

**Problem Set 15: Nuclear Transformations****Major Concepts**

- Explain how an unstable nucleus releases energy
- Describe the three main types of nuclear radiation (alpha, beta, and gamma particles)
- Describe the type of decay a radioisotope undergoes
- Make calculations that involve half-life
- Explain the two ways transmutations can occur

**Reading**

Chapter 19.1, 19.2, &amp; 19.3

Using one paragraph per section summarize the three sections you just read.

**Reading Guide**

Complete Reading Guide 15

**Lab**

Complete Lab 15: Half-Life. Turn in the Lab Report Form.

**Lecture Notes**

Print and read *Lecture 15* from TheChemBook; Combine your notes from class with the notes on TheChemBook. Use the Cornell Notes Strategy to review your notes each night (5 min.).

**Vocabulary**

Define each vocabulary word.

Alpha-particle	Geiger counter	
Beta particle	Half-life	Positron
Decay series	Nuclear transformation	Radioactive
Electron capture	Nucleons	Scintillation counter
Gamma ray	Nuclides	Transuranium elements

**Questions and Problems**

- Using  $Z$  to represent the atomic number and  $A$  to represent the mass number, give the general symbol for a nuclide of element  $X$ .
- When balancing a nuclear equation, what two quantities must be conserved?
- Complete each of the following nuclear equations by supplying the missing particle.
  - ${}_{13}^{28}\text{Al} \rightarrow ? + {}_{14}^{28}\text{Si}$
  - ${}_{24}^{56}\text{Cr} \rightarrow {}_{-1}^0e + ?$
  - ${}_{30}^{72}\text{Zn} \rightarrow {}_{-1}^0e + ?$
- What is the difference between nuclear decay and nuclear transformation reactions?
- Explain why one-fourth of a given radioactive sample still remains at the end of two half-lives?
- Why are particle accelerators needed for bombardment processes?