

## Half-Life of Elements

Length of Activity: 70 minutes

Focus: Half-life decay, Parent and Daughter Cells

Skills: Reasoning, graphing, recording data.

### **Key Question:**

What is the half-life of an element? How can it be used to determine the age of things?

### **Possible Preconceptions:**

The definition of half-life can be misconstrued and applied wrong.

### **Method:**

Students will fill in missing information about the radioactive elements by using an online half-life calculator. And then answer questions accordingly.

### **Materials List:**

Box with Lid

100 marked cubes

Graph paper

### **Standards:**

The student recognizes that energy may be changed in form with varying efficiency. (SC.B.1.4)

The student understands the basic principles of atomic theory. (SC.A.2.4)

The student understands that most natural events occur in comprehensible, consistent patterns. (SC.H.2.4)

### **Objectives:**

Students will:

Graph a chart with data they have derived.

### **Doing the Activity:**

Have the students work in small groups. Each group will be given a box containing a hundred cubes that have been marked on one side. The cubes represent atoms of an imaginary element. The students are to shake the box and pour out all the cubes onto a level surface. Those cubes that land marked side up are to be removed and the remaining cubes replaced into the box. Students should keep track of how many cubes are removed on each toss.

Explain to the students that the cubes that were removed represent the daughter material of the parent element. So those that were removed have radiated away and become stable elements. Those still in the box are unstable parent element and will continue to radiate away.

The students will repeat these steps until 12 trials have been run or all the cubes have been removed. They will then take the data they have recorded and plot a chart. This chart should plot *tosses vs. parent element* left.

Questions at the end of the activity should be answered then.

Name: \_\_\_\_\_

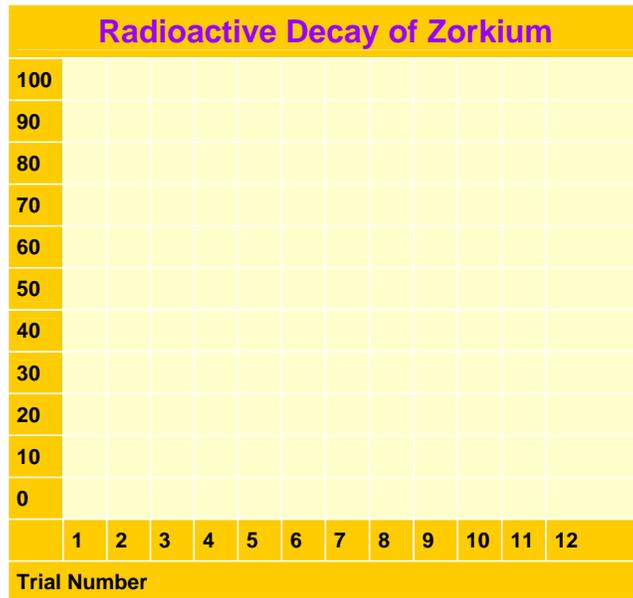
Date: \_\_\_\_\_

Class: \_\_\_\_\_

### Half-Life

Directions:

1. The cubes you have been given represent the imaginary chemical element "Zorkium".
2. Mark only one side of each cube with a felt-tip pen.
3. Hold lid tightly and turn the box over twice. Remove lid.
4. Take out all cubes that have the marked-side up. These cubes represent atoms that have decayed into the daughter element DOZ (Daughter of Zorkium). Record the number of cubes removed and the number of cubes remaining.
5. Continue until at least 12 trials have been run.
6. Plot your data on the chart below.
7. Connect the points you have plotted and draw a best-fit line.



When you are finished graphing, use your chart to answer the following questions.

### Questions

1. Define half-life of a radioactive element.

\_\_\_\_\_

- 
- 
2. How many trials did it take for half of the Zorkium atoms to decay? Suppose each trial equals 1000 years, what is the half-life of Zorkium?

- 
- 
3. Explain radioactive decay of an element.

- 
- 
4. Imagine that you have a sample containing 25 atoms of Zorkium and 75 atoms of DOZ. How old is your sample?

**Extensions:**

1. What type of rock dating was used to age the rocks brought back from the moon?  
Why was this process used?
2. Research two early methods used for determining the age of the Earth based on the salinity of the oceans and the cooling history of the Earth.