SCIENCE 10
10.L: The Half-Life of Popcorn (p. 300)

**Overview**:

As a radioactive sample undergoes decay, the number of parent nuclei steadily decreases. Eventually all of the parent nuclei will decay and there will be none left, but the rate of decay does not remain constant. In this lab we will investigate how the rate of decay changes over time by using a model.

**Materials**:

* 100 popcorn kernels
* container (i.e. Petri dish)

**Safety**:

* Don’t eat and choke on the popcorn kernels.

**Procedure**:

1. Copy down Table A into your notebook:

Table A

|  |  |  |
| --- | --- | --- |
| **Time (shakes)** | **Number of parent “nuclei”** | **Number of daughter “nuclei”**  |
| 0 |  | 0 |
|  |  |  |
|  |  |  |
|  |  |  |

2. Count the popcorn kernels in the Petri dish to see how many parent “nuclei” (kernels) you begin with. Record that value in Table A.

3. Shake the Petri dish (making sure to keep all of the kernels inside) and place it on the desk. Decide which way is “up” and imagine the numbers of a clock around the circumference of the Petri dish.

4. Each popcorn kernel that happened to land with the pointed end between 12 and 3 on the “clock” will be said to have decayed. Count each of these decayed “nuclei” and remove them from the Petri dish. Record a new line in Table A showing how many parent and daughter “nuclei” are present after 1 shake.

5. Close the Petri dish and shake it again. Repeat the rest of the instructions in Part 4. Continue to repeat these steps and add new lines to your table with data until all of the parent “nuclei” have decayed.

6. Make two graphs. On the first graph, plot the number of daughter “nuclei” produced versus time (measured in shakes). On the second, plot the number of parent “nuclei” remaining versus time (measured in shakes).

When you draw your graph, make sure you...

* Draw it using a ruler.
* Label the title and axes.
* Include units for the axes and decide on an appropriate scale to fill the page.
* Draw a line of best fit through your data points.
	+ It will not be straight! Make sure you draw a curve.

**Report**:

When you are finished, write up your findings into a neatly typed or written lab report with the following sections as headings:

* Name, Date, & Block
* Title (The Half-Life of Popcorn)
* Purpose (Why? What did you do and what did you hope to learn from it?)
* Methods (Write: “See lab procedures.”)
* Results (Table A and Graphs)
* Discussion (Answer the questions below.)
	1. What happened to the number of parent kernels over time?
	2. What happened to the rate at which daughter kernels are produced over time?
	3. How many shakes did it take until all the parent kernels decayed?
	4. At what time did the number of parent kernels become approximately 50% of what you started with? What about 25%? How do these two numbers compare?
	5. What is the half-life of your popcorn according to your results?
	6. In what ways did the popcorn represent nuclei well? In what ways were they different?
	7. Are your results identical to your classmates? Why or why not?
	8. If you had performed the experiment with 10,000 kernels, would the half-life change? Why or why not?
	9. If the end kernels that decayed were the ones pointed between 12 and 1, how would this affect the half-life?
	10. What is another way you can think of to simulate radioactive decay?

**Marking Checklist**:

|  |  |
| --- | --- |
| Content (20 points)  |  Title, Purpose, Methods, Results, and Discussion sections present (2) Table A is present, labelled, and filled in completely (3) Two graphs are present and made according to instructions (5)Discussion questions answered thoughtfully in complete sentences (10)   |
| Presentation (10 points)  |  Report is typed or written neatly in pen (3)Formatting clearly separates sections [i.e. Title, Purpose, etc.] (2)Table A and graphs are neat and data easily readable (3)Report is (mostly) free of grammatical errors (2)  |

Total: 30 points