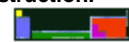


Revised August 2011



AP LAB 2c: Radioactive Decay Simulation



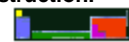
Aim To investigate the a simulated pattern of radioactive decay

Apparatus Scissors, paper cup

Chemicals None

Method

1. Cut the grid of "radioactive atoms" printed on page 4, into 100, individual squares.
2. Place the "radioactive atoms" randomly into a paper cup and shake them vigorously. At this point we assume that no decay process has taken place and that all atoms are "radioactive".
3. Throw the "radioactive atoms" out on to a hard surface.
4. Count the number of atoms that have "decayed" and the number of atoms that are still "radioactive" and record the number in the table on page 2.
5. Return the "undecayed" (still "radioactive") atoms to the paper cup but do NOT include any "decayed" atoms, and repeat steps #3 and #4 above until the decay process is complete, or until you have run out of rows on the results table.



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Results

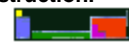
TRIAL	NUMBER OF "RADIOACTIVE NUCLEI"	NUMBER OF "DECAYED NUCLEI"
0	100	0
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		



Conclusion/Calculation

1. Plot a graph of "Radioactive nuclei" (y-axis) against Trial (x-axis).
2. Add a line to the graph in #1 which shows the change in the TOTAL number of "decayed nuclei" over the trials.
3. Use the graph to estimate the half-life (in units of "Trials") for the radioactive decay process.
4. At what point of the decay process is the rate of decay the greatest? How can this be determined from the graph?
5. If the experiment had been conducted with an initial number of 6.02×10^{23} "radioactive nuclei", how many would remain undecayed after five half-lives? What percentage does this represent?
6. In another experiment it is found that 46 "undecayed nuclei" remained from an initial sample of 200 "radioactive nuclei"; how many half-lives have elapsed?
7. Plutonium-242 has a half-life of approx. 373,000 years and Cobalt-58 a half-life of 71 days. If a 10 gram sample of each element undergoes decay, what mass (and %) of each will be left after 1 year? What is the consequence of these data for the storage of radioactive isotopes?

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<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>
<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>
<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>	<u>DECAYED</u>
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