Learning Target: I can develop and use models to compare and contrast the structure of atoms, ions and isotopes.

Build an Atom Phet Lab

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

5 protons Ⓟ
6 neutrons Ⓝ
2 electrons Ⓔ

Which element this atom is on this periodic table below:

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe

The mass of this atom is:
a. 3 mass units
b. 4 mass units
c. 6 mass units
d. 7 mass units
e. 11 mass units

The charge of this atom is:
a. 0, this is a neutral atom
b. -3
c. -1
d. +1
e. +3

2. You start with your atom:

4 protons
5 neutrons
4 electrons

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

A. Hydrogen, Sodium, Fluorine, Xenon, Calcium, and Iron are all different elements.

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

(Select)

Add a proton _____

or Add a neutron _____

or Add an electron _____

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

(Select)

Add a proton _____

or Add a neutron _____

or Add an electron _____

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

(Select)

Add a proton _____

or Add a neutron _____

or Add an electron _____

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 a atom or an ion.
3. Predict how changing the number protons, neutrons, or electrons will change the element, the charge, and the mass of an atom or ion.

Directions:
3. Explore the *Build an Atom* simulation with your partner (about 5 minutes). As you explore, talk about what you find with your partner.

4. Using *Build an Atom,* talk with your partner as you play with the parts of atoms to find:

   A. What parts go in the center of the atom? _____

   B. You can call the center of the atom, the **nucleus**. Most atoms in our environment have a **stable** nucleus.

   C. Play around with the lab until you figured out what makes an atom stable.
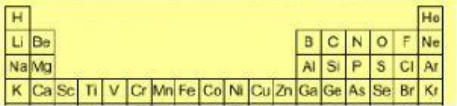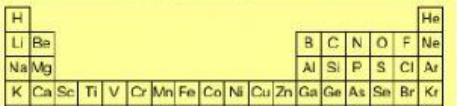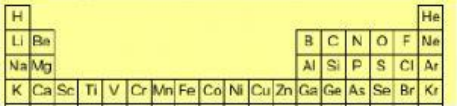   What makes an atom stable? _____

   What makes an atom unstable? _____

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D. 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?

_____

E. Test your idea by identifying the element for the 3 cases.

	Particles	What Element?	What Determines the Element?	Circle the Element
1.	Protons: 7 Neutrons: 7 Electrons: 7		☐ Proton ☐ Neutron ☐ Electron	
2.	Protons: 9 Neutrons: 9 Electrons: 7		☐ Proton ☐ Neutron ☐ Electron	
3.	Protons: 8 Neutrons: 7 Electrons: 7		☐ Proton ☐ Neutron ☐ Electron	

5. Play until you discover what affects the **charge** of your atom or ion.
   What is a rule for making...

   A. An atom **neutral** (one with 0 extra charge)?

   _____

   B. A **+ion** (positive ion, one with extra positive charge)?

   _____

   C. A **- ion** (negative ion, one with extra negative charge)?

   _____

6. 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 <u>stable</u> **nucleus**.

	Number of Particles?	Draw Your Atom or Ion	What is the Charge?
Neutral	Protons: __ Neutrons:__ Electrons:__		
+ Ion	Protons: __ Neutrons:__ Electrons:__		

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- Ion	Protons: ___ Neutrons:___ Electrons:___		

7. 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?

   _____

8. 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 an Electron	☐ Element	
	☐ Charge	
	☐ Mass	