

Name _____

Homework 1

EAS 100 – Homework Assignment #1

RADIOACTIVE DECAY

OBJECTIVE:

This activity illustrates the concepts of radioactive decay of elements, half-life and how the age of a radioactive-element-bearing rock is determined. The exercise also is an opportunity to review/practice the basic science skills of observation (measurement), analysis (graphing), and inference. See pages 224-227 in Lutgens and Tarbuck, 2005.

MATERIALS:

You will need 50 pennies, 50 matches and a shoebox (or similar box) to complete this activity.

PROCEDURE:

Part I – Place the coins in the box with all coins turned to "heads" up. Record the total number (50) as the number of parent radioactive atoms at time equals zero. Shake the box well. After shaking (representing one time period), remove all of the coins which end up as "tails". These coins represent the atoms which have decayed and thus are daughter isotopes. The "heads", coins remaining in the box represent the parent atoms that have survived the time period without decaying. Record the number of remaining "parent" coins in the box. Repeat the shaking and coin removal process until only a few coins remain in the box. Record the number of "parent" coins at the end of each step. The table on the attached page should be used to record your results.

Now use the matches to represent a different radioactive element. Write a "D" on one side of the box to indicate daughter isotopes. Place the matches in the box and shake. After shaking (one time step) remove all matches that point (using the head of the match as the pointing end) toward the end of the box that is indicated by the D. Record the number of remaining matches (parent atoms) in the box and repeat until nearly all of the matches have been removed.

Part II – Plot the results on both of the attached graphs. Use a dot for the coins and a plus sign for the matches. Connect the points on your graphs with a smooth line. Your graph should now resemble in shape the curve in Figure I-5. The more coins used, the better will be the resemblance. (The reason for this is that statistics do not apply well to small numbers. An individual gambler can never predict how he might do on a given try at a slot machine, but averaged over many thousands of gamblers, the casino owners are assured of a steady flow of profits. In the same way, we can never predict just when an individual radioactive atom will decay, but when we are dealing with billions of atoms in rocks (which is always the case), we can be assured that the Law of Radioactive Decay is followed very closely.)

Use both the linear scale and logarithmic scale graph for the penny and the match data.

Part III – Answer the questions on the attached page.

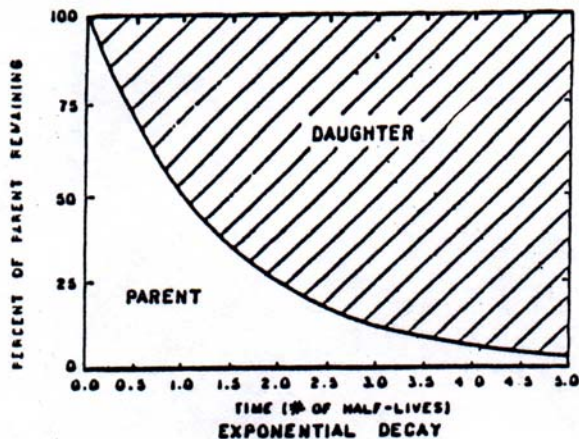
EAS 100 – Homework #1 – Data and Graphs

RADIOACTIVE DECAY

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DATA TABLE:

Number of "Time Intervals"	Parent "Atoms" Remaining	
	Penny	Match
0	50	50
1		
2		
3		
4		
5		
6		



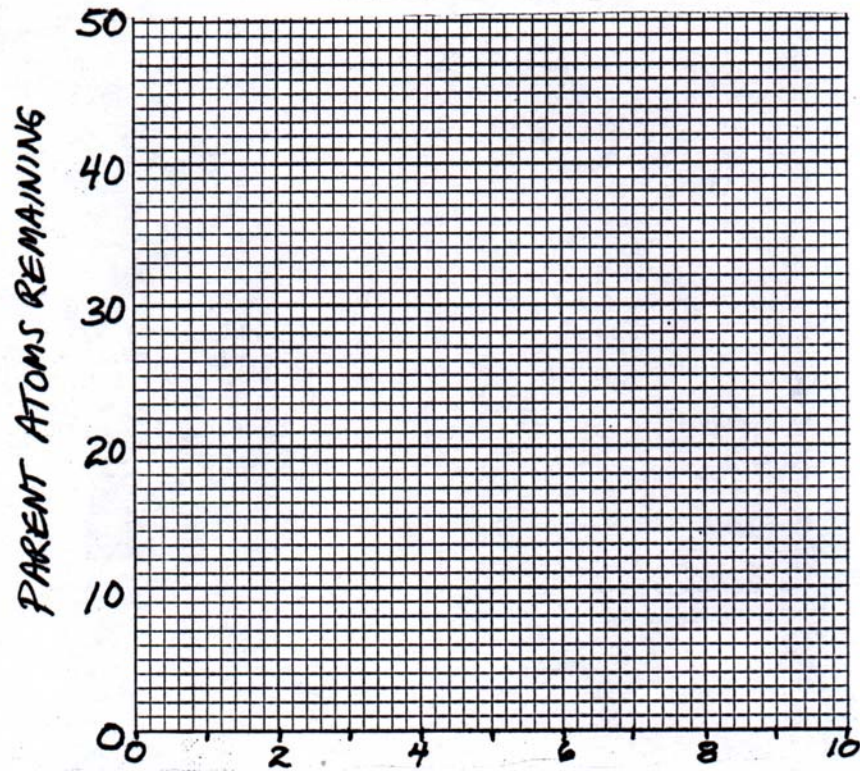
QUESTIONS:

1. Which element, "match" or "penny" decays faster? Why?
2. What is the half-life for the "penny" element and for the "match" element in terms of number of time periods (shaking cycles)?

EAS 100 – Homework Assignment #1 - Graphs
RADIOACTIVE DECAY

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Linear Graph



Logarithmic Graph

