

Introduction for Module 9 – Nuclear Chemistry

Textbook: [Open Stax Chemistry 2e](#)

Suggested Reading: Chapter 21 (especially 21.1-21.3)

Learning Objectives:

- **Describe nuclear structure in terms of protons, neutrons, and electrons**
- **Explain trends in the relative stability of nuclei**
- **Identify common particles and energies involved in nuclear reactions**
- **Calculate kinetic parameters for decay processes, including half-life**

Captions and Attributions:

- 1) The chain reaction of the nuclear fission of Uranium 235 (U-235) begins with a neutron bombarding the fissile U-235 nucleus. [Figure 21.14 When a slow neutron hits a fissionable U-235](#) by [Open Stax](#) is [licensed under CCBY 4.0](#).
- 2) There are some particles that very commonly participate in nuclear reactions, and are related to known decay processes. [Figure 21.4 Although many species are encountered in nuclear reactions](#) by [Open Stax](#) is [licensed under CCBY 4.0](#).
- 3) Various nuclear decay reactions are shown here. The name of the reaction is based on the particle that is leaving or combining with the initial nucleus. [Figure 21.7 This table summarizes the type, nuclear equation](#) by [Open Stax](#) is [licensed under CCBY 4.0](#).
- 4) The “band of stability” shows the trend of the number of neutrons needed to create a stable nucleus as an atom grows larger. The center of this band can be predicted by the atomic mass of an element. [Figure 21.2 This plot shows the nuclides that are known to exist](#) by [Open Stax](#) is [licensed under CCBY 4.0](#).
- 5) First order kinetics – such as that of nuclear decay – divide in half over set periods of time (half life) and shows the following plot of decay over time. [Figure 21.10 For cobalt-60, which has a half-life of 5.27 years](#) by [Open Stax](#) is [licensed under CCBY 4.0](#).
- 6) C-14 dating can be used to calculate the age of a sample, as all living things will have a known amount of C-14 present. [Figure 21.11 Along with stable carbon-12, radioactive carbon-14](#) by [Open Stax](#) is [licensed under CCBY 4.0](#).



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