Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***“Build An Atom” Simulation***

**Directions**:

* Go to the following website: <http://phet.colorado.edu/en/simulation/build-an-atom>
* Click the green “Run Now” button below the large image to start the application.
* Play around with the simulation for a bit to become familiar with the controls and functions. You can add particles to your atom by dragging them into the atomic model.
* The “**Mass**” and “**Net Charge**” boxes should be expanded. ***Do not*** expand the “Symbol” box.

**Part I: Basic Electron Structure**

1. What 2 sub-atomic particles have charges? List each particle ***name*** and its ***charge***.
2. What does the term “neutral” mean? What is the charge of a neutron?
3. What subatomic particle determines the type of Element you make?
4. Describe how many of each subatomic particle you need to make a ***stable***, ***neutral*** beryllium atom.
5. How many electrons (maximum) can fit in the first shell (closest to the nucleus)?
6. Can you ever have more than this number in the first shell? Can you ever have less?
7. How many electrons can fit in the second shell (what is the maximum)?
8. Is it possible to begin filling the second shell without first filling up (to the max) the first shell?
9. Build some atoms, and write down three examples that have a ***stable nucleus*** and ***neutral charge***.

|  |  |
| --- | --- |
|  |  |
| *Electron* | *Nucleus* |

*Include a drawing of your atom. The key above is a suggestion for how to draw the parts of your atom.*

***Be sure to draw the electrons in the correct energy levels (shells).***

|  |  |  |
| --- | --- | --- |
| # of each particle | Drawing of Atom | Element Info |
| Electrons: \_\_\_\_\_  Protons: \_\_\_\_\_  Charge: \_\_\_\_\_ |  | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Symbol: \_\_\_\_\_\_\_ |
| Electrons: \_\_\_\_\_  Protons: \_\_\_\_\_  Charge: \_\_\_\_\_ |  | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Symbol: \_\_\_\_\_\_\_ |
| Electrons: \_\_\_\_\_  Protons: \_\_\_\_\_  Charge: \_\_\_\_\_ |  | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Symbol: \_\_\_\_\_\_\_ |

1. From your observations, how can you predict the number of electrons in a ***neutral*** atom based on the number of protons in the atom?
2. Based on your observations, what is meant by ***mass number***?

**Part II: Making Ions**

Not all atoms are neutral. Many have a charge. Some are more positive and some are more negative. We call the charge on such an atom the “**net** charge”. We call atoms that are charged “***ions*”**.

1. Make a neutral lithium atom. What would you do to make a lithium atom with a ***negative*** charge?
2. Make the neutral lithium atom again. What would you do to make a lithium atom with a ***positive*** charge?
3. When there are the same number of protons (+) and electrons (-), the atom is neutral. What can you say in general about an atom that is ***positively*** charged in terms of the number of protons vs. electrons?
4. What can you say in general about an atom that is ***negatively*** charged in terms of the number of protons vs. electrons?
5. Now you will practice building some specific elements. In the table below, some of the information is filled out about a particular atom. Complete the table below by filling in the blanks and drawing the atom.

|  |  |  |
| --- | --- | --- |
|  | Drawing of Atom |  |
| Electrons: 10  Protons: \_\_\_\_\_  Charge: 2- |  | Name: ***Oxide (charged oxygen)***  Symbol: \_\_\_\_\_\_\_ |
| Electrons: 2  Protons: 3  Charge: \_\_\_\_\_ |  | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Symbol: \_\_\_\_\_\_\_ |
| Electrons: \_\_\_\_\_  Protons: \_\_\_\_\_  Charge: – 1 |  | Name: ***Fluoride (charged fluorine)***  Symbol: ***F-*** |
| Electrons: \_\_\_\_\_  Protons: 1  Charge: +1 |  | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Symbol: \_\_\_\_\_\_\_ |
| Electrons: 10  Protons: \_\_\_\_\_  Charge: \_\_\_\_\_ |  | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Symbol: ***Na+*** |