Errata Nuclear Physics for Applications
July 12 2008

Corrections to Text

Chapter 10

page 284, paragraph after equation 10.6. The calculation of the energy of an electron as a classical particle confined to a box of the size of a nucleus is correct but the implications drawn from it are not. An electron with a kinetic energy of ~ 1.5 GeV is obviously highly relativistic, the ratio of the total energy of the electron to its rest mass is ~ 3×10^3. Hence the result of this simple classical model cannot be correct.

In the limit that the total energy of the electron is large compared to its rest mass, the speed of the electron can be approximated as the speed of light and then one can write E = pc. Using the Heisenberg Uncertainty Principle in the form $\Delta x \Delta p \geq \hbar$, assuming a nucleus of mass number A = 200 and assuming $\Delta x = 2r$, one finds $E \geq 13.5$ MeV. Although much, much smaller in magnitude, this energy is larger than is found for any Q_β outside of the region of the very lightest nuclides where the estimated lower limit on Q_β is significantly larger.

Chapter 10

Figure 10.2. The caption should read "The relative decay probability, $\lambda^\dagger$, for electrons with energies $0 \leq E \leq 1$ MeV and $Q_\beta = 1.0$ MeV as a function of E/E_o. The Fermi function has been assumed to be zero.

Chapter 12

page 377 and equation 12.5. In this equation, e is the absolute value of the charge on the electron and not the eccentricity. In the future a bold e should be used to stand for eccentricity with normal face always being the electron charge.

Chapter 12

page 388, last paragraph. The second sentence gives the partial half-life for spontaneous fission of ^{235}U as about 1×10^{17}s. It should be about 1×10^{19} y or about 3.2×10^{26} s.

Corrections to Problems

Chapter 3

problem 3.4. The problem reads ".....is allowed to stand for a period of three ^{106}Ru half-lives,....". It should read "....a period of three ^{106}Rh half-lives...."

Chapter 7

problem 7.4. The result for the ground state spin and parity of ^{131}Sb is wrong. It uses the neutron single particle level diagram, not the proton single particle level diagram. The state of the 51st proton is predicted to be than of the $1g_{7/2}$ orbital and the ground state spin and parity should be $7/2^+$.

Chapter 8

problem 8.3. The address for the level diagram for N > 126 should read http://ie.lbl.gov/toipdf/nilsson.pdf. There is no hyphen as shown in the text.

Chapter 10

problem 10.4. The problem reads "......... assume that all such decays by neutron emission to leave ^{87}Kr in its ground state." It should read "....... to leave ^{86}Kr in its ground state."

Chapter 10

problem 10.7. This problem is poorly posed. It should be replaced by the following

(a) Assuming that $F(Z,E_o) = 1$ and that the mass of the antineutrino is zero, calculate and plot the spectral distributions $N(p_e) = d\lambda/dp$ versus (E/E_o) for E_o = 0.1, 1.0 and 10.0 MeV (see Figure 10.2 as an example). Be sure to use the appropriate relativistic form for the electron momentum.

(b) Estimate the most probable and average energy ratios $< E/E_o >$ in this approximation as a guide to understanding how the electron spectra will vary among essentially all β^- spectra.

Chapter 14

problem 7. The problem statement should read "Consider equation 14.72 in the general form.......".

Chapter 14

problem 14.3. The problem statement should read " In the limit of the non-relativistic form of equation 14.71, ...".