

### Answer on Question #72359, Physics / Atomic and Nuclear Physics

A radioactive isotope of mercury decays into gold with a decay constant of 0.018. (a) Calculate its half-life (b) what fraction of this original amount will remain after three half-life (c) after 10 days.

**Answer:**

a)

The decay constant is  $r = 0.018$ .

$$t_{1/2} = \frac{\ln 2}{r}$$
$$t_{1/2} = \frac{0.693}{0.018} = 38.5 \text{ hour}$$

b)

$$N = \frac{1}{2} N_0$$

So

$$N = \left(\frac{1}{2}\right)^3 N_0 = \frac{1}{8} N_0 = 0.125$$

c)

10 days = 240 hours

$$\frac{N}{N_0} = 2^{-\frac{t}{T}}$$
$$\frac{N}{N_0} = 2^{-\frac{240}{38.5}} = 0.133$$

**Answer: a) 38.5; b) 0.125; c) 0.133**