Nuclear Homework

Name: _____

A. Write the complete nuclear equation.

1. The following atoms all undergo alpha particle emission.

$^{210}_{84}Po \rightarrow$ $^{206}_{82}Pb$ + α ($^{4}_{2}He$)

$^{238}_{92}U \rightarrow$ $^{234}_{90}Th$ + α ($^{4}_{2}He$)

$^{238}_{90}Th \rightarrow$ $^{234}_{88}Ra$ + α ($^{4}_{2}He$)

$^{222}_{86}Rn \rightarrow$ $^{218}_{84}Po$ + α ($^{4}_{2}He$)

2. The following atoms all undergo beta decay.

$^{14}_{6}C \rightarrow$ $^{14}_{7}N$ + β ($^{0}_{-1}e^-$)

$^{90}_{38}Sr \rightarrow$ $^{90}_{39}Y$ + β ($^{0}_{-1}e^-$)

$^{40}_{19}K \rightarrow$ $^{40}_{20}Ca$ + β ($^{0}_{-1}e^-$)

$^{13}_{7}N \rightarrow$ $^{13}_{8}O$ + β ($^{0}_{-1}e^-$)

3. Given that the half-life of carbon – 14 is 5730 years, consider a sample of fossilized wood that, when alive would have contained 24 g (start) of carbon – 14. It now contains 1.5 g (end) of carbon – 14. How old is the sample? $t_{1/2} = 5730$ yr

24g → 12g → 6g → 3g → 1.5g

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5730 yr ? Time

5730 yr × 4 = **22920 years**

4. A 64 g (Start) sample of germanium – 66 is left undisturbed for 12.5 hours. At the end of that period, only 2.0 g (end) remain. What is the half-life of this material?

64g → 32g → 16g → 8g → 4g → 2g

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$t_{1/2}$ = ? 12.5 hrs

$\frac{12.5 \text{ hrs}}{5}$ = **2.5 hr**

5. 1.000 kg block of phosphorus – 32, which has a half-life of 14.3 days ($t_{1/2}$), is stored for 100.1 (T.T.) days. At the end of this period, how much phosphorus – 32 remains?

$\frac{100.1 \text{ days}}{14.3 \text{ days}}$ = 7 half-life occur

Answer: 0.0078125 kg

1.000 kg → 0.500 kg → 0.250 kg → 0.125 kg → 0.0625 kg → 0.03125 kg → 0.015625 → 0.0078125

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