Name _____ Date _____

Dating—Radioactive Style

A Lab on Forensic Archaeology

Objective

You will use radioactive dating techniques to determine the age of a radioactive material.

Background Information

Stattonville, South Carolina is usually a very quiet community. The year is 1998. Earlier this week some deer hunters stumbled across a suspicious-looking mound of dirt in a heavily wooded area. Crime scene investigators were called in to evaluate the scene.

After determining that this might be a grave, the investigators ask for help from some field archaeologists. Working together, the site is carefully excavated. The skeletal remains of a human are found in the grave.

Citizens state that the area where the skeleton was found has been deserted for about 40 years. The skeletal remains have what appear to be a bullet wound to the skull, so foul play is suspected.

The archaeologists determine that the remains belonged to a female, about age 13. She had been shot at close range through the back of the head. X-rays are taken. Police records turn up missing person reports of ten girls this age. Archaeologists decide to narrow down the range of possibilities by determining how long the young girl has been dead. To do this they must do radioactive dating.

The missing person report looks like this:

Name of girl	*Hometown*	*Date first reported missing*
Sue Crayton	Rexty, SC	1964
Brenda Sills	Tebvro, GA	1985
Jane Killow	Loxton, AL	1945
Fay Johnson	Sunville, TN	1935
Mary Sparks	Mayfield, NC	1990
Linda Tims	Brownton, SC	1933
Andrea Brown	Troopville, GA	1985
Jay Sims	Glexton, SC	1900
Kay Thomas	Yexton, AL	1995
Leslie Andrews	Freeport, NC	1920

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Your job is to simulate the process of radioactive decay and identify the missing person.

Materials

Shoe box for each group
Stiff white paper (8 × 11-inch)
Scissors
Red crayon
Metric ruler
Graph paper

Procedure, Part A

1. To prepare for this activity, you will make your atoms. Use a red marker to completely color one side of a stiff piece of paper. Place the red side of the paper face down on your desk.
2. On the uncolored side, extending the length of the paper, draw a series of horizontal lines 1 cm apart.
3. Now go back to the top, left edge of the paper and draw a series of vertical lines from top to bottom 1 cm apart until you reach the right edge of the paper. If you have extra edges of the paper left, cut them off and throw them away.
4. Use your scissors to cut out each square you formed in this drawing. You should end up with about 567 squares.
5. Place each of your squares in a shoe box. These squares represent atoms of the radioactive remains taken from the skeleton found in the unmarked grave. These particular atoms have a half life of 10 years.

Procedure, Part B

1. Count the atoms in the box and record this number on the Data Table.
2. Shake the box from side to side to mix your atoms. Dump the atoms on the desk in front of you.
3. Remove all atoms (or squares) that land with their red side up. These atoms have decayed during the first half life (in this case, 10 years). Replace all other atoms to the box. Count the number of atoms you removed. Record this number in the proper location on the Data Table. Subtract from the beginning number to find the number of atoms remaining after half life 1 (10 years).
4. Repeat steps 2 and 3 with the atoms remaining in the box. Record your findings. This will be the number of atoms decayed and the number that remain after the second half life of ten more years. The total decay period now will be 20 years. Remember to subtract the number of the atoms that remain from 567 each time to get the number of atoms that decayed. Each two numbers should add to 567 each time.
5. Repeat the above steps four more times so you will have covered 60 years. Record your findings each time.

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DATA TABLE

	Start	*Half life 1—after 10 years*	*Half life 2—after 20 years*	*Half life 3—after 30 years*	*Half life 4—after 40 years*	*Half life 5—after 50 years*	*Half life 6—after 60 years*
Number of atoms that have decayed	0						
Number of atoms that remain in sample	567						

6. Use your data to make a line graph on which the horizontal axis represents time in years and the vertical axis represents the number of atoms of the radioactive element that remain. Be sure to label your graph.

Results gathered by the forensic team report that as of this date, the skeletal remains have lost 90% of their radioactive atoms to decay.

Postlab Questions

1. Name the probable missing person. Explain your answer.

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2. Use your graph to determine how many of the 567 atoms would remain in the sample after about 5 years. How many would you expect to remain in the sample after 55 years?

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3. Was it important to know how many atoms there were in the sample at the start of the experiment? Explain your reason.

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4. Describe how an archaeologist can help forensic scientists date past crimes.

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