Name _____ Date _____ Period _____ 54

RADIOACTIVE DATING OF ROCK

Activity 1 – Understanding Radioactive Decay

1. What does the atomic number of an atom represent?

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

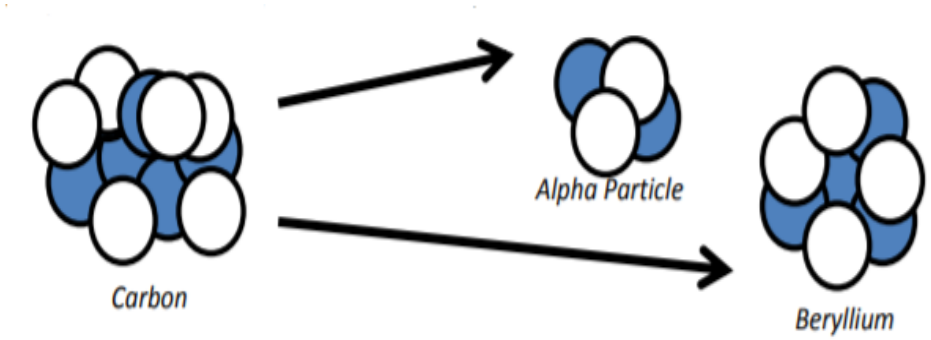
C = **6**	Pb =	Al =	Th =
U =	He =	Xe =	N =
O =	Cl =	Mg =	F =
Fe =	Mg =	K =	Li =

3. If the number of protons is changed, then so is the identity of the atom. For example, when a proton is added to potassium (K) it becomes a form of calcium (Ca)

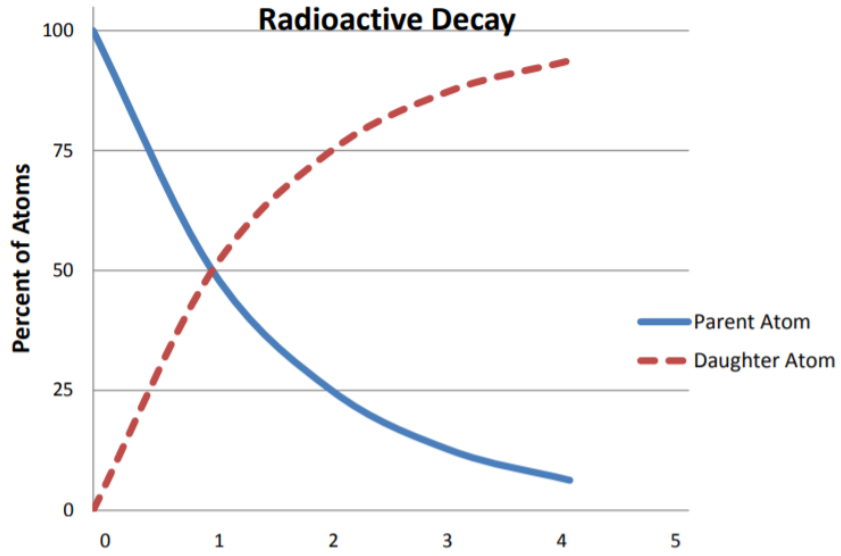
What atom would be created if Aluminum LOST 1 Proton?	Magnesium
What atom would be created if hydrogen GAINED 2 Protons?	
What atom would be created if Thorium LOST 7 protons?	
What atom would be created if Uranium LOST 10 protons?	
How many protons would iron need to lose to become a form of Potassium?	
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?	

4. 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 82, and is changed into lead (82).



5. Use the radioactive decay graph to answer the following questions. Parent atom is the **original** isotope that is not stable and decaying. Daughter atom is the **new** atom created as the original decays.



a. What percentage of original material (parent) remains after 1 half-life?

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

c. What percentage of new material (daughter) exists after 1 half-life?

