bohr model used for?

- showing the relative placement of the subatomic particles within an atom.
- showing how atoms bond together.

- Example:



- Reactive atoms do not have a full outer shell of electrons (**valence shell**), so they will try to fill it by either gaining or losing electrons (whichever requires less).
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- Typically metals will lose electrons while non-metals will gain electrons.
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- **Orally:** *Where are the metals located on the periodic table?*
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- Example: phosphorus will attract 3 more electrons
 - gains a charge of -3 (one for each electron gained)
 - represented by the ion charge on the Periodic Table for each element
 - when the phosphorus atom gains 3 more electrons, it becomes an **ion**



Square brackets used to show the atom is now an ion and the charge is written just outside the bracket

Directed practice: Show students how to draw Bohr diagrams for the following atoms and have them predict what the ion charge will be based on the atom gaining or losing electrons.

1. Sodium atom and sodium ion
2. Magnesium atom and magnesium ion
3. Sulfur atom and sulfide ion
4. Neon atom (NO ION!)

Q: Why will Neon not form an ion?

A: Neon has a full outer shell which is non-reactive (i.e., stable).

Activity: If time, have students look at a variety of gas discharge tubes with a spectroscope. Discuss why some colours are present while other bands of colour are clearly missing from the spectrum.

Homework Bohr Diagram worksheet