CONCEPT: RADIOACTIVE HALF-LIFE

- **Half-Life (___):** The amount of time required for _____ of a *radioisotope* to decay.
  - □ **Radioisotope:** Isotopic version of an element that has an unstable _____ and emits radiation as it decays.
  - □ The radioactive decay of an unknown radioisotope with a half-life of 1 day is displayed as:

Radioactive Decay

10.0 g $^{A}_{Z}X$	1 day → 5.0 g $^{A}_{Z}X$	1 day → 2.5 g $^{A}_{Z}X$	1 day → 1.25 g $^{A}_{Z}X$
_____ half lives	_____ half life	_____ half lives	_____ half lives
_____%	_____%	_____%	_____%

Radioisotope Remaining

- The fraction, percentage and final amount of a radioisotope after each half-life can be calculated by different means.

Radioisotope Remaining

Fraction Formula	Final Amount Formula
Fraction Remaining = (___)□	Final Amount Remaining = [ ]$_i$ ●(___)□
□ ___ = Number of half-lives.	□ ___ = _____ amount of radioisotope

□ Multiplying the fraction remaining value by _____ gives the percentage remaining of the radioisotope.

EXAMPLE: Sodium-24, a radioisotope used in examining human circulation, has a half-life of around 15 days. Approximately what percentage of a sample would remain after 3 months, if a month is considered 30 days?

PRACTICE: The half-life of arsenic-74 is about 18 days. If a sample initially contains 100.00 mg arsenic-74, what mass (in mg) would be left after 72 days?

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PRACTICE: The half-life of iodine-131, an isotope used in thyroid therapy, is 8.021 days. What percentage of iodine-131 remains in a sample that is estimated to be 40.11 days old?

PRACTICE: What is the concentration of a CO_2 in a container after 4 half-lives if 0.325 mol of CO_2 is initially placed into a 5.0 L reaction vessel?

PRACTICE: What is the half-life of the radioisotope that shows the following plot of remaining percentage vs. time?