Name: **Date:**

Problem-Based Task: When Will It Beep?

SMP	
1 ✓	2
3	4 ✓
5	6 ✓
7	8

Many models of household smoke detectors use a radioactive element as a component in the smoke-detection system. In one model, the radioactive element has a half-life of 450 years. This model will stop working (even if you change the battery annually) if the radioactivity drops to 0.2% of its original radioactivity level. The amount of radioactivity $R(t)$ left after t years of radioactive decay is related to the original amount of radioactivity R_0 by the exponential function $R(t) = R_0 \bullet e^{-ct}$, where c is a constant that is unique to the radioactive element. How long can this smoke detector be expected to function properly? Based on this result, explain why it is recommended that the battery in a smoke detector be changed annually.