Name: Key **Date:** _____

Radioactive Decay and Half-Lives Worksheet

Solve #1-8. For #1-5, write a balanced equation for the nuclear reaction as shown below.

Examples:

Chlorine-36 decays by beta emission

$^{36}_{17}Cl \rightarrow {}^{36}_{18}Ar + {}^{0}_{-1}e^{-}$

Dubnium-262 decays by alpha emission

$^{262}_{105}Db \rightarrow {}^{258}_{103}Lr + {}^{4}_{2}He$

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1. Krypton-87 decays by beta emission.

$^{87}_{36}Kr \rightarrow {}^{87}_{37}Rb + {}^{0}_{-1}e^{-}$

2. Curium-240 decays by alpha emission.

$^{240}_{96}Cm \rightarrow {}^{236}_{94}Pu + {}^{4}_{2}He$

3. Americium-243 decays by alpha emission.

$^{243}_{95}Am \rightarrow {}^{239}_{93}Np + {}^{4}_{2}He$

4. Phosphorus-32 decays by beta emission.

$^{32}_{15}P \rightarrow {}^{32}_{16}S + {}^{0}_{-1}e^{-}$

5. Lead-210 decays by beta and then alpha emission.

$^{210}_{82}Pb \rightarrow {}^{4}_{2}He + {}^{0}_{-1}e^{-} + {}^{206}_{81}Tl$

6. The half-life of Iodine-131 is approximately 8 days. If you start with 15 grams of Iodine-131, how much will be left after 24 days?

24 days = 3 half-lives

Amount remaining = Initial amount $\cdot (0.5)^n$

$= 15g \cdot (0.5)^3$

$= 1.875g$

7. Thorium-234 has a half-life of 24 days. If 1 gram remains in a sealed container after 72 days, how much was there originally?

72 days = 3 half-lives

Amount remaining = Initial amount $\cdot (0.5)^n$

$1g = x \cdot (0.5)^3$

$1g = 0.125x$

$x = 8g$

8. The half-life of Polonium-218 is 3.0 minutes. If you start with 20 grams of Po-218, what percentage of the original sample remains after 4 half-lives?

$(0.5)^n \rightarrow (0.5)^4 = 0.0625 = 6.25\%$