Radiometric Dating Exercise

Learning outcomes of this exercise:

- To plot the natural decay curve for a radioactive isotope during decay
- To plot the curve of daughter atoms produced by radioactive isotope
- To use the curves to work sample problems.

Required Items: paper, pencil, graph paper, calculator

Instructions:

We have seen that to date an object such as a rock it must contain atoms of a radioactive isotope, of an element and those of its daughter. The instrument called a ***mass spectrometer*** is generally used to accomplish this task. For example, let us suppose that when a particular rock initially formed, it contained 256 atoms (i.e 100%) of the parent isotope(X) and zero atoms of the daughter(Y)(0%). After one half-life half of the atoms of X (i.e. 128 or 50%) have decayed yielding 128 or 50% atoms of Y, and the process continues on through successive half-lives.

a)Continue this reasoning and complete filling in the table below.

Number of Half-lives Elapsed	Number (%) Parent Atoms Present (P)		Number (%) of Daughter Atoms Present (D)	
	Number	%	Number	%
0	256	100%	0	0%
1				
2				
4				
5				
6				
7				
8				

(b) Plot the graph of the number of parent atoms (on the vertical axis, labeling the axis with % from 0% to 100%) against the number of half-lives (on the horizontal axis).

i. Connect all the points with a smooth curve.
ii. Describe the curve.

(c) On the same graph plot the number of daughter atoms against half-lives.

i. Use a different color pencil to connect all the points with a smooth curve.
ii. Describe the shape of the curve.
iii. Where do the two curves cross each other?

(d)Use the graph to answer the questions below :

i. Analysis of a rock sample shows that it contains 20% of the parent isotope X and 80% of daughter Y. If the half life of the parent X is 230 million years, what is the age of the sample?.
ii. A parent isotope G has a half-life of 400 million years. If a rock sample has 32% of G present, What is the age of the rock?

This activity is written by Ntungwa Maasha, of the College of Coastal Georgia based on the original activity from Richard M. Busch of West Chester university of Pennsylvania