

Fall Term 2006

22.02 Introduction to APPLIED NUCLEAR PHYSICS

Problem Set #7

Prof. Molvig

Passed Out: November 9, 2006

DUE: November 16, 2006

1. Compute the average binding energy per nucleon for ^{169}Os using the oscillator energy levels modified as follows,

$$E_N = \hbar\omega N - V_0$$

with, $V_0 = 50 \text{ MeV}$. (note that the ground state energy, $\sim 3/2\hbar\omega$, has been removed to keep more states below zero energy . . . another anomaly of the oscillator model . . .). Be sure to evaluate binding for both protons and neutrons. Discuss what levels have been used for the filling for each class of nucleon. At what oscillator level does the energy, E_N , go above zero?

2. Krane, problems 5.1, 5.2, 5.3, and 5.6.
3. Figure 5.6 in Krane is only a schematic, average representation of the shell-model single particle states. The energies of the states vary with the proton and neutron number. Show these variations can account for the observed spin-parity assignments for the ground states of the Antimony isotopes, ^{119}Sb , ^{121}Sb , ^{123}Sb , ^{125}Sb , and, ^{127}Sb .