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Half Life Popcorn Lab

Purpose: To simulate radioactive decay and determine the half-life of a radioactive substance.

Procedure

1. Count out 100 kernels of popcorn
2. Put the kernels into the petri dish with a 5cm or 10cm piece of masking tape attached
3. Copy a table like the one below into your notebook.
4. Shake the petri dish and observe the kernels. Count how many kernels point to the tape and record this value in the table below.
5. Remove the number of kernels that were pointing to the tape and repeat. Continue to record you decay values and remaining nuclei in your table until all the kernels have decayed.

Results for 5cm Decay Dish: (example)

Time (# of shake and count events)HF	# of decayed nuclei (# of corn pointing at tape)	Total # of undecayed (Parent) nuclei	Total # of decayed (Daughter) nuclei
0	0	100	0
1	12	88	12
2	16	72	28
3	19	53	47
4	13	40	60
5	4	36	64
6	8	28	72
7	9	19	81
8	6	13	87
9	5	8	92
10	8	0	100

8cm decay dish results:

Time (# of shake and count events)HF	# of decayed nuclei (# of corn pointing at tape)	Total # of undecayed (Parent) nuclei	Total # of decayed (Daughter) nuclei
0	0	100	0
1	23	77	23
2	24	53	47
3	25	28	72
4	13	15	85
5	8	7	93
6	5	2	98
7	2	0	100
/	/	/	/
/	/	/	/
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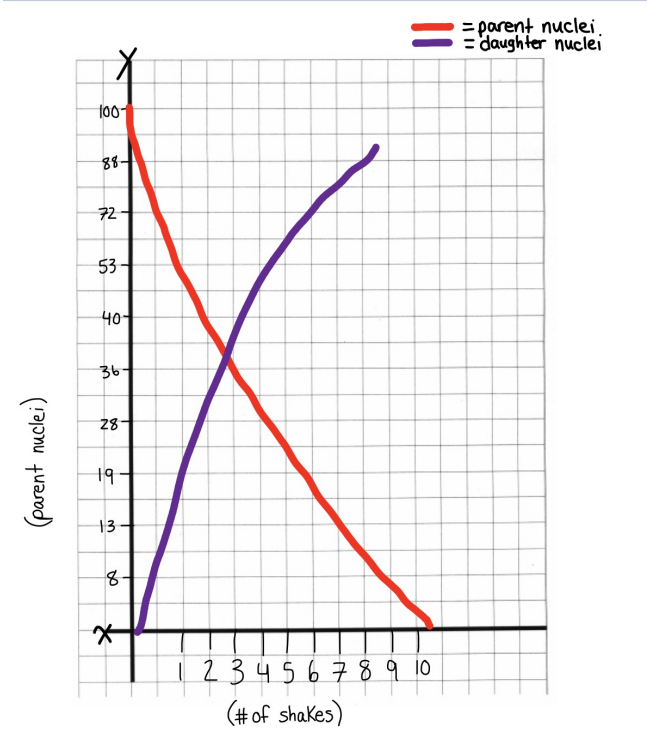

