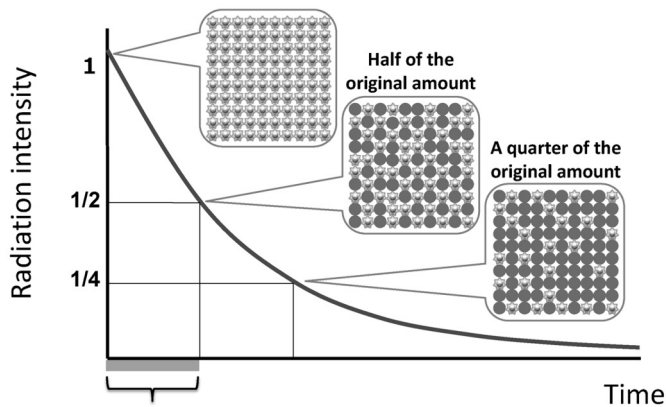# Nuclear Decay Rate

The nuclear decay rate (*speed*) is how fast a particle will decay into a more stable form via alpha, beta -, beta +, or electron capture decay.

Radiation intensity

1

1/2

1/4

Half of the original amount

A quarter of the original amount

Time

An isotope's decay rate is based on the **stability of the isotope** that will decay as part of the decay process.
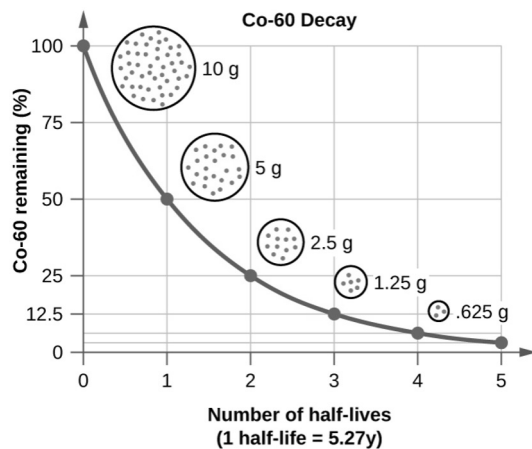
Nuclear Decay Rate
More Stable – Slower Rate
Less Stable – Faster Rate

13

Nuclear Half Life

The time for particles to decay is based on the stability of particles is a isotopes Half-Life time.

Co-60 Decay

Co-60 remaining (%)

100

75

50

25

12.5

0

10 g

5 g

2.5 g

1.25 g

.625 g

0   1   2   3   4   5

Number of half-lives
(1 half-life = 5.27y)

The **Half-Life** of a particle is the time it takes for half (50%) of the particles to decay from the original isotope state.
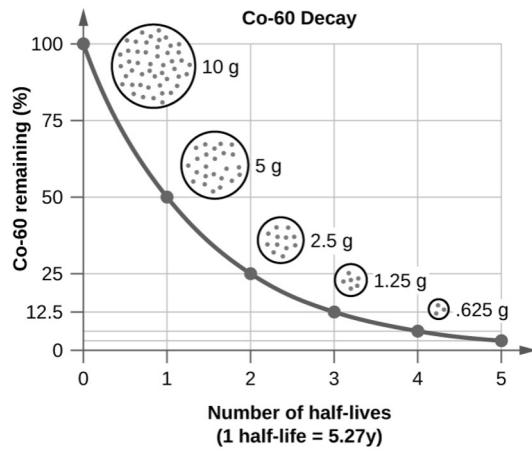
The graph of a decay curve shows the rate of decay slows down over time

$$\text{Rate} = \frac{\text{Remaining Undecayed Isotopes}}{\text{Decay Time (}Based\ on\ Half\text{-}Life\text{)}}$$

14

1

Decay Process

The decay process shows a decrease in total isotopes over time.

Co-60 Decay

Co-60 remaining (%) vs Number of half-lives
(1 half-life = 5.27y)

10 g — 5 g — 2.5 g — 1.25 g — .625 g

Co-60 Decay Process (HL = 25min)

Decay Time	Number Half Lives	Remaining Isotopes	Particles Decayed
0min	0 HL	500	0
25min	1 HL	250	250
50min	2 HL	125	375
75min	3 HL	63	438
100min	4 HL	32	470
125min	5 HL	16	486
150min	6 HL	8	494

15