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

**Pre-lab for Build an Atom**

1. You build an atom that has the following components:

3 protons

4 neutrons

3 electrons

**Draw a picture of how you would build your atom below:**

**Circle which element this atom is on this periodic table below:**



**The mass of this atom is:**

1. 3 mass units **Explain what ideas you used to choose an answer:**
2. 4 mass units \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 6 mass units \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 7 mass units
5. 11 mass units

**The charge of this atom is:**

1. 0, this is a neutral atom
2. -3
3. -1
4. +1
5. +3
6. You start with your atom: 3 protons

4 neutrons

3 electrons

**You want to change your atom’s properties.
Mark YES if a change will work, and mark NO if it will not work.**

* 1. Hydrogen, Helium, Lithium, Beryllium, Boron, Carbon are all different elements.

	If you want to **change the type of element** your atom is, you can either:

 (circle)

 Add a proton Yes or No

 or Add a neutron Yes or No

 or Add an electron Yes or No

* 1. If you want to **change the charge** of your atom, you can either:

 (circle)

 Add a proton Yes or No

 or Add a neutron Yes or No

 or Add an electron Yes or No

* 1. If you want to **change the mass** of your atom, you can either:

 (circle)

 Add a proton Yes or No

 or Add a neutron Yes or No

 or Add an electron Yes or No

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

**Build an Atom**

**Learning Objectives:**

1. Draw models that show atoms or ions.
2. Use information about the number of protons, neutrons, and electrons to
* Identify an element and its position on the periodic table
* Draw models of atoms
* Determine if the model is for an atom or an ion.
1. Predict how changing the number protons, neutrons, or electrons will change the element, the charge, and the mass of an atom or ion.

**Directions:**

1. Explore the ***Build an Atom*** simulation with your partner (about 5 minutes). As you explore, talk about what you find with your partner.
2. 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. The center of the atom is referred to as 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** and include a drawing of your nucleus.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Number of particles in your nucleus:** | **Draw 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: 6Electrons: 6 |  | ☐ Proton☐ Neutron☐ Electron |  |
| 2. | Protons: 7 Neutrons: 6Electrons: 6 |  | ☐ Proton☐ Neutron☐ Electron |  |
| 3. | Protons: 6 Neutrons: 7Electrons: 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?** | **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 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 |  |

1. Challenges!

**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 |

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

**Post-lab for Build an Atom**

1. You build an atom that has the following components:

3 protons

4 neutrons

3 electrons

**Draw a picture of how you would build your atom below:**

**Circle which element this atom is on this periodic table below:**



**The mass of this atom is:**

1. 3 mass units **Explain what ideas you used to choose an answer:**
2. 4 mass units \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 6 mass units \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 7 mass units
5. 11 mass units

**The charge of this atom is:**

1. 0, this is a neutral atom
2. -3
3. -1
4. +1
5. +3
6. You start with your atom: 3 protons

4 neutrons

3 electrons

**You want to change your atom’s properties.
Mark YES if a change will work, and mark NO if it will not work.**

* 1. Hydrogen, Helium, Lithium, Beryllium, Boron, Carbon are all different elements.

	If you want to **change the type of element** your atom is, you can either:

 (circle)

 Add a proton Yes or No

 or Add a neutron Yes or No

 or Add an electron Yes or No

Explain the ideas you used to choose your answer:

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

* 1. If you want to **change the charge** of your atom, you can either:

 (circle)

 Add a proton Yes or No

 or Add a neutron Yes or No

 or Add an electron Yes or No

Explain the ideas you used to choose your answer:

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

* 1. If you want to **change the mass** of your atom by 1 or more mass units, you can either:

 (circle)

 Add a proton Yes or No

 or Add a neutron Yes or No

 or Add an electron Yes or No

Explain the ideas you used to choose your answer:

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

* 1. If you **add 1 proton and 1 neutron to your atom** …

Will the element change? \_\_\_\_ If so, circle the new element?



Will the mass change? \_\_\_\_\_ If so, what is the new mass of the atom? \_\_\_\_\_\_\_\_
Will the charge change? \_\_\_\_ If so, what is the new charge of the atom?\_\_\_\_\_\_\_\_