

Understanding Radioactive Decay

Atomic Number Review

What does the atomic number represent? _____

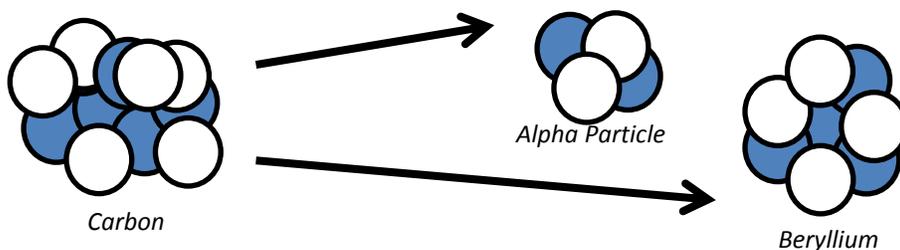
Locate each of the following on the periodic table and record the atomic number (the first one has been done for you):

C 6	Th	Cl	K	Ar
Pb	U	N	I	Xe
Al	Mg	O	He	Pt

If the number of protons is changed then so is the identity of the atom! For example, when a proton is added to Carbon it becomes a form of Nitrogen.

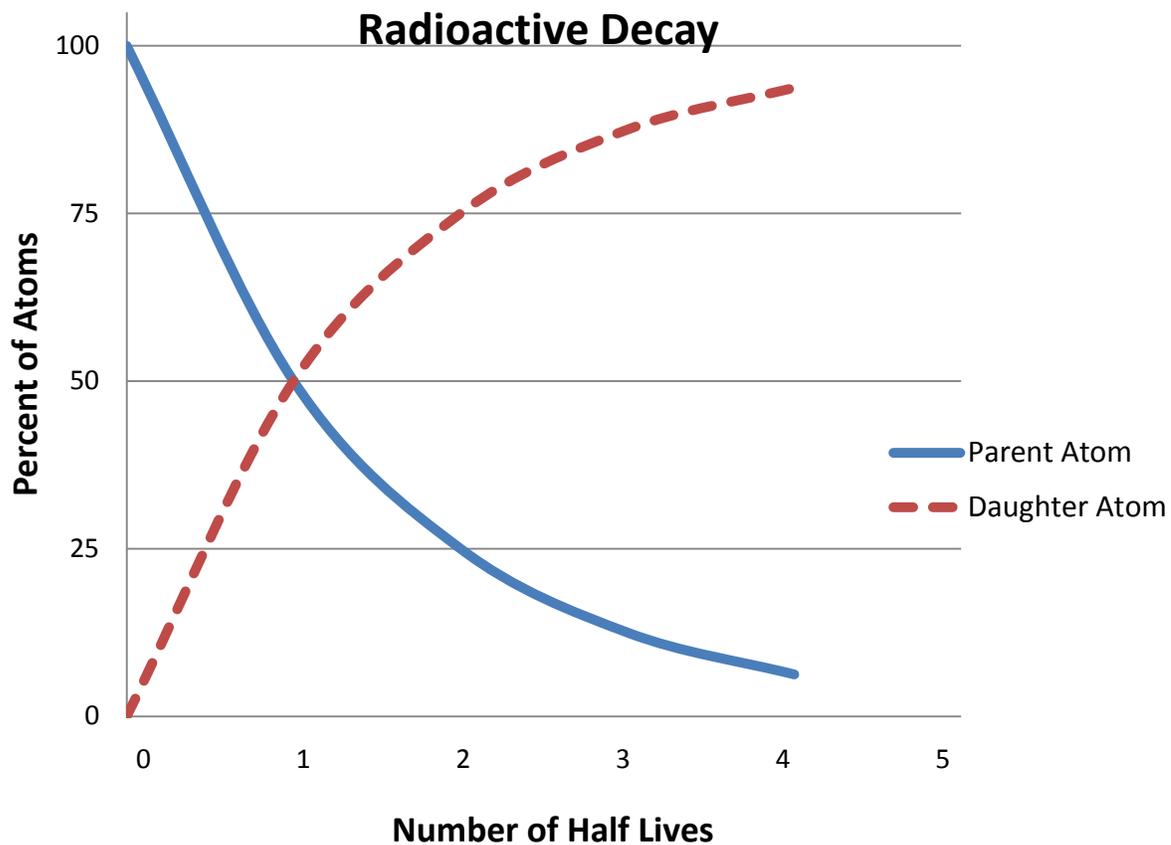
What atom would be created if Aluminum LOST 1 proton?	Magnesium
What atom would be created if Hydrogen GAINED 1 proton?	
What atom would be created if Thorium LOST 7 protons?	
What atom would be created if Uranium LOST 10 protons?	
How many protons would Iron need to lose to become a form of Potassium?	
How many protons would Uranium need to lose to become a form of Thorium?	
How many protons would Chlorine need to gain to become a form of Calcium?	

An isotope is an atom that has an unusual number of neutrons in the nucleus. Too many neutrons make the atom unstable, or radioactive. In an effort to become more stable the atom will release alpha particles (made of 2 protons and 2 neutrons each). Remember, the loss of protons changes the identity of the atom!



For example, in nature Uranium-235 loses 10 protons and 10 neutrons to become more stable. By losing 10 protons Uranium (atomic number 92) now has an atomic number of 82 (which is Lead).

It takes a long time for some radioactive atoms to decay. Scientists measure radioactive decay in half-lives. A half-life is the amount of time required for one half of the atoms of a radioactive substance to disintegrate. Radioactive decay can be graphed like this:



Analyze the graph above by answering these questions:

What percentage of original material (parent atoms) remains after 1 half-life? _____

What percentage of parent atoms remains after 2 half-lives? _____

What percentage of new material (daughter atoms) exist after 1 half-life? _____

What percentage of daughter atoms exists after 3 half-lives? _____

How many half-lives does it take for a parent atom to decay 75% (so only 25% remains)? _____

How many half-lives does it take for a parent atom to decay 50%? _____

How many half-lives does it take a parent atom to decay 94% (so only 6% remains)? _____

Each radioactive isotope has a different half-life (determined using mathematical models and experiments). Look over the list of radioactive isotopes and their half-lives. Match each isotope to an item that might be dated using the known half-life for that isotope. (You can draw lines to show which isotope might match each object)

Isotope	Half-Life	Object to be Dated
Carbon-14 (C-14)	5,730 years	Metamorphic Rock (about 8 million years old)
Nickel-59	76,000 years	Sedimentary Rock (about 125,000 years old)
Palladium-107	6.5 million years	Solar System (4.4 to 4.6 billion years old)
Uranium-238	4.5 billion years	Ancient Clothing (about 10,000 years old)