## Determining a Fossil's Age Lab-Mini-Lab

**Purpose** How can you simulate radioactive half life? Simulate the radioactive decay of Potassium-40 (K-40) into Argon-40 (Ar-40) with pennies.

<u>Materials</u>	Shoe box with lid/container	100 pennies
	Graph paper	

### **Procedures**

- 1. Complete the data table provided as you go through this experiment.
- 2. Count to make sure you have 100 pennies and then place the 100 pennies in the container
- 3. Arrange all the pennies in the box so that their "head" sides are facing up. Each "head" represents the Potassium-40 (K-40) atom. Each "tail" represents the Argon-40 (Ar-40).
- 4. Record the number of "heads" (100) and "tails" (0) present at the start of the experiment.
- 5. Cover the container. Shake the container well. We will let the "shake" represent one halflife of K-40, which is 1.3 billion years.
- 6. Count and record the number of "heads" and "tails" present after the shake.
- 7. Remove all the "tail" pennies, representing the Argon-40 (Ar-40).
- 8. Repeat procedures #5 7 four more times to complete the "trial 1" column.
- 9. Start over from procedure #3 two more times so that you complete "trial 2" and "trial 3."

Number of Shakes	Number of Heads (K-40 atoms) left					
(Half lives)	Trial 1	Trial 2	Trial 3	Totals	Average	
0						
1						
2						
3						
4						
5						
Number of Shakes	Number of Tails (Ar-40 atoms) left					
(Half lives)	Trial 1	Trial 2	Trial 3	Totals	Average	
0						
1						
2						
3						
4						
5						

#### **Calculations and Data**

# Make a graph using these instructions:

- 1. Place a title at the top of the graph.
- 2. Label and plot the number of "half-lives" for K-40 on the x- axis.
- 3. Label and plot the average values for the "Number of K-40 Atoms left" on the y-axis.
- 4. Remember, each half-life mark on the graph for K-40 represents 1.3 billion years.

#### Lab Questions

- 1. What symbol represented an atom of K-40 in this experiment?
- 2. What symbol represented an atom of Ar-40 in this experiment?
- Compare the numbers of protons and neutrons of K-40 and Ar-40 using the Periodic table of Elements.

<u>K</u>	Ar
Protons =	Protons =
Neutrons =	Neutrons =

4. Can Ar-40 change back to K-40? Explain your answer, pointing out what **procedural part** of the experiment supports you answer.

5. Define the term half-life. What **procedural part** of the simulation represented a half-life period of time in the experiment?

6. Explain how scientists use radioactive dating to approximate a fossil's age.

7. Why do scientists perform several trials of the same experiment and use "average" results like you did?

- 8. Based on **your graph**, what is the rock's approximate age when 50% of the original amount of K-40 remains?
- 9. Based on **your graph**, what is the rock's approximate age when 25% of the original amount of K-40 remains?
- 10. Based on **your graph**, what is the rock's approximate age when 12.5% of the original amount of K-40 remains?