**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Build an Atom**

**Directions:**

1. Begin the Build an Atom simulation: <http://phet.colorado.edu/en/simulation/build-an-atom>
2. Explore the Build an Atom simulation for about 5 minutes.
3. UseBuild an Atom to find:
   1. What parts go in the center of the atom? :
   2. The center of the atom is called the **nucleus**. Most atoms in our environment have a **stable** nucleus.
   3. Play around, and write down three different examples of atoms that have a **stable nucleus**.

|  |  |  |
| --- | --- | --- |
|  | **Number of particles in  your nucleus:** | **What element  is it?** |
| 1. | Protons: \_\_  Neutrons:\_\_ |  |
| 2. | Protons: \_\_  Neutrons:\_\_ |  |
| 3. | Protons: \_\_  Neutrons:\_\_ |  |

* 1. Everything around us is made up of different elements. The air has Oxygen (**O**) and Nitrogen (**N**). Plants and people have lots of Carbon (**C**). Helium (**He**) is in balloons. Hydrogen (**H**) is in water.

Play until you discover which **particle (or particles)** determines the name of the **element** you build. What did you discover?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Test your idea by identifying the element for the 3 cases.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Particles** | **What Element?** | **What Determines the Element?** | **Circle the Element** |
| 1. | Protons: 6  Neutrons: 6 Electrons: 6 |  | ☐ Proton  ☐ Neutron  ☐ Electron |  |
| 2. | Protons: 7  Neutrons: 6 Electrons: 6 |  | ☐ Proton  ☐ Neutron  ☐ Electron |  |
| 3. | Protons: 6  Neutrons: 7 Electrons: 7 |  | ☐ Proton  ☐ Neutron  ☐ Electron |  |

1. Play until you discover what affects the **charge** of your atom or ion.  
   What is a rule for making...
   1. An atom **neutral** (one with 0 extra charge)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. A **+ion** (positive ion, one with extra positive charge)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. A **- ion** (negative ion, one with extra negative charge)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Show a neutral atom, a positive ion, and a negative ion. (These examples should be consistent with the rules you discovered.) All of your examples should also have a **stable nucleus**.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Number of Particles?** | **What element is it?** | **What is  the Charge?** |
| Neutral | Protons: \_\_  Neutrons:\_\_  Electrons:\_\_ |  |  |
| + Ion | Protons: \_\_  Neutrons:\_\_  Electrons:\_\_ |  |  |
| - Ion | Protons: \_\_  Neutrons:\_\_  Electrons:\_\_ |  |  |

1. Play until you discover what affects the **mass** of your atom or ion.  
     
   Which particles are heavy and which particles are light? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   What is a rule for determining the mass?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Using all of your rules, figure out what changes for each of these actions to an atom or ion. You can test your ideas with the simulation. If you have new ideas, rewrite your rules.

|  |  |  |
| --- | --- | --- |
| **Action** | **What Changes?** | **How Does it Change?** |
| Add a Proton | ☐ Element |  |
| ☐ Charge |  |
| ☐ Mass |  |

|  |  |  |
| --- | --- | --- |
| **Action** | **What Changes?** | **How Does it Change?** |
| Remove a Neutron | ☐ Element |  |
| ☐ Charge |  |
| ☐ Mass |  |

|  |  |  |
| --- | --- | --- |
| **Action** | **What Changes?** | **How Does it Change?** |
| Remove an Electron | ☐ Element |  |
| ☐ Charge |  |
| ☐ Mass |  |

|  |  |  |
| --- | --- | --- |
| **Action** | **What Changes?** | **How Does it Change?** |
| Add a Electron | ☐ Element |  |
| ☐ Charge |  |
| ☐ Mass |  |

**Design a positive ion with a charge of +2:**

|  |  |
| --- | --- |
| **Particles** | **Properties** |
| Protons: \_\_  Neutrons:\_\_  Electrons:\_\_ | Element:\_\_  Mass:\_\_  Charge:\_\_  Stable Nucleus: ☐ Yes ☐ No |

**Design a neutral, atom with a mass of 8:**

|  |  |
| --- | --- |
| **Particles** | **Properties** |
| Protons: \_\_  Neutrons:\_\_  Electrons:\_\_ | Element:\_\_  Mass:\_\_  Charge:\_\_  Stable Nucleus: ☐ Yes ☐ No |