PHY492 Spring 2001 Nuclear and Elementary Particle Physics Quiz 3

Due today at 3:00 pm on Friday 2/23/01 in Thomas Glasmacher's mailbox (either P/A or NSCL)

1. $^{151}_{64}$Gd has a lifetime of 124 days. It decays to $^{151}_{63}$Eu with a Q-value of 464 keV. Describe the nature of this decay and write down the decay products.

2. $^{151}_{60}$Nd has a neutron separation energy of 5.334 MeV and a proton separation energy of 10.240 MeV.

   Is this a proton- or neutron-rich nucleus compared to stable Nd isotopes?

   Write down all possible decay modes and what additional information you need to decide if this decay mode is possible.

3. $^{240}_{98}$Cf alpha-decays in its ground-state. The daughter nucleus is not well known, but has a 0^+ ground state and may have excited 2^+ and 4^+ states, where the excitation energy of the 2^+ state is less than that of the 4^+ state.

   Write down the three possible decays of $^{240}_{98}$Cf and define the Q-values.

   Give two arguments why the decay to the ground state of the daughter should dominate.