# Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Hour: \_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_

# Chemistry: *Half-Life of Radioactive Isotopes*

# Introduction:

# The half-life is a measure of how much time it takes for ½ of a sample of radioactive atoms to decay into stable, or non-radioactive, atoms. After one half-life passes, only ½ of the atoms are still radioactive – the other half are stable. After a second half-life passes, another ½ of the *remaining* radioactive atoms have decayed into stable nuclei.

# Activity:

# Each group needs 32 pennies. Place them on a desk in a 4 x 8 grid with heads up. Each heads-up penny represents one gram of radioactive strontium-90 (Sr-90), which means you will start with 32 g of radioactive material. Each tails-up penny represents one gram of stable, non-radioactive yttrium-90 (Y-90). Sr-90 has a half-life of 28 years.

|  |  |
| --- | --- |
| What is the current year? |  |
| How old are you? |  |

1. One half-life passes. Turn over (to tails-up) ½ of the pennies.

|  |  |
| --- | --- |
| What year is it? |  |
| How old are you? |  |
| How many g of Sr-90 do you have now? |  |
| How many g of Y-90 do you have now? |  |

1. Another half-life passes. Turn over (to tails-up) ½ of the remaining Sr-90.

|  |  |
| --- | --- |
| What year is it? |  |
| How old are you? |  |
| How many g of Sr-90 do you have now? |  |
| How many g of Y-90 do you have now? |  |

1. Another half-life passes. Turn over the proper number of pennies.

|  |  |
| --- | --- |
| What year is it? |  |
| Are you still alive? |  |
| How many g of Sr-90 do you have now? |  |
| How many g of Y-90 do you have now? |  |

1. Another half-life passes. Turn over the proper number of pennies.

|  |  |
| --- | --- |
| What year is it? |  |
| How many g of Sr-90 do you have now? |  |
| How many g of Y-90 do you have now? |  |

E. Another half-life passes. Turn over the proper number of pennies.

|  |  |
| --- | --- |
| What year is it? |  |
| How many g of Sr-90 do you have now? |  |
| How many g of Y-90 do you have now? |  |

Make a graph of the half-life of Sr-90 using your data. Put the year on the horizontal axis and the number of grams of radioactive Sr-90 on the vertical axis. Include all the elements of a good graph, and make your graph neat.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Questions:** Answer the following questions, based on your graph. Show work, if you need to.

1. About how many grams of Sr-90 will you have 16 years from now?

2. About how many grams of Sr-90 will you have in the year 2050?

3. About how many grams of Y-90 will you have 100 years from now?

4. Would Sr-90 be useful for finding out how old a dinosaur fossil is? Why or why not?

5. Theoretically, will the amount of Sr-90 in your 32 g sample ever be zerograms? Why or why not?