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Half Life and Radioactive Decay

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CMST SCOLLARCITY Lesson Plan Template-Lesson Plan using **TI Technologies** (Due Tuesday, July 27th)

Submit as hard copy AND electronically through ANGEL

Name: Joe Zuniga
Grade level(s)/Subject taught: Regents Earth Science
Objectives: (Remember…*How will the modeling tool help the student better learn the objective?)* • Students will be able to complete a table which shows conservation of matter. • Students will be able to determine the half life of a substance given a graph of the radioactive substance and its stable product. • Students will recognize the graph as exponential decay.

Items to include in your TI Technologies lesson plan: (use *your* area/discipline/concepts).

For the math teacher:

1. *Write* the Mathematical Concept or "key idea" that TI Technologies will be used to teach: (e.g. Students use mathematical modeling/ multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships)

and/or…

For the Science teacher:

1b. *Write* the Science Concept or "key idea" that TI Technologies will be used to teach: (e.g. Organisms maintain a dynamic equilibrium that sustains life).

Half Life and Radioactive Decay

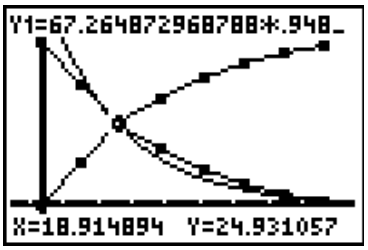
I will teach the topics of radioactive decay and half life and assess the student's knowledge with a bellwork assignment. Many students that are able to correctly give the definitions of half life and radioactive decay are not able to apply their knowledge to actual data to obtain answers. I will determine the student's level of understanding and either do this exercise as a demonstration on the overhead using the calculator or have the students do this in small groups independently. If I do this as a demonstration I will have the students do the lab afterwards.

The day of the exercise I will start the class by modeling a graph of linear and exponential decay. First I will start with 50 pennies and have a student take 5 out each time and tell me how many are left as I complete the table and then show the graph. I will then repeat the demonstration asking the student to remove one-half of the remaining pennies each time.

I will be circulating among the groups to check their progress, and to show them how to use the trace button to determine the half life. I will use the calculator to show that the number of atoms are conserved and that the half life point should be at y=25, the spot that the lines intersect. I will emphasize that we can not have part of and atom and must work in whole numbers.

The modeling of radioactive decay on the calculator, either teacher of student centered, will give a concrete example (model) for an abstract concept, that many of the students have difficulty with. Flipping a coin, a concept that students are familiar with, will also help to explain the concept of exponential decay, and that once a stable product is produced (the tails are not replace in the cup) no further reaction occurs.

Target	Acceptable	Unacceptable
Student correctly develops a table.	Each trial has a total of 50 atoms.	There is more than 1 trial that does not have a total of 50 atoms.
Student is able to identify the half life of Headsium using their data.	Student correctly identifies half life +/- 0.5 hours.	Student is not able to identify half life, incorrectly identifies half life, greater than +/- 0.5 hours error
Student is able to describe how they determined the half life using their graph.	Student identifies the half life as the intersection point (equal numbers of each atom.	Student is not able to identify the half life as the intersection of the lines.

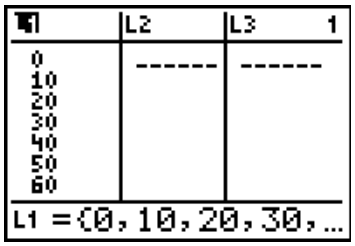


This is a simulation to model radioactive decay. You will be working with 2 imaginary atoms, headsium and tailsium. Headsium is an unstable radioactive element that breaks down into the stable isotope tailsium. Each shaking (trial) will represent 10 hours).You will record data, graph the results and determine the half life of headsium in this exercise.

Procedure:

1.

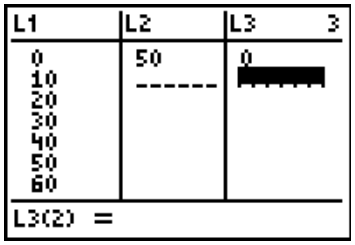
You need to set up a list (data table) on the calculator to record your data. Press: STAT – ENTER



L1 – trial - # of hours
L2 – # of atoms of Headsium
L3 – # of atoms of Tailsium

2.

Start with 50 pennies heads up in your tray. This represents 50 atoms of Headsium. Enter a 50 (the number of pennies that are heads) in column L2. Enter a 0 in column L3 (the number of atoms of Tailsium).



3.

Place the pennies in the cup and shake. (Be sure to cover the top with your hand)
Pour the pennies into the tray and count the number of pennies that are now tails. These are the stable isotope Tailsium and will not react further, change. Enter the data in the data table in column L3. Count the number of pennies that are still heads and enter in column L2. Be sure that the values add up to 50.

4.

Place the pennies that are still heads into the cup and shake and pour into the tray again. Count the totals for Headsium and Tailsium and record the data.

5.

Repeat for 7 trials or until there are no atoms of Headsium left.

6.

Press GRAPH to see your results. Press the TRACE button and use the right and left arrows to find the value for x and y at the point of intersection of the lines. What is the half life for Headsium? How do you know? How many atoms of Headsium and Tailsium are there after 2 half lives? What fraction of the original amount (50 atoms of Headsium is there after 2 half lives? How long are 2 half lives?