62 Gamma Spectroscopy

Gam Prelab

1) What are quantity could explain why the original nucleus is less stable than the resultant nucleus plus the decay products?

Change in energy of the system. (If the energy drops/is emitted from the system, we should see a more stable system.)

2) A nucleus undergoing alpha decay has $\Delta Z = \Delta N = -2$ and $\Delta A = \Delta Z + \Delta N$

3) A nucleus undergoing beta decay has $\Delta Z = 1$, $\Delta N = -1$, and $\Delta A = 0$

4) A nucleus undergoing gamma decay has ~~$\Delta Z = 1$, $\Delta N = 1$, and $\Delta A = 0$~~ $\Delta Z = \Delta N = \Delta A = 0$

5) Much like ~~the~~ electrons around a nucleus, nucleons within a nucleus have a structure relative to the nucleons' center. Therefore it is possible for a nucleon to be in an excited state. A gamma decay occurs when a nucleon moves from an excited state to a lower-energy state.

6) ~~The three detectors discussed all have gamma rays deposit all energy to~~ Gas-Filled detectors have energy deposited into the gas by gamma rays. ~~Scintillation detectors have energy deposited by photons released~~ In scintillation detectors, electrons struck release photons as their energy states drop. These new photons are picked up in a photomultiplier tube.

7) In solid-state detectors, gamma rays cause movements of electrons through a semiconductor.

7) In Compton scattering, only some of the photon's energy is transferred to the electron that triggers ionization. Because not all energy is transferred, we get a smaller frequency reading than is actually for the incident photon, causing a widening of the spectrum data.

8) I think the pulse is short to prevent interference. With a long duration such as 100 [ms] any irregularities could cause significant chances of photons colliding and interfering with one another.

9) Gain could be affected by the properties of AC-frequency and how frequently we create pulses.

10) An analog-to-digital converter takes continuous quantity information and converts it into into discrete, time-based chunks so that it can be read and analyzed digitally via a computer.

11) For a linear fit, the minimum number of calibration sources is 2.

12) I would chop the data to analyze the two gammas separately from one another but otherwise normally.