# Nuclear Chemistry

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## Objectives

- Write equations for transmutation reactions
- Understand 5 types of nuclear radiation
- Perform half-life calculations

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## Transmutation Reactions

- Transmutation—converting one type of atom into another
  - Only nuclear reactions
  - Radioactive decay
  - Particle bombardment

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$$^{18}_{9}F \rightarrow {}^{17}_{8}O + {}^{1}_{1}H$$

The superscripts have to add up

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$$^{14}_{7}N + {}^{4}_{2}He \rightarrow {}^{18}_{9}F$$

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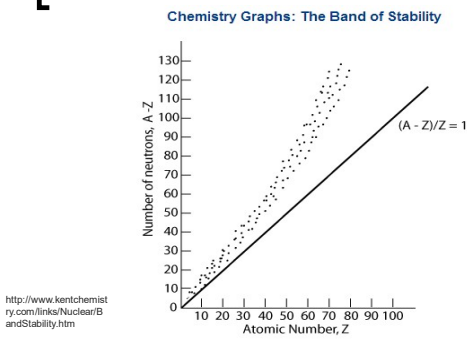


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- Alpha (α) Radiation
  - Gives off α particle, helium nucleus, no $e^-$

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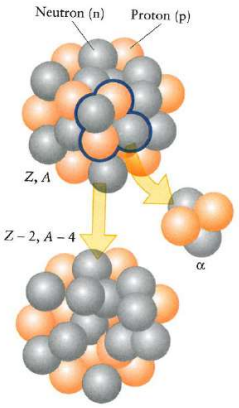


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- Uranium-238 undergoes alpha decay. Write the equation.
- Thorium-230 emits an alpha particle. Write the equation.

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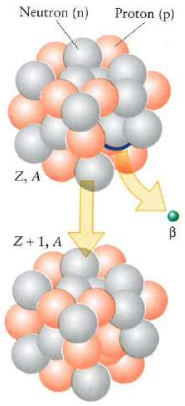


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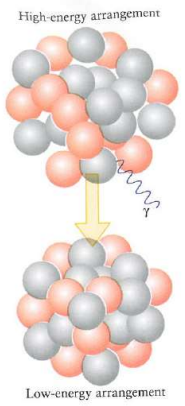


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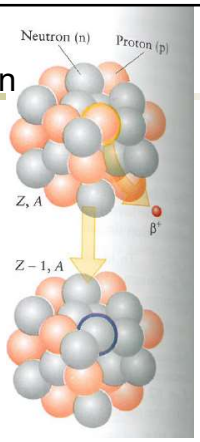


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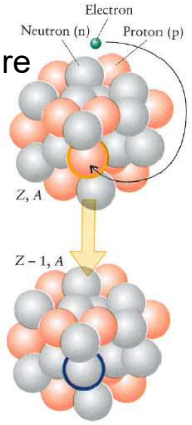


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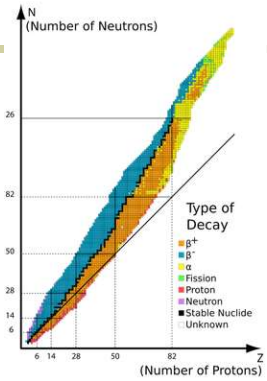


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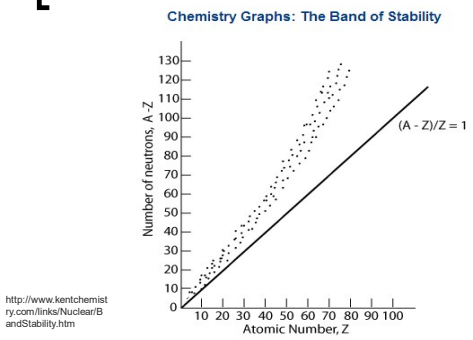


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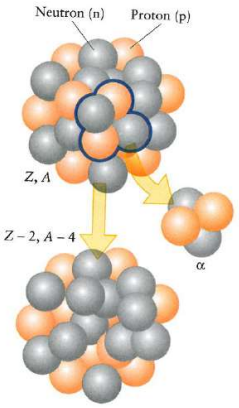


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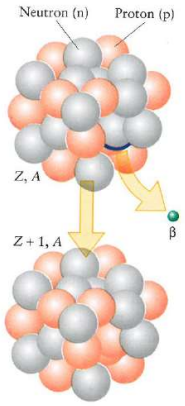


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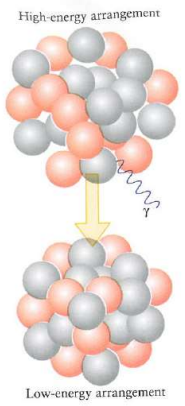


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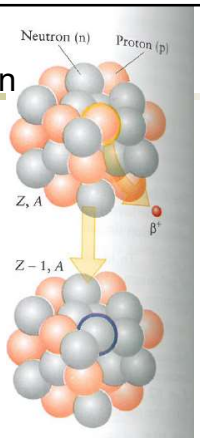


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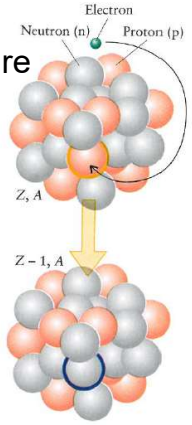


