Activity 14C: T-Charts, Decay Curves, and Half-Lives

Helpful tips to calculate a half-life:

- Draw or insert a T-chart.
- In the T-chart, label the left side with time units (number of half-lives, years, ka, Ma, Ga, etc.)
- Label right side with mass units (percentage, atoms, gram, kilograms, etc.)
- Begin by ALWAYS writing zero in the first spot of the time column.
- In the mass column, begin with the given mass if provided. Recall that this is 100% of the original parent isotope.
    - If the mass is the starting mass, keep dividing the number in the mass column by 2 for each half-life in the left column.
    - If you are given a final mass, record this at the very bottom of the mass column.
        - If the mass given is the final mass, multiply that mass by 2 until the initial time (Time 0) is reached.
        - The final mass amount at the bottom of the mass column equals how much mass is left after radioactive decay has occurred.
- In the time column, add one half-life at a time until you reach the total time given in problem. The number of half-lives elapsed is equal to the number of times you added a half-life in the time column.

1. Calculate the amount of parent isotope remaining for all the given half-lives in this T-chart.

Number of Half-lives	Amount of Parent Isotope Remaining (%)
0	100
1	
2	
3	
4	
5	
6	
7	
8	

Table 14.4: T-chart to use in question 1-3 in Activity 13C: T-Charts, Decay Curves and Half-lives. (CC-BY 4.0; Chloe Branciforte, own work)

2. Plot your findings from the T-chart on the graph below.

3. Draw the decay curve by connecting your plotted data points.

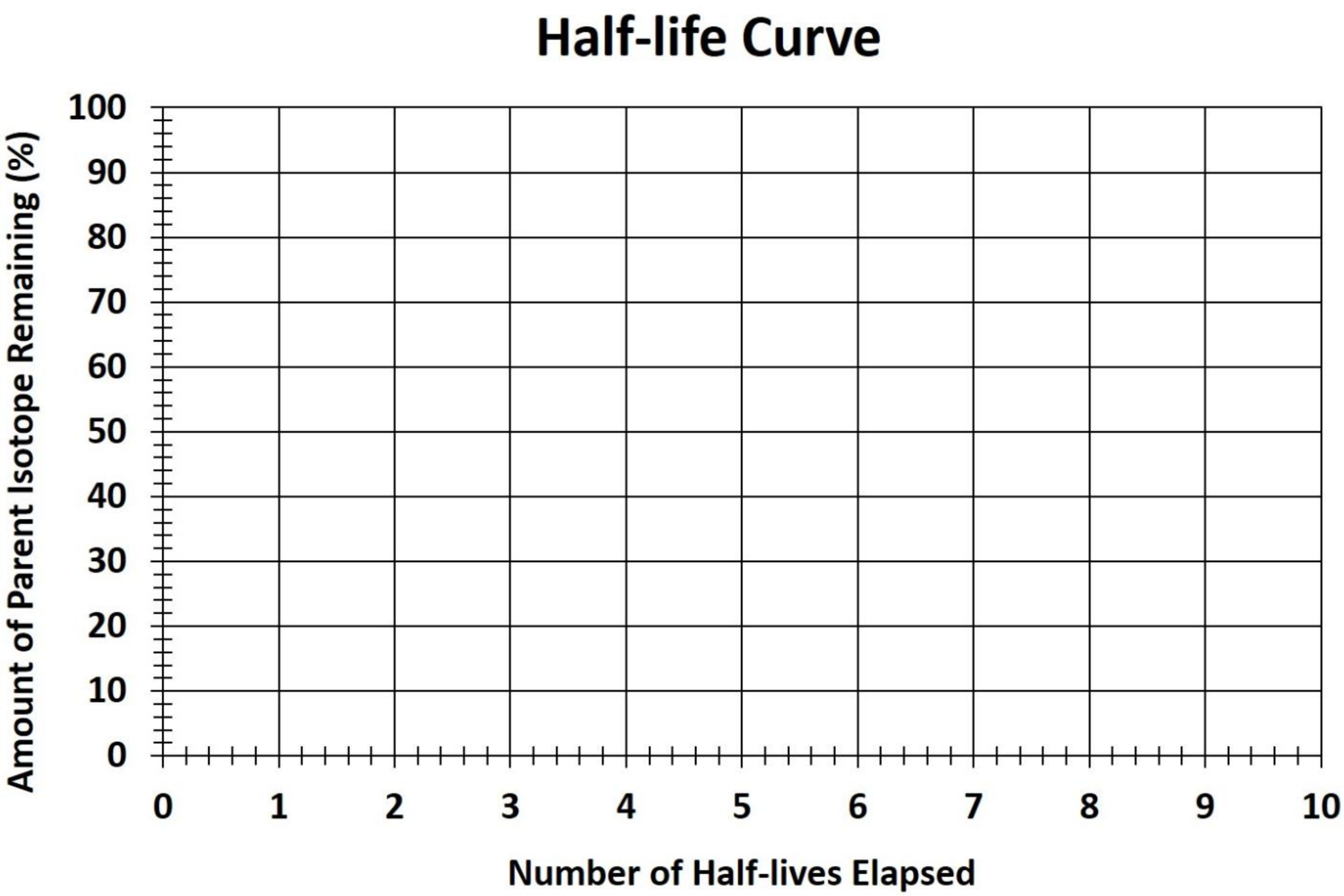

Figure 14.25: Graph to use in question 2-7 in Activity 13C. (CC-BY 4.0; Chloe Branciforte, own work)

Using the above graph (Figure 14.25), answer the following questions.

4. How much of the parent isotope would be remaining after 7 half-lives have passed?
   - ☐ **a.** 6.25%
   - ☐ **b.** 1.56%
   - ☐ **c.** 0.78%
   - ☐ **d.** 0.39%

5. If a radiometric element has a half-life of 425 years, how old would a rock be that only had 3.125% of the parent isotope remaining?

- ☐ **a.** 2125 years
- ☐ **b.** 1700 years
- ☐ **c.** 2550 years
- ☐ **d.** 3400 years

6. Approximately how much of the parent isotope would be remaining after 3.5 half-lives?

- ☐ **a.** 16%
- ☐ **b.** 12%
- ☐ **c.** 4%
- ☐ **d.** 8%

7. Based on your graph above, approximately how many half-lives have passed when only 35% of the parent isotope is remaining?

- ☐ **a.** 0.75
- ☐ **b.** 1.5
- ☐ **c.** 2.1
- ☐ **d.** 2.5