Name _____ Date _____ Phys. Science Period _____

Finding the Half-Life of Pennium (or Candium)

Background: When the nuclei of a radioactive element decay, energy is released and nuclei of a different element are produced. The nuclei of a radioactive element decay at a constant rate. The rate of decay is based on the element's ***half-life***. The half-life of an element is the length of time it takes for one-half of its nuclei to decay. The pennies and/or candies represent atomic nuclei of various isotopes. Heads up (pennies) or letter up (candy) represents a nucleus that is radioactive. Tails up (pennies) or blank side (candy) represents a nucleus that has decayed and is no longer radioactive.

Purpose: In this activity you will model the half-life of an element by causing "nuclei" to decay.

Pre-Lab Questions:

1. Define nuclear decay: _____
2. Define half-life:_____
3. Why do you think (*pennies, M&Ms, skittles*) make a good retranslation of nuclear decay? _____

_____

Hypothesis: If we model radioactive decay, then _____% of the "nuclei" will decay with each trial.

Procedure:

1. Retrieve your sample of isotopes (Pennium or Candium) from your teacher.
2. Count the total number of items in the bag. **Record that # _____** *(this will be used in 3rd column all the way down).*
3. Return the items to the bag and shake for 20 seconds (this is the ½ life of pennium and candium).
4. Pour the contents of the bag on to your lab surface and take out any pennies that are **tails up (decayed atoms)**; candy that is **blank side up (decayed atoms).**
5. Count the **TOTAL** number of nuclei that decayed and record this data in your table. **Do <u>NOT</u>** place these isotopes back in the bag.
6. Count the number of nuclei that have NOT decayed and record this in your data table. Return the **heads up** penniums (or **letter up** candiums) to the bag and repeat steps 3 to 6 until ALL isotopes have decayed.
7. For each trial, calculate the percentage that decayed using this formula:

% decayed = # of pennies removed ÷ # before shaking x 100
% decayed = # of candies removed ÷ # before shaking x 100

Data:

Half-Life	Total time (seconds)	# of Isotopes **Before** shaking	# of Isotopes **Undecayed**	Total # of Pennies **Decayed**	% of Decay
0	0 seconds		0	0	0
1					
2					
3					
4					
5					
6					
7					

Conclusions:

1. How did your results compare to the hypothesis above? _____

_____

2. What is the shape of the line(s) on your graph? _____
3. What side of the pennies/candies represented the decayed atom? The undecayed atom? _____

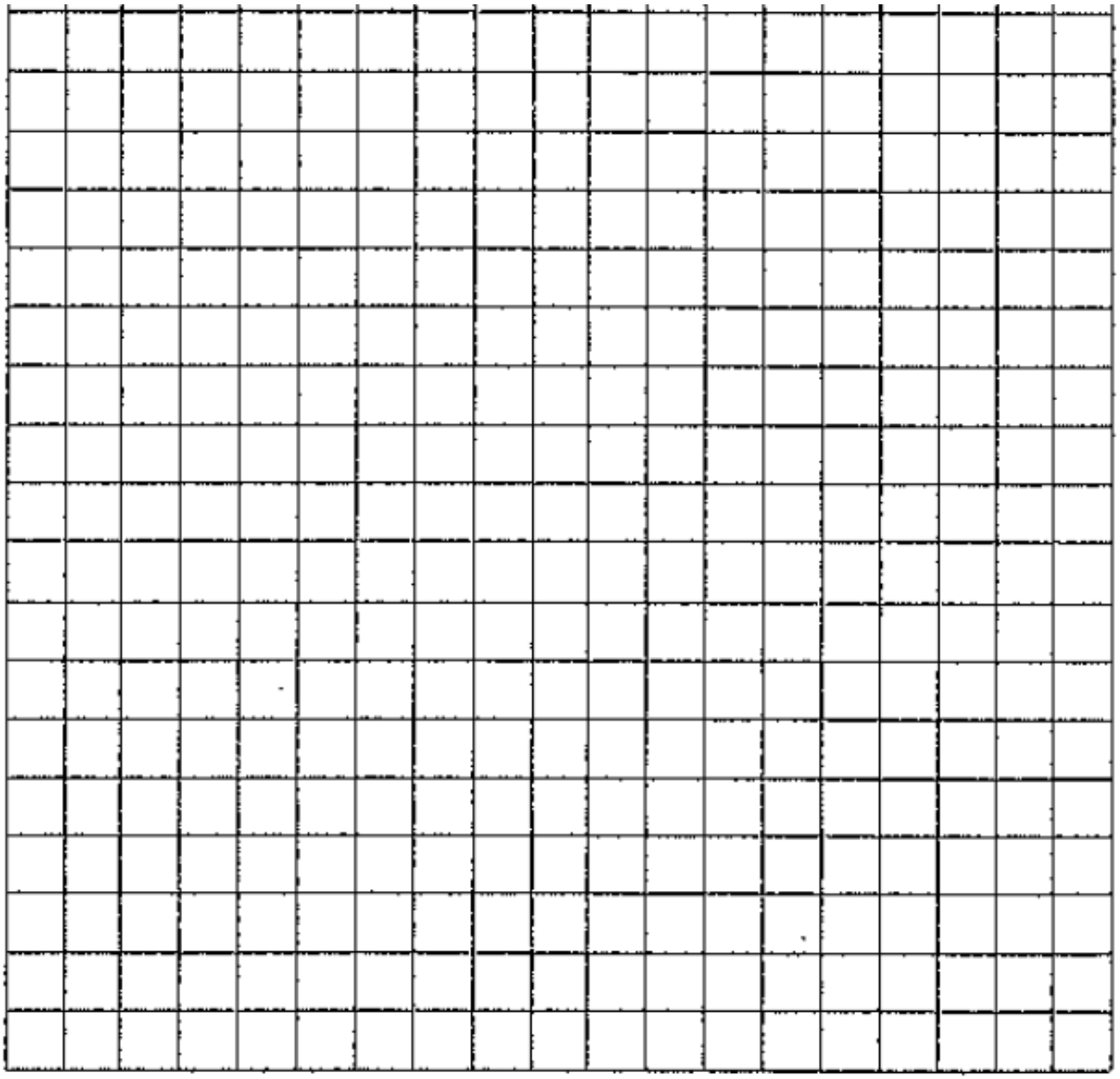
_____

4. How long would you expect it to take a 500 piece sample to completely decay? _____

Graph and Analysis:

1. On a sheet of graph paper, prepare a graph of your results. Make sure to **label <u>and</u> number** your axis. Use two colors to represent decayed and undecayed radioisotopes.
    a. First color: (y-axis is number of pennies/candies decayed/face down, x-axis is trial #)
    b. Second color (y-axis is number of pennies/candies that are left undecayed /face up; x-axis is trial #).

    Title: _____



_____

2. What do you notice about the lines that you graphed? _____
   _____

3. Does this graph represent half-life a real element? Why or why not? _____
   _____