The Atomic nucleus

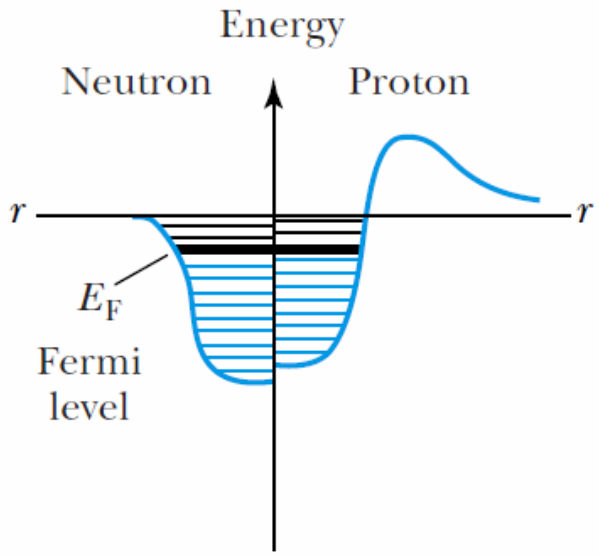

Figure 12.8 Diagram of nuclear potential wells as felt by neutrons and protons. Neutrons are more strongly bound than protons because of the Coulomb potential. All levels below the Fermi energy E_F are filled.

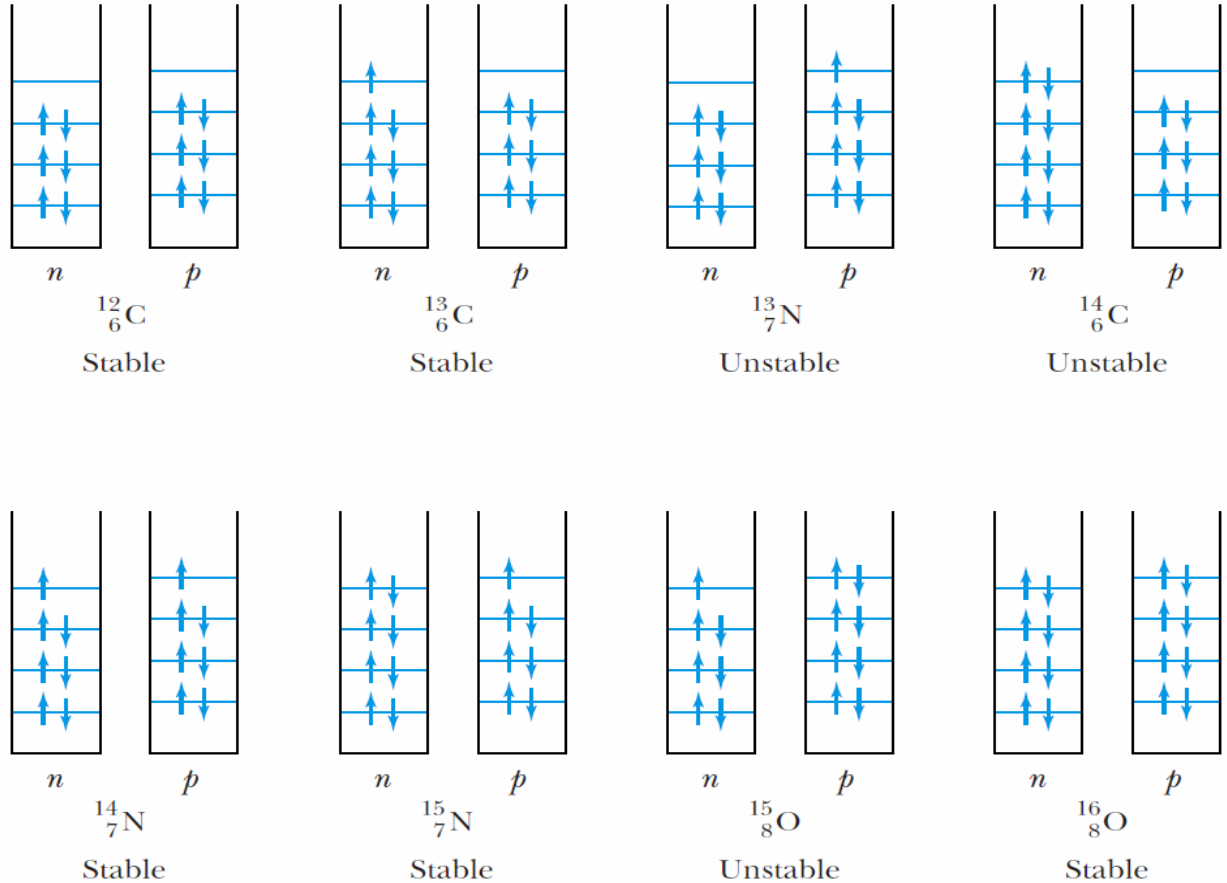

Figure 12.9 Schematic diagram of proton and neutron energy levels for several nuclei between ^{12}C and ^{16}O. The nuclei ^{12}C and ^{16}O are particularly stable, but the effects of $N \approx Z$ and the spin-pairing effects are important in this region.

Liquid drop model

$$B\left({}^{A}_{Z}X\right) = a_V A - a_A A^{2/3} - 0.72Z(Z-1)A^{-1/3} - a_S\frac{(N-Z)^2}{A} + \delta$$

$$\text{Pairing } \delta = \begin{cases} +\Delta & \text{for even-even nuclei} \\ 0 & \text{for odd-}A\text{ (even-odd, odd-even) nuclei} \\ -\Delta & \text{for odd-odd nuclei} \end{cases}$$