Problem-Based Task: Analyzing Kidney Function

Coaching Sample Responses

a. What is the initial amount of indium-113m?

The initial amount of indium-113m is 500 milligrams.

b. At what rate does indium-113m decay?

Indium-113m has a half-life of 1.7 hours.

c. What function represents the half-life of indium-113m?

An exponential function in the form $g(x)=ab^{\frac{x}{t}}$ represents this situation, where a represents the initial amount, b represents the rate of decay, x represents the number of hours, and t represents the time period.

The function $g(x)=500\left(\frac{1}{2}\right)^{\frac{x}{1.7}}$ represents the half-life of indium-113m.

d. What function represents the half-life of technetium-99m?

As stated in the problem, the function that represents the half-life of technetium-99m is $f(x)=500\left(\frac{1}{2}\right)^{\frac{x}{6}}$.

e. What is the initial amount of technetium-99m?

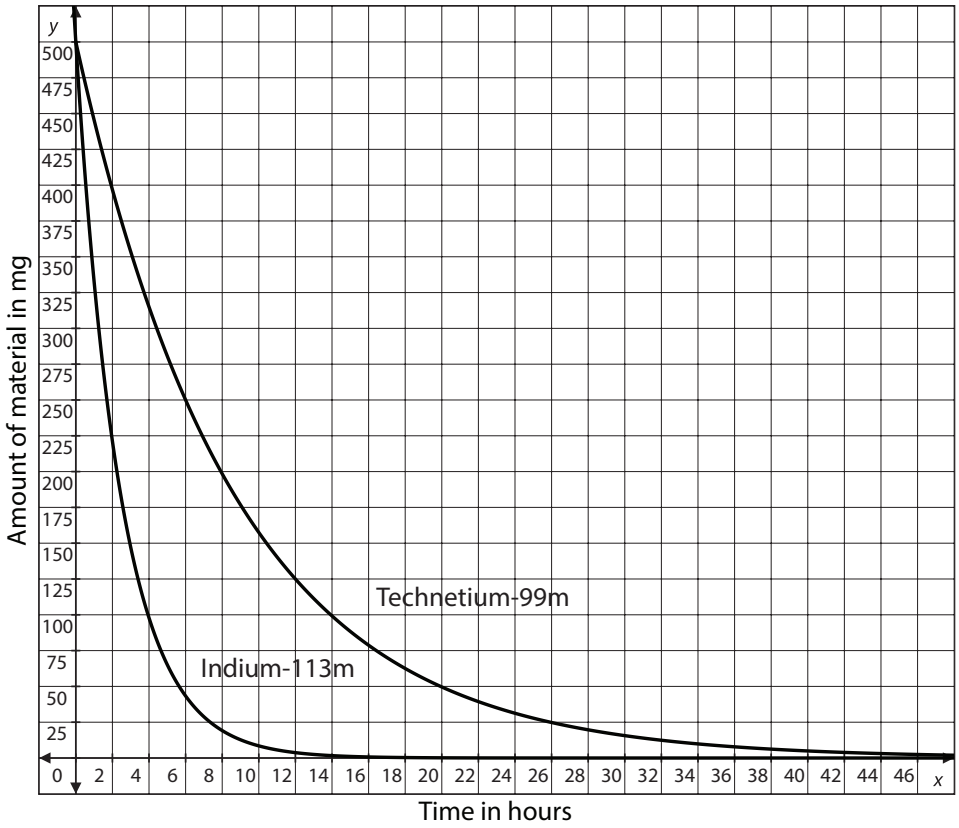
The initial amount of technetium-99m is 500 milligrams, as found in the equation.

f. At what rate does technetium-99m decay?

Technetium-99m has a half-life of 6 hours.

This value is found in the denominator of the exponent in the function given.

g. Graph both functions on one coordinate plane.



h. Which function is decaying at a faster rate? Use the functions and your graph to explain your reasoning.

It can be observed from the graph that indium-113m decays at a faster rate than technetium-99m. The initial amount of each material is the same, 500 milligrams. As time passes, the amount of indium-113m decreases more quickly than technetium-99m. For example, after 2 hours, there are approximately 220 milligrams of indium-113m compared with 400 milligrams of technetium-99m. After 6 hours, there are approximately 40 milligrams of indium-113m compared with 100 milligrams of technetium-99m. It would take longer for technetium-99m to decay than for indium-113m to decay.

Recommended Closure Activity

Select one or more of the essential questions for a class discussion or as a journal entry prompt.