

Half Life

Do radioactive materials always remain unstable (radioactive)?

No. They will eventually become stable.

**How long does it take for unstable
(radioactive) atoms to give off
energy (radiation) and become
stable?**

Radioactive elements decay at different rates from fractions of a seconds to millions and billions of years!

Half-Life Data Worksheet

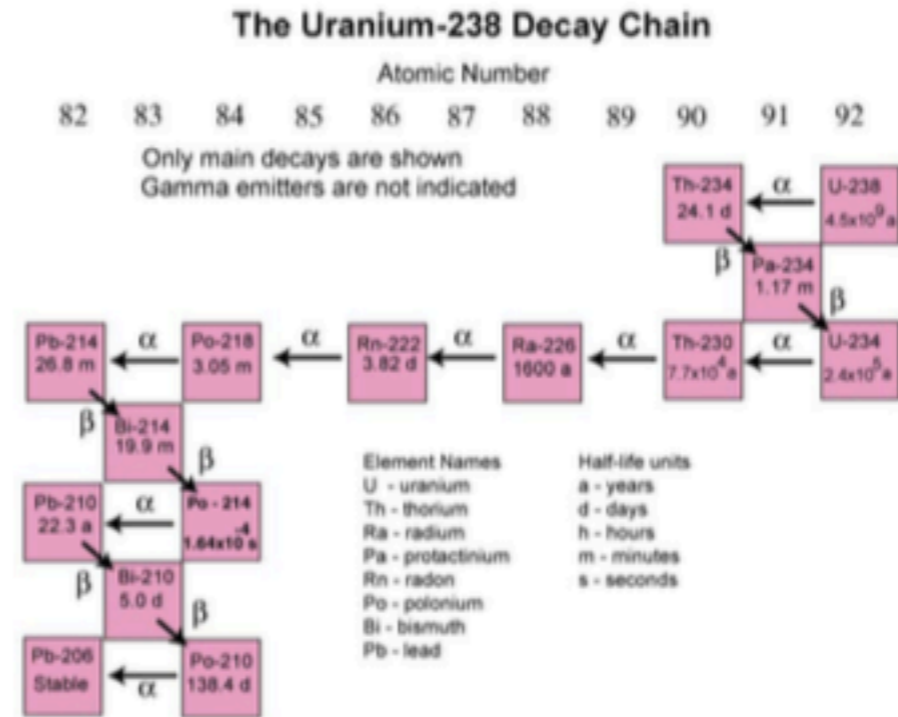
Name: _____

Date: _____

Follow the directions and answer the questions.

The following image shows how uranium-238 (a radioactive element) decays and changes to a stable element (lead-206). The half-life of each element is shown in years and days.

1. Hypothesize what half-life is:



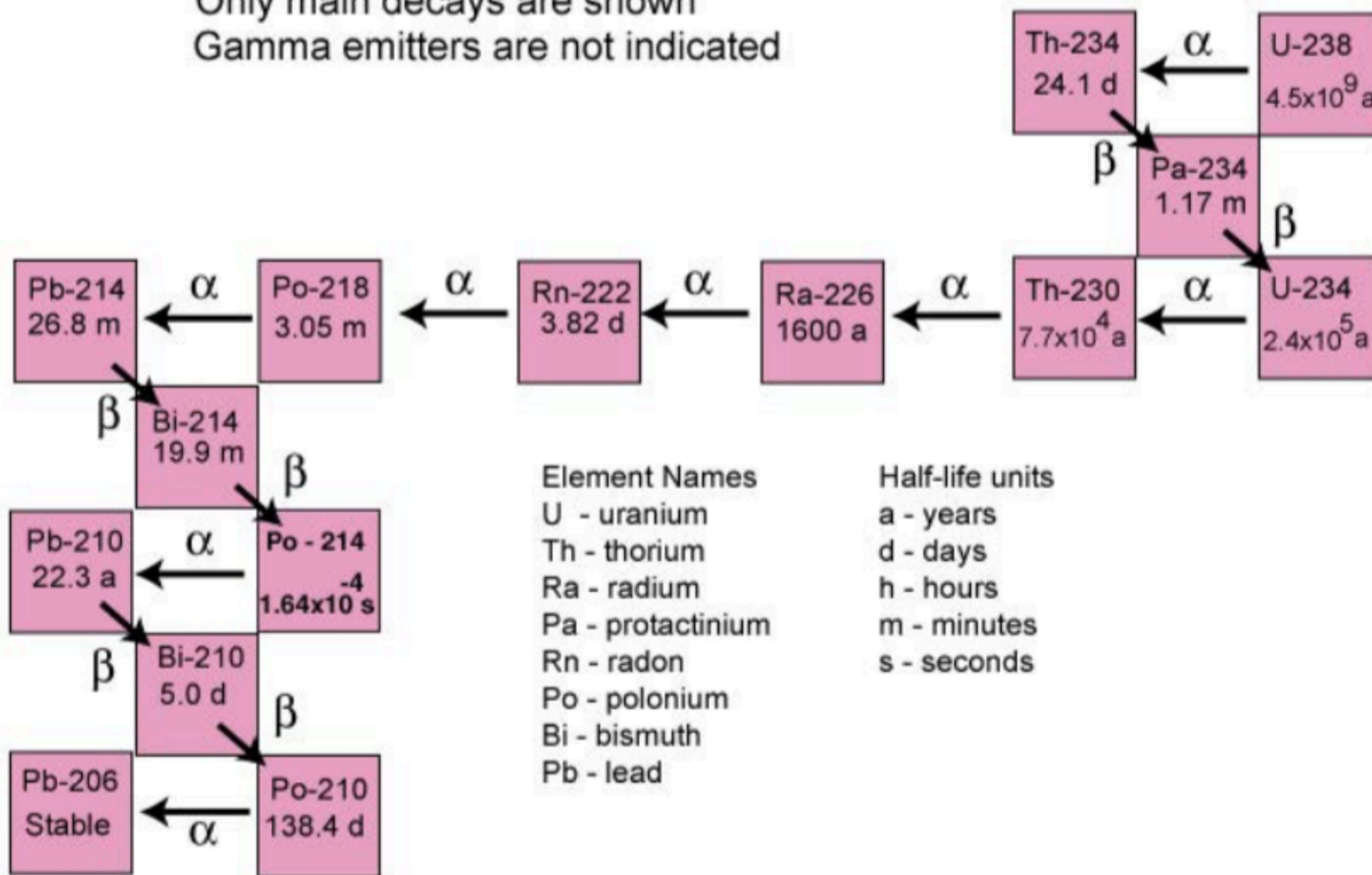
Fill in the hypothesis!

