**Physical Science Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Build An Atom- Virtual Lab**

**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. Describe all vocabulary words needed to meet the goals.
3. Use a periodic symbol to tell the number of protons, neutrons, and electrons in an atom or ion.
4. Draw the symbol for the element as you would see on the periodic table

**Directions:**

1. Follow these direction to the ***Build an Atom*** simulation. [www.phet.colorado.edu](http://www.phet.colorado.edu)

Then click on blue “Play with Sims”

Select Chemistry from the menu on the left.

Choose the ***Build an Atom*** simulation.

Select RUN NOW

1. Using ***Build an Atom,*** 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. **WRITE A RULE FOR WHAT DETERMINES THE MASS OF AN ATOM.**
   4. Make a table like the one below to identify three examples – at least 1 stable and at least 1 unstable – that shows your rules **for stability** 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. **WRITE A RULE FOR WHAT DETERMINES THE NAME OF THE ELEMENT** you build. What did you find determines the element name?
   2. Test your idea by identifying the element for the 3 cases. Write down the information you use to determine the element.

|  |  |  |
| --- | --- | --- |
| **example** | **Atom or Ion has** | **What Element is it?** |
| 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. How was example 2 different from example 1? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Did this result in a new element?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. How was example 3 different from example 1?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Did this result in a new element?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Changing the **charge** of your atom or ion.
2. Use your text book to find the definition of an ion. Write the definition here:
3. **WHAT IS A RULE FOR MAKING A CHARGED ATOM (AN ION)?**
4. A neutral atom which has no charge.
5. A positive ion which has positive charge?
6. A negative ion which has negative charge?
7. Write about how you used the tools­­­­­­­­­­­­­­­­­­­­­ in the sim helped you decide if the atom had a positive, negative, or 0 charge.
8. Make a table like the one below to 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?** |
| 1 | # of protons:  # of neutrons:  # of electrons: |  |  |  |
|  |  |  |  |  |
| 2 | # of protons:  # of neutrons:  # of electrons: |  |  |  |
| 3 | # of protons:  # of neutrons:  # of electrons: |  |  |  |

1. **Using all of your rules**:

You determined the **rule for the stability** of an atom in this lab, **part 2b**.

You determined the **rule for the mass** of an atom in this lab, **part 2c**.

You determined the **rule for the identity** of an atom (its name) in **part 3a.**

You determined the **rule for making a charged atom** in **part 4b.**

* 1. Use these rules to complete this table and make predictions. DO NOT test them.

|  |  |
| --- | --- |
| **If I make this change:** | **What changes also? Element name, charge, mass?** |
| Add a proton |  |
| Remove a neutron |  |
| Remove an electron |  |
| Add an electron |  |

* 1. When you are satisfied with your answers, then test your ideas with the simulation. If you have new ideas, **rewrite your rules or make changes in the chart as necessary**. Briefly describe any changes you made:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

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1. Design challenges:

**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\_\_



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

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

Is the nucleus of your ion stable or unstable? \_\_\_\_\_\_\_\_\_\_\_\_

Using the simulation tool called **Symbol** .

1. Use the symbol shown to answer the questions.
2. How many protons?
3. How many neutrons?
4. What is the mass?
5. Is the atom neutral? If not, why not?
6. Use the symbol shown to answer the questions.
7. How many protons?
8. How many neutrons?
9. What is the mass?
10. A neutral atom would have \_\_\_\_\_\_ electrons. However this is a positive ion. That means that it actually has \_\_\_\_\_\_ electrons.
11. Use the symbol shown to answer the questions.
12. How many protons?
13. How many neutrons?
14. What is the mass?
15. A neutral atom would have \_\_\_\_\_\_ electrons. However this is a negative ion. That means that it actually has \_\_\_\_\_\_ electrons
16. Use the symbol shown to answer the questions.
17. How many protons?
18. How many neutrons?
19. What is the mass?
20. A neutral atom would have \_\_\_\_\_\_ electrons. However this is a positive ion. That means that it actually has \_\_\_\_\_\_ electrons.
21. **Reflection. STOP AND THINK.** Make sure you know working definitions for:   
    nucleus, proton, neutron, electron, atom, ion, charge, neutral, atomic mass, and element.

\*\*If you have any question, ask your teacher now.

1. Play all 4 levels of the **Games** to check your understanding.