Homework 5, due 10-23

The figure shows energy levels in a Woods-Saxon potential. Concentrate on the right side of the figure which shows the results in the presence of a spin-orbit interaction.

1. Give the expected shell model spin and parity assignments for the ground state of (a) $^7$Li, (b) $^{11}$B, (c) $^{15}$C, (d) $^{17}$F, (e) $^{31}$P, (f) $^{141}$Pr.

2. The low-lying levels of $^{13}$C are the ground state with $J^\pi = \frac{1}{2}^-$, a $\frac{1}{2}^+$ state at 3.09 MeV, a $\frac{3}{2}^-$ state at 3.68 MeV, and a $\frac{5}{2}^+$ state at 3.85 MeV. All other states are more than 7 MeV above the ground state. Try to give a shell model interpretation of these states.