Student directions *Beta Decay*

This is written to follow Loeblein's activity for Alpha Decay
http://phet.colorado.edu

Learning Goals: Students will be able to:

- Describe the process of Beta decay
- Differentiate between Alpha and Beta decay
- Compare the meaning of "Half-life" for Alpha and Beta decay.

Directions: Open Beta Decay

1. Investigating "Beta Decay"
    a. Start on the **Single Atom** tab - observe the decay of Hydrogen-3 and Carbon- 14. Use **Reset Nucleus** to watch the process repeatedly. Write a description of what happens in the beta decay of an atom.

    b. Check your ideas with the "Custom" atom and reflect on your ideas.
    New ideas here:

    c. Verify your ideas by using online resources to determine what the differences are between Hydrogen-3 and Helium-3 as well as Carbon-14 and Nitrogen-14. Also, use other resources to see what "Beta Decay" means and cite at least one valid source.
    Cites here:

    d. Practice using your ideas by predicting what would happen if the following undergo beta decay:
        i. Carbon -10 → _____+ _____
        ii. Cesium-137 → _____+ _____
        iii. Thorium-234 → _____+ _____

    e. Practice using your ideas by predicting what would happen Uranium-238 undergoes alpha decay and then beta decay.
    Uranium-238→

2. Investigating "Half-life" for Beta Decay
    a. Use the Charts at the top of the sim to test ideas you might have about half-life. Make sure to use multiple samples and substances with a variety of half-lives. Make a data table that shows your tests.
    Data Table here:

4/30/2012 Thanks to Phil Cook, chemteacherphil@gmail.com for his ideas on PhET Teaching Ideas:
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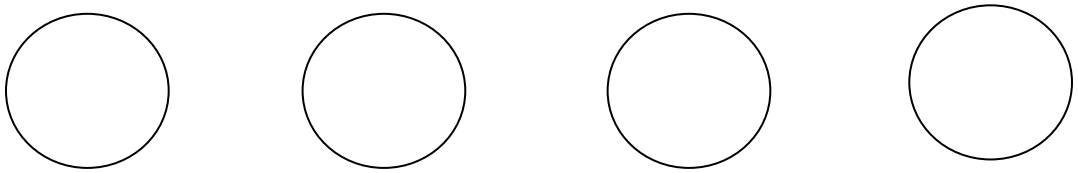
b. In your own words, describe what "half-life" means for Beta Decay.

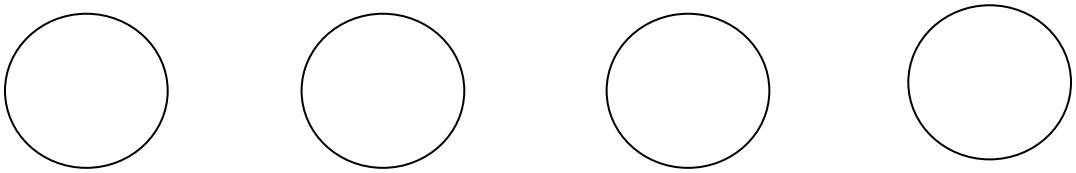
3. Check your ideas by drawing predictions **without** using the sim for the following scenario:

   If you have a *substance* that has a half- life of 20 years make predictions of what will happen by sketching the pie graphs indicating the number of the *substance* and it's *decayed atoms* for a reaction starting with 100 total atoms.



t= 5 years t=10 years t=20 years t=30 years

d. Use the sim to test the scenario. Copy the graphs. (**Pause** and **Step** may help)



t= 5 years t=10 years t=20 years t=30 years

e. How do your predictions compare to the results shown in the sim?

f. What ideas do you have to explain the similarities and differences in the data and also your predictions?

4. Compare and contrast Alpha and Beta decay processes including the meaning of "half-life" in each process.

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