The Uranium-238 Decay Chain

Atomic Number

82 83 84 85 86 87 88 89 90 91 92

Only main decays are shown
Gamma emitters are not indicated



Class Demo #1

- 1) 3 volunteers stand together**
- 2) fast (Radon: 3.8 days), medium (1600 years), slow (4.5 billion years)**
- 3) Walk to first halfway mark and stop before going on**
- 4) Walk to the second halfway mark and stop before going on**
- 5) Observations?**

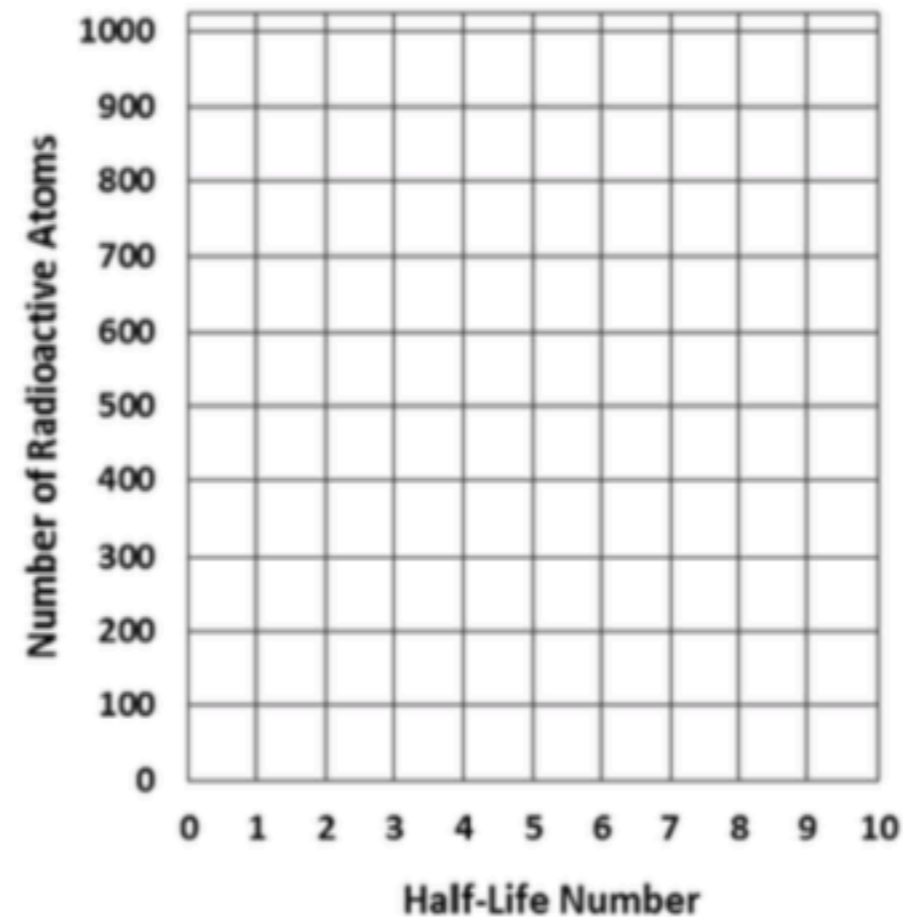
Class Demo #2

- 1) 12 volunteers (radon and polonium signs)**
- 2) Everyone starts as radon**
- 3) Half life occurs**
- 4) 2nd half life occurs**
- 5) 3rd half life occurs**

Complete #2 now

2. Calculate the number of radioactive atoms remaining after each half-life. Write the number of atoms in the "Number of Radioactive Atoms" column. Plot the number of radioactive atoms on the graph provided. Note that the number of unstable (radioactive) atoms decreases as they are being transformed into stable atoms.

| Half-Life Number | Number of Radioactive Atoms |
|------------------|-----------------------------|
| 0 | 1024 |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |



Observations: _____

Complete #3 now

3. If you had a sample of 4,000 radioactive atoms, how many atoms would remain after 5 half-lives?

| Half-Life Number | Number of Radioactive Atoms |
|------------------|-----------------------------|
| 0 | 4000 |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

Complete #4-7 now

4. If you had a sample of 210 atoms, and you started with a sample of 3,360 atoms, how many half-lives have elapsed?

5. If the half-life of the sample from question 2 is 30 minutes, how many hours did it take to decay from 3,360 atoms to 210 atoms?

6. Can you determine the age of something (like a fossil) by examining its half-life? Explain.

7. In what other ways might it be useful to know a sample's half-life?
