PhET Isotopes and Atomic Mass

Name _____ Date _____

Use the link https://phet.colorado.edu/en/simulation/isotopes-and-atomic-mass to go to the PhET website for the simulation Isotopes and Atomic Mass.

Begin with the **Isotopes and Atomic Mass**.

Click on the + symbols next to the bar with Symbol and Abundance in Nature to display the data.

You can build isotopes of different atoms by clicking on the symbol and adding or subtracting neutrons using the bowl of neutrons next to the scale. You can also click on the scale to change to Atomic Mass (amu).
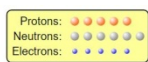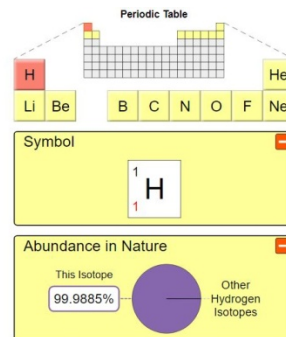
Let's practice with Boron.

1) What are the symbol, atomic mass and abundance in nature of the isotope Boron - 11?
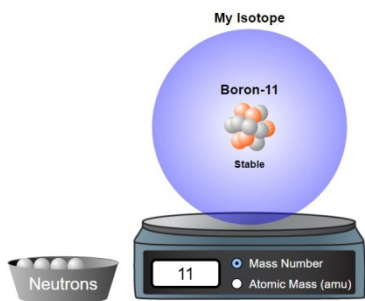
Now add one neutron to make Boron -12. Notice that the atom shakes. This indicates that the isotope is unstable. Unstable isotopes undergo radioactive decay. You will need to note this for other elements in the table below.

Symbol			$^{18}_{8}O$			
Name	Carbon-13			Beryllium-10		
Protons		7			2	
Neutrons		6			2	10
Electrons						
Atomic Mass						18.99840
Abundance						
Stable OR Unstable						

Isotopes and Atomic Mass continued

2) What is an isotope? Compare different isotopes of the same element to answer the question.

3) What is the relationship between natural abundance and stability?

Go to the bottom of the screen and select the **Mixtures** tab.

Click on the + symbols to expand the Percent Composition and Average Atomic Mass data.

You can drag different isotopes of the element to the black screen and see how the ratios affect the percent composition and Average Atomic Mass.

When you want to start a new combination of the same element click on the erase symbol at the bottom left of the black screen. When you want to start with a new element click on the symbol on the Periodic Table to see the possible isotopes.

Let's start with Hydrogen. Complete the chart for the following combination of hydrogen atoms.

# of H-1 atoms	# of H-2 atoms	% Comp of H-1	% Comp of H-2	Average Atomic Mass
2	2			
5	5			
8	2			

1) If the average atomic mass of hydrogen in nature is 1.0079, what does that tell you about the percent composition of H-1 and H-2 in nature?

Mixtures continued

2) What two things determine the average atomic mass of an element?

3) Look at Boron. It has two possible isotopes. Based on the average atomic mass on the Periodic Table (10.81), which isotope is most abundant in nature? Justify your answer.

Go to the Isotope tab and find the percent abundance of Lithium-7. Record that number below.

4) The natural abundance of Lithium-7 is _____ %

Now predict how many atoms of Lithium-7 and Lithium-6 are needed to reach the average atomic mass from the Periodic Table (6.944).

5) For **1** atom of Lithium-6, I will need _____ atoms of Lithium-7 for an average atomic mass of 6.944.

Switch to the slider button instead of the bowl so that you can select more than 10 atoms to verify your prediction. Set Lithium-6 to 1. Then move the slider until the average is close to 6.944. Record what the actual number needed.

6) For **1** atom of Lithium-6, I needed _____ atoms of Lithium-7 for an average atomic mass of 6.944.

SUPER Challenge
7) Chlorine has two possible isotopes. You must use at least one atom of each isotope. What combination of the number of atoms and isotopes will come closest to the actual average atomic mass of 35.45? Show your combination below. What does this mean about the percent abundance of these isotopes? (Remember, the 2 percent values must add up to 100%)

Cl - 35 _____ **atoms**   _____ **%**

Cl - 37 _____ **atoms**   _____ **%**