Physics 211B : Problem Set #3

[1] Find all the possible multiplets for the ions Co^{2+} and Sm^{3+}. Find the ground state terms using Hund's rules.

[2] Consider the paramagnetic phase of the Hubbard model within the Stoner approximation. Compute the charge susceptibility, $\chi_c = \partial n/\partial\mu$, at $T = 0$. This is related to the isothermal compressibility via $\kappa_T = n^{-2}\chi_c$. Show that the bare (*i.e.* $U = 0$) value is $\chi_c = g(\varepsilon_F)$, *i.e.* the density of states at the Fermi level. Show within Stoner theory how this result is modified when $U > 0$.

3] Investigate within the Stoner approximation how the Curie temperature $T_c(U)$ varies as a function of U for $U \gtrsim U_c$.

[4] Work out the spin wave dispersion for a nearest-neighbor Heisenberg antiferromagnet on the triangular lattice. Assume that the Néel state has three sublattice order, with the moment on the sublattices points at angles 0°, 120°, and 240°.