Lesson – Radioactive Dating

THE FOLLOWING VIDEO HAS BEEN APPROVED FOR ALL AUDIENCES
BY THE EARTH SCIENCE TEACHERS ASSOCIATION OF AMERICA , INC

THE VIDEO HAS BEEN RATED

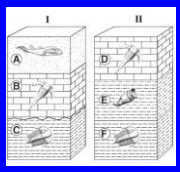
I	INTELIGENT UNDER 15 REQUIRES TEACHER ASSISTANCE

STRONG EARTH SCIENCE LANGUAGE, DETAILED DIAGRAMS, AND SUPER AWESOMENESS

- I can explain absolute dating
- I understand what half life means
- I can use the Radioactive Decay chart on the ESRT
- I can answer radioactive decay questions

Review:

1. List the layers from oldest to youngest
2. Name 2 processes that produced the unconformity in outcrop I
3. Describe the 2 characteristics a fossil must have to be considered a good index fossil.



Absolute Dating

- **Numerical age** of rocks & other objects
- Examples:
  - Radioactive Dating
  - Counting Tree Rings

Isotopes & Radioactive Decay

ELEMENT
Substance of atoms that are chemically alike

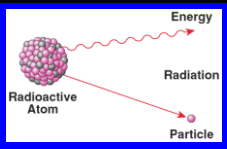
-Elements exist in several forms called **ISOTOPES**

Ex: Carbon-12 & Carbon-14

Isotopes of carbon

Carbon-12	Carbon-14
6 protons	6 protons
6 neutrons	8 neutrons

- Isotopes are **UNSTABLE** or **RADIOACTIVE**
- Emit energy in a process called **RADIOACTIVE DECAY**



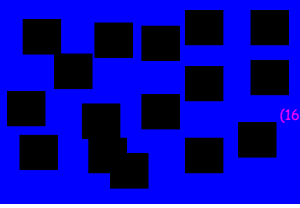
This occurs until a **STABLE** isotope FORMS

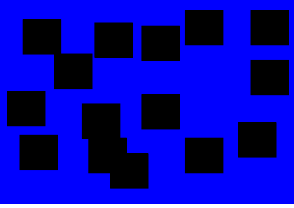
Radioactive materials decay from the "Parent" material into the "Daughter Product".

Original "Parent" Material

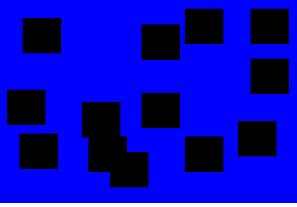
Daughter Product

You'll never know which atoms will decay…

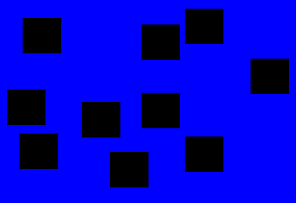




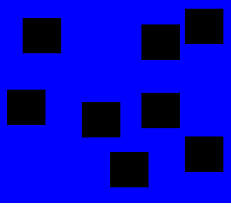
… or when …



But one thing we do know…



…is that it always takes the same amount of time for **half** to disappear.



(8 atoms)

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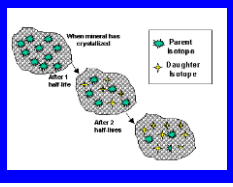
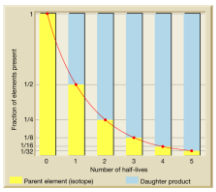
Half-life

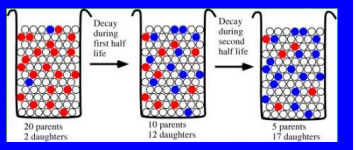
Time required for **HALF** of the atoms in a given mass of an isotope to **DECAY**



The Half-Life Decay Curve



Every Half-life you ***lose half*** of the **PARENT ISOTOPE** & ***gain half*** of the **DAUGHTER ISOTOPE**



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Radioactive Decay Data

RADIOACTIVE ISOTOPE	DISINTEGRATION	HALF-LIFE (years)
Carbon-14	$C^{14} \rightarrow N^{14}$	5.7×10^{3}
Potassium-40	$K^{40} \rightarrow Ar^{40}$, $K^{40} \rightarrow Ca^{40}$	1.3×10^{9}
Uranium-238	$U^{238} \rightarrow Pb^{206}$	4.5×10^{9}
Rubidium-87	$Rb^{87} \rightarrow Sr^{87}$	4.9×10^{10}

PARENT DAUGHTER

Scientific Notation to Normal

Count the # of times the **DECIMAL** needs to be moved to **RIGHT** for each power of ten and ADD ZEROS

1) 5.7×10^3 ⟶ 5700

2) 3.5×10^6 ⟶ 3500000

3) 1.1×10^4 ⟶ 11,000

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RADIOACTIVE ISOTOPE	DISINTEGRATION	HALF-LIFE (years)
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Potassium-40	$K^{40} \rightarrow Ar^{40}$, $\rightarrow Ca^{40}$	
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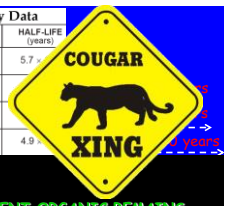
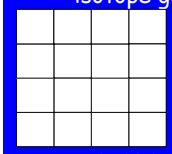
Rubidium-87	$Rb^{87} \rightarrow Sr^{87}$	4.9 ×



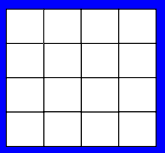
Carbon-14
- **SHORT** half-life
- Used to **DATE RECENT ORGANIC REMAINS**

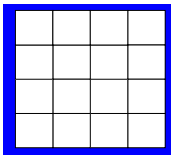
Uranium-238
- **LONG** half life
- Used to **DATE OLD ROCKS** (age of Earth)

Each half-life, the parent isotope gets cut in half.



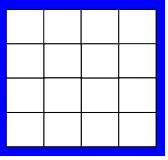
One half-life →





←Two half-lives.

Three half-lives. →



Sample Questions

One half life for a penny is 5,730 years. How many pennies will be left after 1 half life? How many years have past?

1 Half-live = 6 TOTAL
AGE of PENNIES
5,730 years

BEGIN = 12 TOTAL

How many pennies will be left after 3 half life? How many years have past?

3 Half-live = 1.5 TOTAL
AGE of PENNIES
17,190 years

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