Names: _____

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Group Activity 1 **Due:** In class, August 26th

1. Which of the following reactions are possible without non-standard model physics? For invalid reactions, indicate what the issue is.

   a. $^{137}Cs \rightarrow {}^{137m}Ba + e^-$

   b. $^{12}C(\alpha,\gamma)^{16}O$

   c. $^{144}Sm(\gamma,\alpha)^{140}Nd$

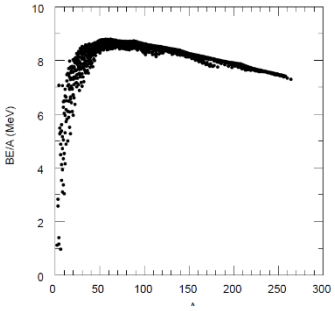
   d. $^{126}Te(n,\gamma)^{127}I$

2. Suppose I were to start with pure ^{226}Th, what nuclide would I mostly wind up with? Write the dominant decay sequence using the NNDC primary decay mode as a guide. Roughly how long would it take for half of the material to undergo this conversion? (Hint: This does not require complex math …or even addition!)

3. What is the element with the highest-mass stable nuclide with N=Z?

4. What is the element with the highest-mass stable nuclide with Z>N?

5. This depicts experimentally measured binding energies per nucleon. The peak is located at ^{58}Fe, meaning this is the lowest energy state for nuclear matter. Why isn't everything around you (including yourself) made of ^{58}Fe?



From B. Alex Brown, Lecture Notes on Nuclear Structure Physics, 2005