**Build an Atom**

**Directions:**

1. Explore the ***Build an Atom*** simulation with your partner (about 5 minutes). As you explore, write down at least three things that you discover about the atom.

a.

b.

c.

1. Using ***Build an Atom,*** talk with your partner as you play with the parts of atoms to find:
   1. What parts go in the center of the atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. You can call the center of the atom, the **nucleus**. Most atoms in our environment have a **stable** nucleus.
   3. Play around, and write down three examples of atoms that have a **stable nucleus that is neutral** and include a drawing of your nucleus. (Hint: Add or remove electrons to make your atom neutral. Add or remove neutrons to make your atom stable.)

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

* 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. A 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?** | **Draw Your  Atom or Ion** | **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 (add mass) and which particles are light (do not add mass)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     
   Create a mathematical formula, using n=neutrons, p=protons to create an equation that will help you determine the mass an atom.

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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 |  |

**7.** Design an Atom

**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 |

**When you complete this worksheet, you may click on the “Game Tab” and attempt all levels of the game. Please do so quietly.**