Atom Building Activity

NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_

We have discussed mixture, compounds, and elements. Now let’s examine the structure of the atom itself. You will use a simulation activity from the University of Colorado’s PhET Simulation Labs to examine atom building. You will start this activity in school and you can complete it at home. If you do not have internet access at home you may download the program and complete the activity in your laptop after school.

1. Read the instructions and the questions for each simulation.
2. The simulations run on Java 6. At home you might have to update your Java to run the programs.
3. Go to the web site: <http://phet.colorado.edu/en/simulations/category/chemistry/general>
4. Scroll down and click on the ***Build An Atom*** simulation. If you are working at school, select the <run now> button to run the simulation on the web site. If you are working at home, you may either select <run now> button or you may download the app to your computer.
5. Start with the ***Build Atom*** icon.
6. Make sure that all of the <+> boxes on the right of the screen are open.
7. Add protons and neutrons to the nucleus and watch what happens to the Periodic Table, Atomic Symbol, the Mass Number and the Net Charge.
8. Add electrons and watch the Net Charge.
9. Try a variety of different combinations of protons, neutrons, and electrons.
10. Complete the table on the backside for the first 10 elements.
    1. You want to have a **stable nucleus** and a **ZERO net charge**.
    2. Start with 1 proton and 1 electron. This is hydrogen. Record the numbers in the table.
    3. Add a second proton and the add neutrons until the nucleus is stable. Add electrons so that you have a zero net charge. Record the values.
    4. Continue through to Atomic Number 10.
11. Answer the questions below based on your observations.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **DATA** | | | | | | |
| Symbol | Name | Atomic Number | Mass Number | Number of Protons | Number of Neutrons | Number of Electrons |
| H |  |  |  |  |  |  |
| He |  |  |  |  |  |  |
| Li |  |  |  |  |  |  |
| Be |  |  |  |  |  |  |
| B |  |  |  |  |  |  |
| C |  |  |  |  |  |  |
| N |  |  |  |  |  |  |
| O |  |  |  |  |  |  |
| F |  |  |  |  |  |  |
| Ne |  |  |  |  |  |  |

Questions:

1. Which particles contribute to the **mass number** and which do not? Why?
2. Which particle contribute to the **atomic number** and why?
3. Which particles contribute to the **net charge** and how does each change the net charge?

# Isotopes

## Background:

For all element the number of neutrons can make the nucleus stable or unstable. The **Nuclear Strong Interaction** (also called the nuclear strong force or nuclear force) is what holds the nucleus together. Neutrons help hold the protons the right distance apart from each other to maintain nuclear stability.

Different isotopes of the same element are written in words and symbols to show the mass number. (Recall that mass number is the number of protons and neutrons). For example, the two isotopes of Carbon that discussed were carbon-12 and carbon-14. The symbolic notation for these two isotopes would be:

for carbon 12 with an atomic number of 6 and a mass number of 12.

for carbon 14 with an atomic number of 6 and a mass number of 14

## Activity:

1. Start by creating the isotope oxygen-16. This will have 8 protons, 8 neutrons, and 8 electrons.
   1. What is the symbolic notation for this isotope? \_\_\_\_\_\_\_\_\_\_\_\_.
   2. Is this isotope stable or unstable?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Add a neutron to the atom.
   1. What element is this now?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   2. What is the name of this isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. What is the symbolic notation for this isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_.
3. Add another neutron to the atom. You should have 8 protons, 10 neutrons, and 8 electrons.
   1. What element is this now?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   2. What is the name of this isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. What is the symbolic notation for this isotope? \_\_\_\_\_\_\_\_\_\_\_\_\_.
   4. Is this isotope stable or unstable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. If the three isotopes of oxygen have a percent abundance and masses shown below, compute the atomic mass of this element.
   1. Multiply the **Mass** of each isotope times the **Percent Abundance** to get the **Mass Contribution**.
   2. Add the Mass Contributions of each isotope to get the atomic mass of oxygen.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Mass X** | **Percent Abundance =** | **Mass Contribution** |
| **Oxygen-16** | 16 | 95% |  |
| **Oxygen-17** | 17 | 2.5% |  |
| **Oxygen-18** | 18 | 2.5% |  |
| **Oxygen** | | |  |