Absolute Dating

How do we use radioactive decay in dating the absolute age of a rock, fossil, or event?
Absolute Dating

- **Absolute Dating** - using radioactive decay to determine the exact age of a rock, fossil, or event

- **Radioactive Decay** - the disintegration of an isotope over time
Step 1: Geologists drill for core samples.
Step 2: Geologists crush the samples into thin sections and a fine powder.
Step 3: Geologists analyze the samples for composition and inconsistencies.
Step 4: Geochronologists use spectroscopes to measure the ratio of stable to unstable products.
Periodic Table
Absolute Dating

• *Isotopes* - variations of an element that have the same atomic number but differing atomic masses

  • Example: Stable carbon has a mass of 12 units called Carbon-12 and isotopic carbon has a mass of 14 units called Carbon-14
Absolute Dating

- **Half-Life** - the time required for half of a radioactive product to decay to a stable product
  - In a given sample of a radioactive isotope half of the atoms will decay to a stable product, but the remaining half is still radioactive
Absolute Dating

- Each element has its own half-life that range from fractions of a second to billions of years.
Absolute Dating

• The half-life of an isotope is not affected by any environmental factors such as temperature, pressure, or chemical reactions
Absolute Dating

• **Uranium-238** - one of the most important isotopes when dating rocks or events millions of years ago
  
  • Mass: 238 units
  
  • Decay: Uranium-238 $\rightarrow$ Lead-206
  
  • Half-Life: 4,500,000,000 years
Absolute Dating

• **Carbon-14** - one of the most important isotopes when dating organic remains within tens of thousands of years

  - **Mass**: 14 units
  - **Decay**: Carbon-14 $\rightarrow$ Nitrogen-14
  - **Half-Life**: 5,700 years
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<tr>
<th>Half-life</th>
<th>Percentage of Unstable C-14</th>
<th>Percentage of Stable N-14</th>
<th>Number of Years</th>
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