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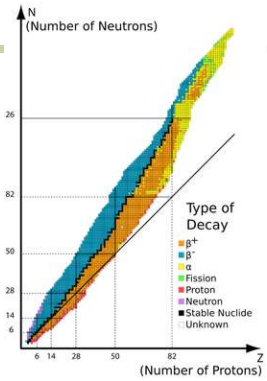


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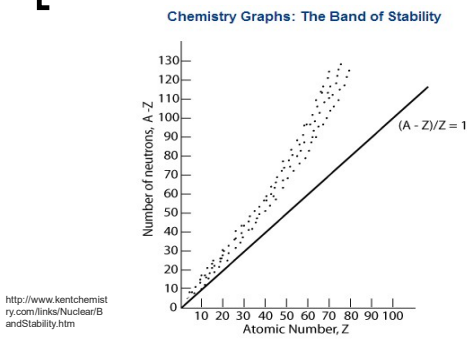


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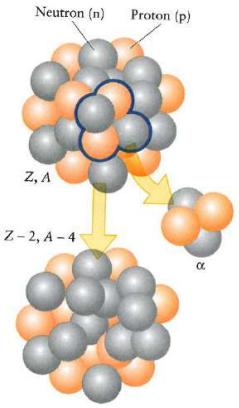


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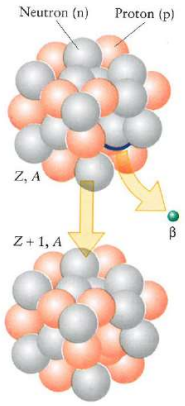


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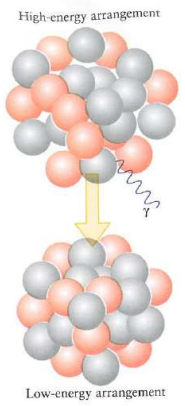


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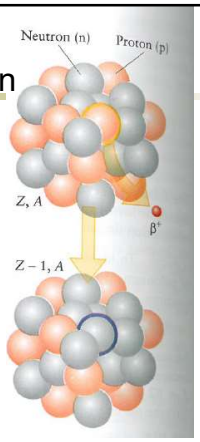


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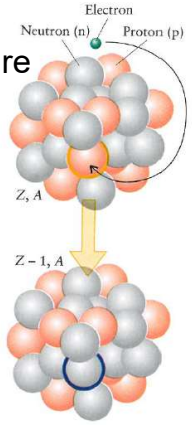


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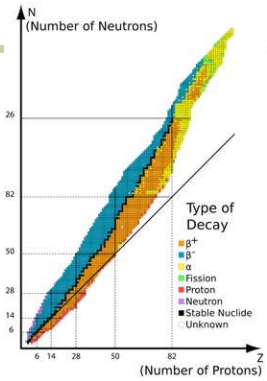


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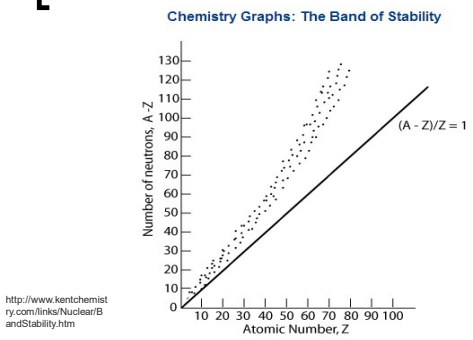


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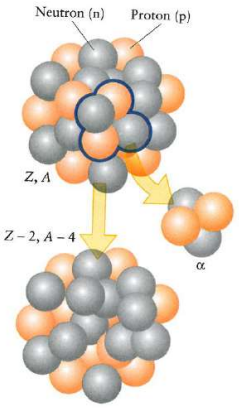


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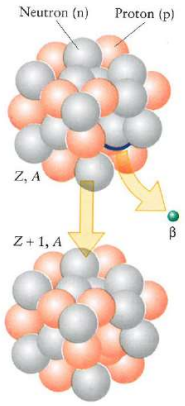


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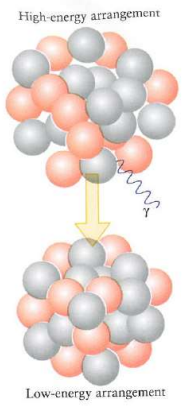


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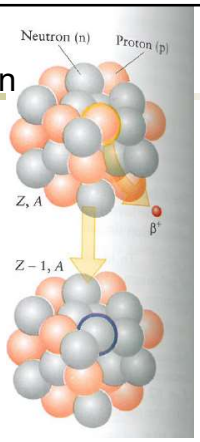


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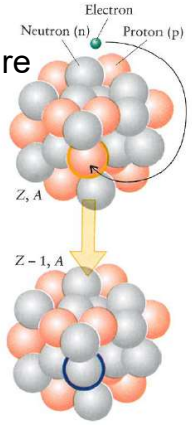


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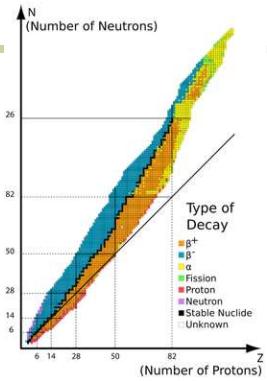


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## Half-life problem #2

- Carbon-14 emits beta radiation and has a half-life of 5730 years. You are left with 25.0 g of carbon-14 after 22920 years. What was the original mass of carbon-14?

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## Half-life problem #3

- Karen the scientist has a 0.800 g sample of cobalt-60. After 10.5 years, only 0.200 g of the sample is cobalt-60. What is the half-life of cobalt-60?

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