Spring, 2o1o   Problem Set #1
Distributed: Wed., 20 Jan. 1o   Due: Mon., 25 Jan. 1o
(10 points)

1. ^{60}Co is produced in nuclear fission reactors and chemically separated for use in a number of irradiation machines.

   (a) What is the atomic number of the most stable isotope with A=60 predicted by the semi-empirical mass model?

   (b) Write the balanced decay equation expected for this isotope based on your answer to the previous question.

   (c) Calculate the Q value for this decay in MeV. Indicate the source of masses, etc. needed to calculate your answer.

2. ^{18}F is an isotope that is mass-produced in small cyclotrons for use in PET scanners. The Radiology Department on campus runs their own cyclotron dedicated to producing this and related isotopes.

   (a) Write a balanced decay equation for this isotope and calculate the Q value for the decay of this isotope. (Note: this isotope does not decay by electron capture.)

   (b) The ^{18}F is often incorporated into deoxyglucose to make fluorodeoxyglucose (FDG) for brain scans because this molecule is rapidly consumed (phosphorylated) by brain cells. What is the activity of a sample of ^{18}F-FDG that was initially 350 MBq 3.00 hours later?