Name _____ Date _____ Per_____ **VIRTUAL LAB Half-Life**

Virtual Lab: How can you simulate the radioactive half-life of an element?

This lab is located at: http://glencoe.mcgraw-hill.com/sites/dl/free/0078693896/280405/E18.html

Background Information:

The rate of decay of a radioactive isotope of an element is measured in terms of its half-life. When a radioactive isotope decays, the decayed atoms form a daughter product. The half-life of a radioactive element is the time it takes for half of its atoms to decay into the daughter product. After two half-lives, one-fourth of the original isotope's atoms remain, and three-fourths have turned into the daughter product. After many more half-lives, a very small amount of the original parent isotope remains, and almost all of it has decayed into the daughter product.

Each radioactive isotope has its own characteristic half-life. For instance, the naturally occurring radioactive isotope of uranium (U-238) decays into thorium-234 with a half-life of 4.5 billion years. This means that half of the original amount of uranium-238 still remains after this time. In contrast, some radioactive isotopes decay quickly. For instance, polonium-214 has a half-life of 0.00016 seconds!

Objectives: In this Virtual Lab you will investigate the meaning of radioactive half-life as you see a simulation of the radioactive decay of isotopes of four hypothetical elements.

- Collect radioactive decay rate data for hypothetical isotopes over a period of 20,000 years.
- Determine, compare, and contrast half-lives of four radioactive elements.

Procedure:

1. Click the Video button. Watch the video to find out about atoms. Write your observations in the Journal.
2. Select one of the four elements from the pull down menu. Note: At first you will see 100 radioactive atoms on the screen.
3. Click the Years Passed button to advance the time 1000 years.
4. Click the Count the Remaining Radioactive Atoms button to see how many radioactive atoms remain.
5. At any time you can click the Remove Atoms No Longer Radioactive button to remove the daughter atoms.
6. Record your data in the data table.
7. Continue to advance the time by 1000-year intervals until you have determined the half-life of the element.
8. After you have completed the Table for the element you chose, click the Graph button to plot your data.
9. Repeat these steps for the three remaining elements.
10. Complete the Questions.

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Data Table:

	Remaining Radioactive Atoms			
Years	**Element A**	**Element B**	**Element C**	**Element D**
0				
1,000				
2,000				
3,000				
4,000				
5,000				
6,000				
7,000				
8,000				
9,000				
10,000				
11,000				
12,000				
13,000				
14,000				
15,000				
16,000				
17,000				
18,000				
19,000				
20,000				

Questions:

1) According to your data, what are the approximate half-lives of the elements A, B, C, and D?

A:

B:

C:

D:

2) What part of an original isotope's number of atoms remains have two half-lives?

3) What happens to a radioactive isotope as it decays? Does the radioactive material disappear? Explain.

4) After three half-lives of an isotope, 1 billion (one-eighth) of the original isotope's atoms still remain in a certain amount of this element. How many atoms of the daughter product would you expect to be present?