Instructor: Cathy Adriance (2003 Science Teacher Workshop participant)
School District: East Brunswick
Lesson Title: Radioactive Decay: The Half Life of an Unknown Element
Grade: 9
Subject: Biology
Objectives:
Students will be able to:

- Compare and contrast the characteristics of the unknown element before and after it "decays."
- Determine the volume of their sample using the formula LxWxH.
- Plot the results of their data on a line graph.
- Analyze their data and graph and determine the half-life of the unknown.

Materials:

- A block of prepared agar
- Metric ruler
- Knife
- Dilute HCl
- Clock or stopwatch
- 500ml beaker
- spoon
- goggles
- waxed paper

Preparation:
Before the start of this lab, the teacher needs to prepare 3 liters of plain agar (as per instruction on container). Add a pinch of phenylthalein to the agar after it has boiled.
Add a few pellets of NaOH to the agar. The agar should be a dark magenta color. Pour agar into a 9" x 13" glass or enamel pan (do NOT use aluminum). Allow three hours to cool and solidify.
A lesson on isotopes, radioactive decay and half-life should be taught prior to doing this lab.
Student should wear goggles.

Procedure:
1. Obtain a block of agar from your teacher and put it on a piece of waxed paper that is approximately 30 cm long.
2. Trim it down to a perfect 5cm cube.
3. Calculate the volume of the cube. Record in data table.

4. Place cube in 500ml beaker. Cover the cube with HCl. Leave the cube in the acid for exactly 10 minutes. Take qualitative observations during this time period.
5. At the end of the 10-minute time period, remove the cube from the acid using a spoon. Immediately measure all sides of the cube.
6. Quickly cut off all of the white area. Place the white material on a separate piece of waxed paper.
7. Measure all sides of the remaining cube. Calculate the volume of the cube. Record the dimensions and volume of the cube on the data chart.
8. Repeat steps 4 through 7 five more times.
9. At the end of the 6 trials, note the amount of magenta and white agar you have.
10. Dispose of materials as per teacher instructions.
11. Wash your hands thoroughly.
12. Prepare a line graph. Place volume on Y-axis and time on X-axis.

Questions to answer:
1. What did you notice about the quantity of magenta versus white agar as time went on?
2. Define radioactive decay.
3. Define half-life. How did this lab illustrate half-life?
4. Determine the approximate half-life of the unknown element by analyzing you data chart and graph. Tell how you arrived at this number.
5. Theoretically, why should you never run out of the original element?
6. Why was your data not "perfect"? Give several reasons.
7. Compare and contrast the data on this activity to that of a naturally occurring radioactive element. Present your answer in chart form.

Data Chart

Trial	Time (min)	Block Dimensions (cm)	Volume (show work)
1	0	7 x 7 x 7	
2	10		
3	20		
4	30		
5	40		
6	50		