



Radioactive Decay Problems

Bromfield Honors Chemistry

Half Life

- The amount of time required for one half (50%) of a sample to undergo radioactive decay

Half Life

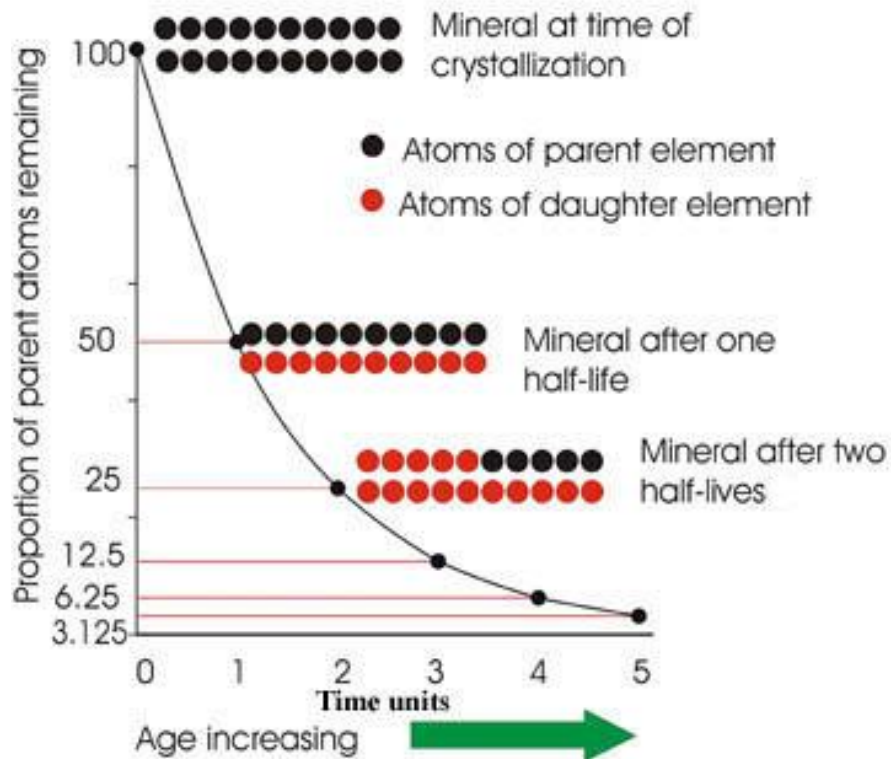
- The amount of time required for one half (50%) of a sample to undergo radioactive decay
 - $T_{1/2}$
- ***The rate at which a nucleus decays is fixed by its internal properties, and is not affected by biological, chemical or physical conditions.***

Half-Life

- Applet

- Half life can vary greatly—from fractions of a second to billions of years!
- Independent of the amount of isotope

Half-Life



- Half life can vary greatly—from fractions of a second to billions of years!

Applications

- Geology
- Video: [100 Greatest Discoveries](#)
- Archaeology
- Video: [Carbon-14 Dating](#)

Example Problem

- Gold-198 has a half-life of 2.70 days. If a 225 gram sample of gold-198 disintegrates over the course of 10.8 days, what mass of gold-198 remains?

Half-lives	Elapsed time (days)	Fraction gold-198 remaining	Grams of gold-198 remaining
0	0	1	225
1	2.7	$\frac{1}{2}$	112.5
2	5.4	$\frac{1}{4}$	56.25
3	8.10	$\frac{1}{8}$	28.13
4	10.8	$\frac{1}{16}$	14.1

Example Problem #2

- What is the half-life of a radioactive isotope if a 325 g sample decays to 10.2 g in 26.3 years?

# of half-lives	Mass of radionuclide	Total elapsed time
0	325 g	0
1	162.5	↓
2	81.25	
3	40.63	
4	20.31	
5	10.2 g	

$$T_{1/2} = \frac{26.3}{5} = 5.26 \text{ y}$$