* Learning Target: to be able to understand atomic and molecular properties of the major biological elements by modeling them.

** Big Picture \rightarrow Matter & Energy & Identifying Patterns. How we get there \rightarrow Modeling & Asking Questions

Rules for making Bohr Models (Bohr models allow us to see the number of subatomic particles in each atom of an element, from the nucleus to the valence electron shell)

How to make a Bohr model:

Step 1: Draw a nucleus

Step 2: Write the number of protons and neutrons in the center of it (atomic # = # protons & atomic mass - atomic # = # neutrons)

Step 3: Look at what **horizontal row** (called a **period**) the element is in on the periodic table to see how many energy levels (called electron **orbits**) you need to draw around your nucleus.

Step 4. The **first energy shell** holds only 2 electrons. These first two electrons are only **valence electrons** (outermost) in hydrogen and helium (atomic numbers 1 & 2)

Step 5. The **second and third energy shells** can hold up to 8 electrons, so you work clockwise from 12 o'clock around the energy level and draw one electron at each hour -12, 3, 6, and 9 o'clock around the nucleus and when you return to 12 o'clock, pair them up.

Step 6. Remember, the **valence shell**, **the outermost energy shell** of electrons is the one involved with reactions and it may have empty spaces where if it is not full (called a **stable octet**). That's okay! You'll see why that is important when we make **Lewis Dot diagrams** next.

Why atomic models? Allow us to see how elements behave \rightarrow **reactivity** \rightarrow how elements within molecules/compounds react based on how many **valence electrons** they have.

Q: How do we find out how many valence electrons an element has?

Q: How might you see molecules or compounds behaving in the equation for photosynthesis? Use evidence!

Rules for Lewis Dot Diagrams (Lewis dot diagrams allow us to see ONLY THE VALENCE ELECTRON SHELL which focuses only on the shell used during the forming of atomic bonds)

Step 1. Determine the number of **valence electrons** in your atom from the vertical column numbers of the periodic table. Columns beginning with the following elements have these numbers of valence electrons: H=1, Be=2, B=3, C=4, N=5, O=6, F=7, and He=8. Ignore the columns starting with Sc to Zn until you take chemistry!

Q: number the **vertical columns** (called **families**) on the periodic table below.



Step 2. Write the **atomic symbol** in the center of your diagram.

Step 3. Add one valence electron to each hour (12, 3, 6, and 9) around the atomic symbol just like you did when making a Bohr model earlier (*See Step 5 of making Bohr models in the left column*). <u>NOTE, you are only doing this for valence electrons so there is only one orbital!</u>

Step 4. If bonding two atoms, determine the central atom (often the one with 1 atom, or the one that forms the most bonds)

Step 5. Draw single bonds between the two atoms you are showing as bonded together (NOTE: each single bond represents 2 electrons when you are counting!)

Step 6. Add all other valence electrons to atoms as lone pairs. See written example on class website for help.

Step 7. Turn lone pairs into double or triple bonds to give every atom a quartet (or duet, if hydrogen)

Bohr Model

Directions: Draw the Bohr & Lewis Dot models for the 4 elements shown below. The element tiles were copied from the ptable.com website and are the same as your copy of the periodic table. When finished, check your answers with a neighbor.

