



# NUCLEAR CHEMISTRY

## KINETICS: RADIOACTIVE DECAY RATES

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## PRACTICE PROBLEM 1

$^{60}\text{Co}$  decays with a half-life of 5.27 years to produce  $^{60}\text{Ni}$ . Calculate the fraction of original sample of  $^{60}\text{Co}$  that will remain after 15 years has passed.

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$$\begin{aligned}\frac{N_t}{N_0} &= 0.5^{\frac{t}{t_{1/2}}} \\ &= 0.5^{\frac{15 \text{ yr}}{5.27 \text{ yr}}}\end{aligned}$$

$$\frac{N_t}{N_0} = 0.139$$

## PRACTICE PROBLEM 2

$^{239}\text{Pu}$  decays with a half-life of  $t_{1/2} = 2.41 \times 10^4$  years. Calculate the time it would take for a sample of  $^{239}\text{Pu}$  to decay to 2.5% of its original population.

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$$\begin{aligned}t &= -\frac{t_{1/2}}{\ln 2} \ln \frac{N_t}{N_0} \\ &= -\frac{2.41 \times 10^4 \text{ yr}}{\ln 2} \ln \frac{2.5}{100} \\ t &= 1.28 \times 10^5 \text{ yr}\end{aligned}$$