1. The amount of time it takes for **half** the atoms in a piece of radioactive material to break apart

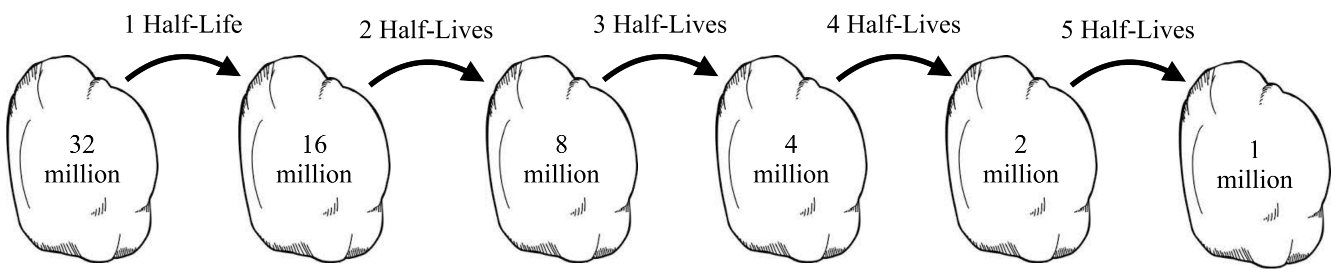
2. After one half-life, ½ of the original sample remains. After 2 half-lives, ¼ of the sample remains.

3a. 10 grams will remain. 4 days represents 1 half-life. Therefore, ½ of the 20g sample will remain.

3b. 5 grams will remain. 8 days represents 2 half-lives. Therefore, ¼ of the 20g sample will remain.

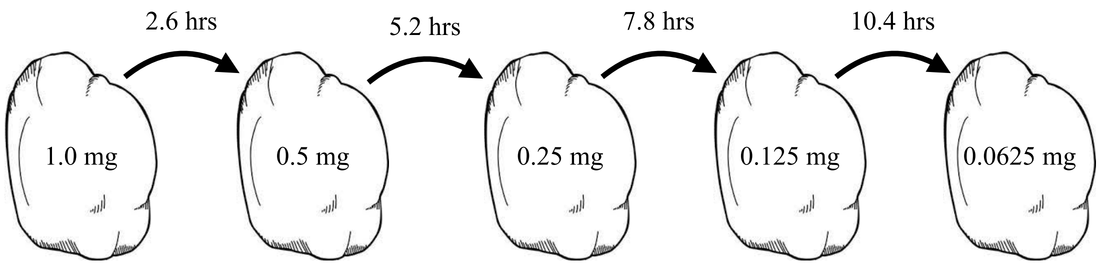
4. No, the entire sample will not decay in 50 days. The half-life of Thorium-234 is 25 days. As such, 50 days represents 2 half-lives. At the end of this time, ¼ of the Thorium will still remain.

5.



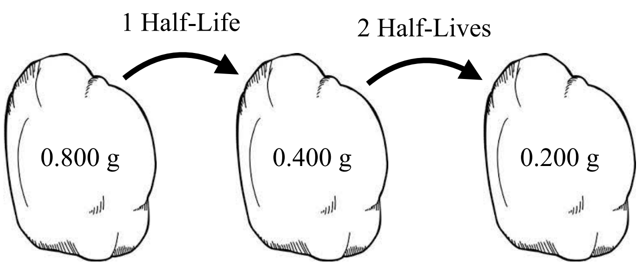
1 million atoms would remain

6.



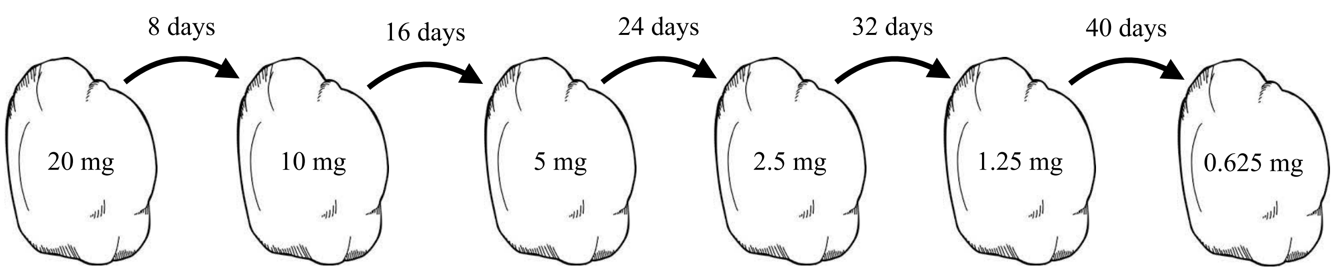
0.0625 mg Manganese-56 will remain

7.



$$\frac{10.5 \text{ years}}{2 \text{ half-lives}} = 5.25 \text{ years}$$

8.



0.625 mg Iodine-131 will remain

9. It is important that radioactive isotopes used in medical treatment have short half-lives so the potentially dangerous nuclei don't linger in patients' bodies for long periods of time.

10a. Drugs administered to patients breakdown over time and become less effective as a result. This breakdown over time is similar to the radioactive breakdown of nuclei we measure using half-life. Because of this similarity, doctors speak of a drug's half-life, referring to how long the drug will be effective.

10b. The speed of a chemical reaction is partly due to the amount of the reactants that are available to react and create products. As a reaction takes place, the amount of reactant decreases. This decrease in reactant amount is similar to how radioactive atoms decrease in number over time.