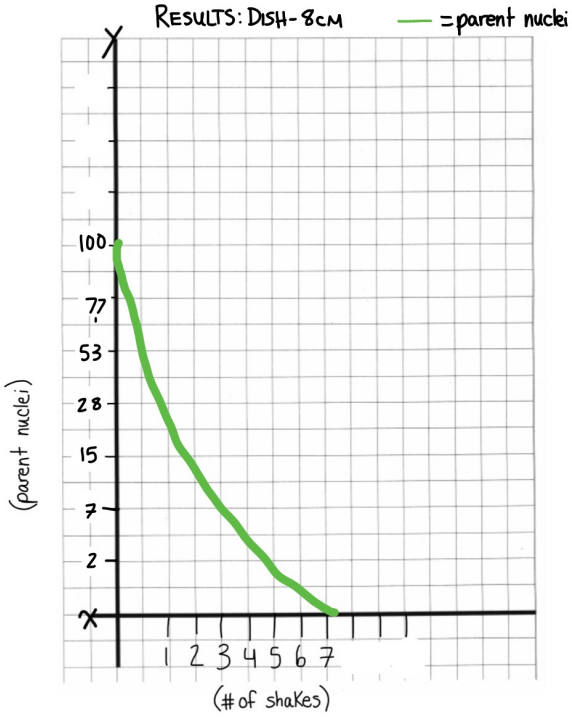

6. Plot your values and draw a curve or best fit on a graph (see below) with the Parent nuclei number on the vertical (y-axis) and the time (number of shakes) on the horizontal (x-axis).
7. Repeat the activity with the alternative (10cm or 5 cm) dish and plot and draw it's curve on the same graph using a different colour.
8. Plot the values and draw a curve or best fit on the graph with **one** of the Daughter nuclei using an different colour
9. Label your graph and lines clearly.

Questions:

1. **Generally, did the number of decay events (kernels pointing to the tape) increase, decrease, or stay the same? Why?**

Generally, the number of decay events decreased. It varied at each time a half life occurred. (Sometimes the number went up, other times it went down) It generally decreased because the chance that the corn will point towards the tape lessens each time that you remove corn from the dish. So, as the number of corn lessens, the number of decayed nuclei decreases.

2. **a) Use your graph to determine the time (number of shakes) at which the number of remaining nuclei was half (i.e. 50) for the 5cm dish. (This represents the half-life.) **

The number of shakes was: 3, when the remaining nuclei was about half.
(It was at 53, which is about half of 100, what we started with)

b) How does your 50% compare this with the time (shakes) at which 25% remained?

At 6 shakes, 25% of the nuclei remained. (28 kernels) which is about half of 50.
This result compares to question A because half of 6 is 3. (which would be your half-life)

3. **Do the same comparison (above) for the 8cm tape and describe what you find.**

50% nuclei remaining: 2 shakes (53 kernels)
25% nuclei remaining: 3 shakes (28 kernels)

The remaining nuclei was at half much faster (in the span of 2 shakes), and the same result occurred for when it was at 25%. This is the case because the tape (8cm) had a much bigger surface area for the corn to point to than the first tape (5cm), therefore we were able to remove many more kernels at each time. (Each shake)

4. Do you think you would you get the same results if you repeated the experiment? Explain.

I think that you would get about the same results, because the probability would be about the same if you repeated the same procedure both times. The numbers/times may slightly change but they would generally stay the same.

5. What results would you expect if the tape were 3 cm long?

I would expect that it would take more shakes to have 50% and 25% of the remaining nuclei, because the surface area of the tape is even smaller, so it would take longer for all the kernels to point towards it. ex: # of shakes for 50% of remaining nuclei would be 4-5.

Conclusion:

In conclusion, the results of both attempts of the lab (tape of 5 cm, and of 8cm) compared to each other in a logical way. For example, it takes longer to have 50% OR 25% of the nuclei remaining the smaller the size of the tape, because there is less chance that the kernels would point to the tape. Whereas if the tape is larger in size, the remaining nuclei increases much quicker. In general for both attempts, the decay evens (kernels pointing towards tape) decreased with the # of shakes added. A concluding point of the results would be: the longer the size of the tape, the more chance there is of more kernels pointing towards it. (decay events = faster) Some possible errors in this experiment could have been the way that each "half-life" was shaken, (needs to all be the same speed & duration each time) or the accuracy of which kernels were actually pointing in the direction of the tape. Some improvements to these errors would be assuring that each shake is the same (the same person each time), and measuring which kernels point towards the tape.

	Just starting out…	In Progress	Getting there	Got it	Rock Star
Observations				/	• Table accurately completed and filled out • Graph accurately drawn and labelled • Graph includes the parent and daughter isotope remaining
Completion/Questions				/	• Questions have been accurately answered • Answers demonstrate a good understanding of the concepts • Thoughtful/meaningful answers • No questions have been left blank
Conclusion / Reflection / Big Ideas				/	• Student shows exceptional ability to sum up the big ideas of the lab activity • Student can describe the purpose and specifically report his/her findings • Detailed yet concise • Student has demonstrated reflection on the activity, addresses possible errors made during lab activity and improvements for future tests