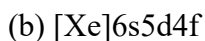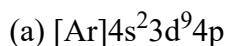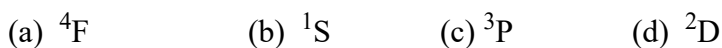# Chem 532: Problem Set #7

Due in class: Monday., Nov. 28th

(1) Find all the RS term symbols that arise from each of the following electron configurations.

(a) $[Ar]4s^2 3d^9 4p$

(b) $[Xe]6s5d4f$

(2) Give the number of <u>states</u> that belong to each of the following terms:

(a) ^4F (b) ^1S (c) ^3P (d) ^2D

(3) Predict the <u>ground state</u> term symbol for each of the following atoms:

(a) As $([Ar]4s^2 4p^3)$ (b) Zr $([Kr]5s^2 4d^2)$

(4) Consider the following electronic configuration of the Ce^+ atom, $[Xe]4f5d6s$

  (a) Determine all the possible Russell-Saunders terms for this configuration. Also give all the levels for the term with the highest L and S.

  (b) For the one level of (a) with the highest possible <u>total</u> angular momentum, what are the expectation values of L^2, S^2, and J^2 ?

  (c) Write the normalized Slater determinant wavefunction corresponding to the one $M_J=13/2$ state associated with part (a). Be very specific in your labeling of the spin-orbitals and use full notation.

  (d) Two of the four possible quartet spin functions are $\alpha_1\alpha_2\alpha_3$ ($M_s = +3/2$) and $\beta_1\beta_2\beta_3$ ($M_s = -3/2$). Use the (3-electron) definitions of the S_- or S_+ operators in both coupled and uncoupled representations to determine one of the two remaining quartet spin functions (your choice).