Half Lives Practice Problems 9

- you may use a ruler and a calculator (of your choosing)
- you will need colored pencils
- the exam is closed book
- unlimited time
- no scantron necessary – put all answers on these pages
1. Write a general equation which describes the fact that radiometric elements decay such that

\[
\frac{1}{2} \text{ is left after one half life} \\
\frac{1}{4} \text{ is left after two half lives} \\
\frac{1}{8} \text{ is left after three half lives} \\
\frac{1}{16} \text{ is left after four half lives} \\
\frac{1}{32} \text{ is left after five half lives} \\
\text{etc…} \\
\]

*Define all of your terms and/or variables.*

2. Using your general equation above, what fraction of parent material is left after 1.25 half lives? *You may use your calculator but show all of your work and show what you plug where in your equation(s).*

3. Using your general equation above, what fraction of parent material is left after 4.05 half lives? *You may use your calculator but show all of your work and show what you plug where in your equation(s).*
4. Solve (or rework) your general half-life equation so that it is a general equation which calculates the age of the sample from the fraction of parent material remaining. You may use log base 2 or log base e. Define all of your terms and/or variables.

5. Using your general age equation, calculate the age of a sample where 96.511% of the Rb$^{87}$ parent material remains.

6. Using your general age equation, calculate the age of a sample where 26.425% of the K$^{40}$ parent material remains.
**Answers**

2. what fraction of parent material is left after 1.25 half lives? \[ y = \frac{n_f}{n_i} = 0.42045 \]

3. what fraction of parent material is left after 4.05 half lives? \[ y = \frac{n_f}{n_i} = 0.06037 \]

5. calculate the age of a sample where 96.511% of the Rb\(^{87}\) parent material remains. \[ t_{age} = 2.5 \text{ BYO} \]

6. calculate the age of a sample where 26.425% of the K\(^{40}\) parent material remains. \[ t_{age} = 2.4 \text{ BYO} \]