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

e. How many half-lives does it take for 75% of a parent atom to decay? (Only 25% left)

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

g. How many half-lives does it take a parent atom to decay by 94% (only 6% is left)

6. **Matching** –**use a line to match** each isotope to an item that might be used to date each of the items

Isotope and half-life	Object to be Dated
Carbon-14 (5,730 years)	Metamorphic Rock (about 5 million years old)
Nickel-59 (76,000 years)	Sedimentary Rock (about 100,000 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 7,000 years old)

Activity 2 – Finding the Age of the Rock Activity

Color Key

Blue	Orange
K-40 (Parent)	Ar-40 (Daughter)

Red	White
U-238 (Parent)	PB-206 (Daughter)

Use this number (y-value) to find this number (x-value)

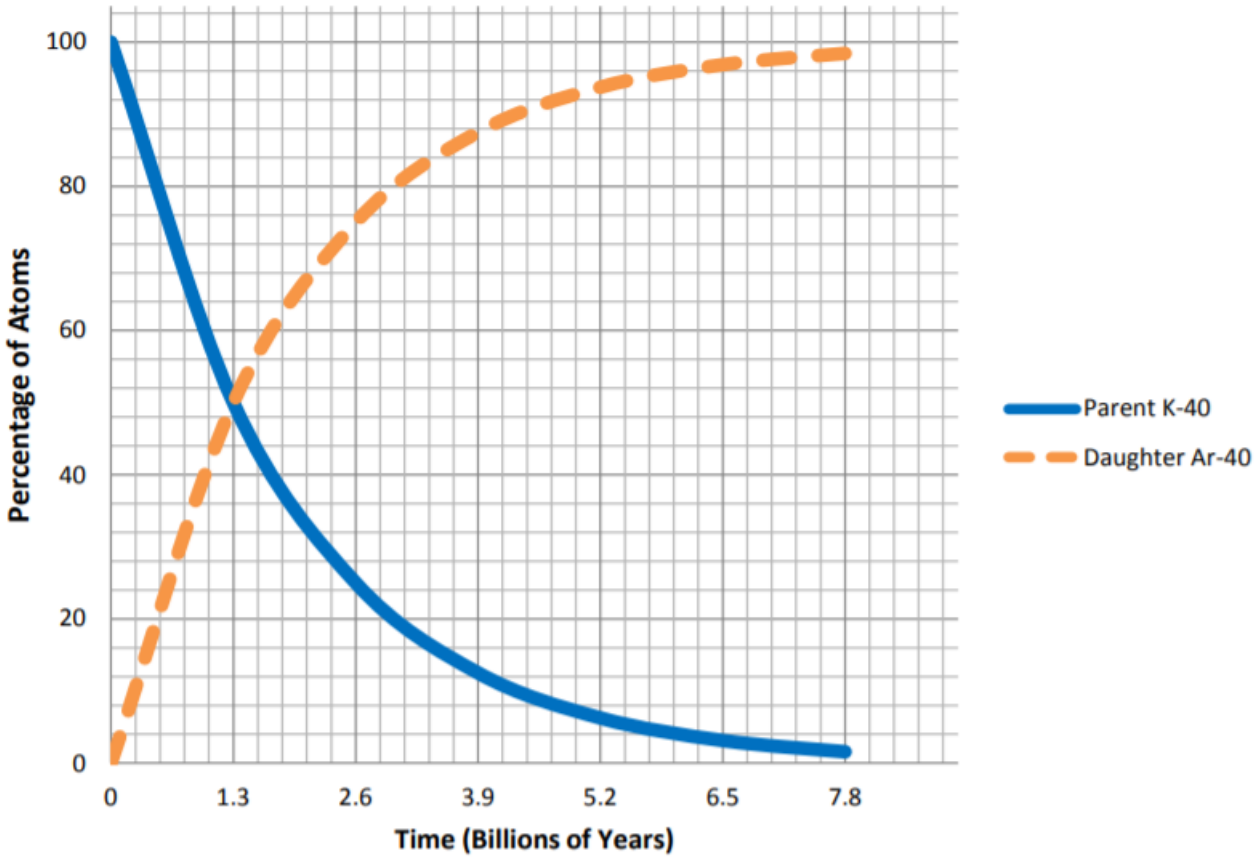
Data Table

Sample #	# Parent Atoms	% of Parent Atoms	# of Daughter Atoms	% of Daughter Atoms	Estimated Age of Sample (from the graph)
1 – Meteorite					
2 – Metamorphic Rock					
3 – Meteorite					
4 – Metamorphic Rock					
5 – Meteorite					
6 – Metamorphic Rock					

Analysis Questions

1. Which sample (or samples) was the youngest in age?
2. Which same (or samples) was the oldest in age?
3. Would it be better to date the age of our solar system with metamorphic rocks or meteorites? Explain why
4. How is radioactive dating or rock different than relative dating?
5. How would our understanding of the solar system change if scientists discovered a meteorite that was 10 billion years old?

K-40 into Ar-40



U-238 into Pb-206