Physics U613 – Nuclear and Particle Physics

Problem Assignment #4

due Thursday, 21 February 2008

Problem 1. Martin, ch. 7, problem #3.

Problem 2. Find the allowed values of the total angular momentum for three identical fermions in an $f_{7/2}$ orbital, *i.e.* in a $(\frac{7}{2})^3$ configuration.

Problem 3. Use the results of the preceding problem and the schematic diagram of single-nucleon energy levels handed out in class to assign plausible configurations to the levels in ^{43}Ca (shown in the class handout) up to 2.20 MeV above the ground state. Some of these are fairly obvious – others may not be unique (and the actual state is a mixture of configurations in any case), but try to find assignments for each state that are consistent with the angular momentum and parity of the state.

Problem 4. Martin, ch. 7, problem #4.

Problem 5. Martin, ch. 7, problem #9. Think carefully here about when the electron mass is included in a quoted energy, and when not. Also, note that the proton lab energy is not quite the same as the center of mass energy – do take that into account here.