**Learning Goals:** Students will be able to

1. Make atom models that show stable atoms or ions.
2. Use given information about subatomic particles to

* Identify an element and its position on the periodic table
* Draw models of atoms
* Determine if the model is for a neutral atom or an ion.

1. Predict how addition or subtraction of a proton, neutron, or electron will change the element, the charge, and the mass of their atom or ion.
2. Identify elements by their symbol on the periodic table.

**Pre-lab for Build an Atom**

An atom that has the following components:

3 protons

4 neutrons

3 electrons

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



**The mass of this atom is (circle one):**

1. 3 amu

**Explain what ideas you used to choose an answer:**

1. 4 amu
2. 6 amu
3. 7 amu
4. 11 amu

**The charge of this atom is (circle one):**

1. 0, this is a neutral atom
2. -3

**Explain what ideas you used to choose an answer:**

1. -1
2. +1
3. +3

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

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

If you want to **change the type of element** of an 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

If you want to **change the charge** of an 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

If you want to **change the mass** of an 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

**PhET Build an Atom Simulation:**

1. Go to rustscience.com🡪Chemistry🡪 1 Atomic Structure🡪 Click on the Build an Atom Simulation
2. Explore the ***Build an Atom*** simulation with your partner for a few minutes.
3. 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? What is the center called?
   2. Play until you discover a good rule for making the center of the atom “stable”. What seems to make the center of the atom “unstable”?
   3. In the table below identify three examples – at least 1 stable and at least 1 unstable – that shows your rules **for stablility** work and include a drawing of your nucleus.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **What is in your nucleus?** | **Draw your nucleus** | **Is it stable or unstable?** | **What Element is it?** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

1. Everything around us is made up of different elements. The air has Oxygen and Nitrogen. Plants and people have lots of Carbon. Helium is in balloons. Hydrogen is in water.
   1. Play until you discover a rule for what determines the name of the **element** you build. What did you find determines the element?
   2. Test your idea by identifying the element for the 3 cases. Write down the information you use to determine the element in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **example** | **Atom or Ion has** | **What Element is it?** | **How is an element determined?** |
| 1 | # of protons: 6  # of neutrons: 6 # of electrons: 6 |  |
| 2 | # of protons: 7 # of neutrons: 6 # of electrons: 6 |  |
| 3 | # of protons: 6 # of neutrons: 7 # of electrons: 7 |  |

1. Play until you discover some good rules about the **charge** of your atom or ion.
   1. What is a rule for making:
      1. A neutral atom which has no charge.
      2. A positive ion which has positive charge?
      3. A negative ion which has negative charge?
   2. In the table below identify three examples of atoms and ions (1 with neutral charge, 1 with a positive charge, and 1 with a negative charge) that show your rules **for charge** work and include a drawing of your atom. **(All of your examples should also have a stable nucleus.)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **What is in your  atom or ions?** | **Draw your  atom or ion** | **What is  the charge?** | **Is it a neutral atom, positive ion,  or negative ion?** | **What determines the charge of an atom?** |
| 1 | # of protons:  # of neutrons:  # of electrons: |  |  |  |
| 2 | # of protons:  # of neutrons:  # of electrons: |  |  |  |
| 3 | # of protons:  # of neutrons:  # of electrons: |  |  |  |

1. Play until you discover some good rules about the **mass** of your atom or ion.

|  |
| --- |
| **What determines the mass of an atom?** |

1. **Using all of your rules**, figure out what changes for each of these changes to an atom or ion.

|  |  |
| --- | --- |
| **If you…** | **What changes also? Element name, charge, mass?** |
| Add a proton |  |
| Remove a neutron |  |
| Remove an electron |  |
| Add an electron |  |

1. Design challenges: Try these with your partner.

**Design a positive ion with a charge of +2 Design neutral, stable atom with a mass of 9**

**include a drawing: include a drawing:**

Number of protons \_\_\_\_

Number of neutrons\_\_\_\_

Number of electrons\_\_\_\_

Number of protons \_\_\_\_

Number of neutrons\_\_\_\_

Number of electrons\_\_\_\_

Drawing

Drawing

What element is your ion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What element is your atom? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What mass is your ion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What is the charge of you atom?\_\_\_\_\_\_\_\_\_\_\_\_

Is the nucleus of your ion stable or unstable?

1. Click the game tab at the top of the simulation. Call your teacher over when you have completed a level and she will check it off.

* Level One Time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ms. Rust’s Initials \_\_\_\_\_\_\_
* Level Two Time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_
* Level Three Time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_
* Level Four Time \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_

1. **Partner Discussion.** Make sure you know working definitions for:   
   nucleus, proton, neutron, electron, atom, ion, charge, neutral, atomic mass, and element.