Names: _____

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Group Activity 6 **Due:** In class, September 14th

1. A year ago, you started keeping a lucky radioactive coin in your pocket, because that's what cool people do. When you go it, you noticed you had almost a mole ($\approx 6\times10^{23}$) of some type of nucleus in it. Today, you've noticed a third of your lucky nuclei have decayed to something else. What is the half-life (in years) of the nuclide that makes up your lucky coin?

2. You're desperate to get your hands on as much of nucleus 2 as you can, but you have a deadline. You decide to make 2, which has a decay constant λ_2, using the reaction $1 \rightarrow 2$ with the rate R_{12}. How many half-lives will it take to make 50% of the maximum possible amount of nucleus 2? What about 75%? 90%? 99%?

3. You were talked into partaking in a heist of a priceless piece of artwork. To get top dollar, you need to prove the painting is an original by showing it has the right age. You have determined the $^{14}C/^{12}C$ ratio is 1.1×10^{-12} for a 1mg sample. Since you know the pre-nuclear era specific activity of ^{14}C is 2.27×10^{-4} Bq/mg, how old is your sample? In other words, did you get talked into violating Section 668 of Title 18 of the US Code for nothing!?