Exercises

1. Balance the following nuclear reactions and identify the type(s) of radioactivity given off.

a) $^{131}_{53}I \rightarrow$ $^{131}_{52}Te$ + β^+

$p^+ \rightarrow n + \beta^+$

b) $^{210}_{83}Bi \rightarrow$ $^{206}_{81}Tl$ + α + γ $\quad \alpha = {}^4_2He$

c) $^{66}_{29}Cu \rightarrow {}^{66}_{30}Zn +$ β + γ

$n \rightarrow p^+ + \beta^-$

2. An organism dies, it stops taking in radioactive carbon-14 from the environment. If the carbon-14 to carbon-12 ratio is a piece of petrified wood is one sixteenth the ratio of carbon-14 to carbon-12 in living matter, then how old is the rock? Hint: How many half lives have elapsed? The half-life of carbon-14 is listed in this activity.

$t_{1/2} = 5730\,yr$

$\frac{1}{16} = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \Rightarrow 4\ t_{1/2}$

5730×4

22920 yrs

3. Suppose the 0.75 g of barium-131 were administered to a patient two months (60 days) ago. How many milligrams of barium-131 would still be present in the patient if it only leaves the body via radioactive decay?

$^{131}Ba \Rightarrow t_{1/2} = 12$ days $\quad \frac{60}{12} = 5\ t_{1/2}$

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{32}$ (original amt)

$\frac{.75g}{32} =$ 0.023g ^{131}Ba

Congratulations! You have completed the final guided inquiry packet of Chem 309.