Purpose: This activity introduces you to two common forms of nuclear decay.

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Parent Isotope | ParticleEmitted | DaughterIsotope | Change in atomic number | Number of Protons lost or gained | Number of Neutrons lost or gained | Change in mass number | Alpha or Beta decay? |
| 1 | 226 4 222 Ra He + Rn88 2 82 |  | Two lost |  |  | Alpha |
| 2 | 214 4 210 Po He **+** Pb84 2 82 |  |  | Two lost |  |  |
| 3 | 47 0 47 Ca e **+** Sc20 -1 21 |  |  |  |  |  |
| 4 | 148 4 144 Gd He **+** Sm64 2 62 |  |  |  | Minus four |  |
| 5 | 14 0 14 C e **+** N6 -1 7 | Plus one  |  |  |  | Beta |

Instruction: You will be looking at two types of radioactive decay – alpha decay (α) and beta decay (β). Fill in the table below and then use it to help you figure out what is happening during each type of decay.

Answer the following questions:

1. What changes take place in the nucleus when an alpha particle is emitted?
2. What is the identity of an alpha particle?
3. What changes take place in the nucleus when a beta particle is emitted?
4. Which particle is associated with beta decay?
5. When an alpha particle is lost from atom, where on the periodic table would you look to find the product??
6. Fill in the missing parts of these nuclear reaction:

 140 140

F) Ba ? + La

 56 57

 110 106

E) I ? + Sb

 53 51

 238

D) U α + ?

 92

 35 0

 C) Si e¯ + ?

 14 -1

 40 40

A) ? β¯ + Ca

 20

 4 226

B.) ? He + Ra

 2 88

1. Does the identity of the atom change during radioactive decay? Why or why not?
2. If an atom of element number 85, astatine, undergoes alpha decay, what atom will be produced?
3. If an atom of element number 87, francium, undergoes beta decay, what atom will be produced?
4. Which isotopes are most likely to decay?

**Making Sense:**

Give a specific example of how a chemist might make gold using alpha decay. Be specific about which isotope of gold is made. Give a specific example of how a chemist might make gold using beta decay. Be specific about which isotope of gold s made. Would the isotopes of gold prepared by alpha and beta decay be located in the band of stability?

**If you finish early…**

Write an equation representing alpha decay in a possible isotope of Es, einsteinium.