

NUCLEAR REACTIONS

--When the nucleus of an atom is unstable, it will **spontaneously decay** and the nucleus will emit particles

--A change like this in the nucleus of an atom is called a **nuclear reaction**.

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Types of Decay

There are two types of decay that we will talk about:

alpha decay

beta decay

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Alpha Decay

-- Alpha decay is a form of nuclear decay - radioactivity

-- An alpha particle is a helium nuclei $\begin{matrix} 4 \\ 2 \text{He} \end{matrix}$

-- During alpha decay

- * 2 protons are lost
- * 2 neutrons are lost

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Alpha Decay

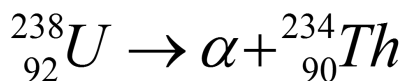
$$\begin{matrix} {}^{238}_{92}\text{U} & \rightarrow & \alpha & + & {}^{234}_{90}\text{Th} \\ {}^{238}_{92}\text{U} & \rightarrow & {}^4_2\text{He} & + & {}^{234}_{90}\text{Th} \end{matrix}$$

Two ways to write alpha decay:

α or ${}^4_2\text{He}$ or ${}^4_2\alpha$

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Parts of Alpha Decay



Parent Atom

Alpha particle

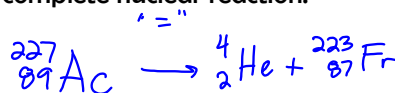
Daughter Isotope

"type of decay"

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Example: Alpha Decay

What products do you expect if an atom of actinium-227 undergoes alpha decay? Write the complete nuclear reaction.

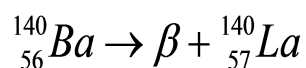


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Beta Decay

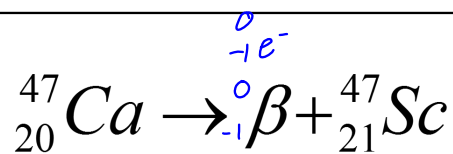
-- During beta decay, a **neutron** inside the nucleus of the atom **changed** into an **electron** and a **proton**.

-- The **proton** stays inside the nucleus and an **electron** is emitted.



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Example: Beta Decay



Parent Atom

Beta particle

Daughter Isotope

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Practice

1. What is an alpha particle?
helium nuclei ${}^4_2\text{He}$
2. Where do you think the electron comes from in beta decay?
neutron \rightarrow proton
neutron \rightarrow electron
3. What do you think is happening in this equation?
 ${}^1_0n^0 \rightarrow {}^0_{-1}e^- + {}^1_1p^+$
how we get p

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Practice

4. Complete the reactions and determine if it is alpha decay or beta decay.

- a. ${}^{210}_{82}\text{Pb} \rightarrow {}^0_{-1}e^- + {}^{210}_{83}\text{Bi}$
parent \rightarrow daughter isotope
beta
- b. ${}^{230}_{90}\text{Th} \rightarrow {}^4_2\text{He} + {}^{226}_{88}\text{Ra}$

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Radioactivity

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