CHEM 260

Assignment 8

Due Monday 10th March 2003

30. A hydrogen-like atom has a series of spectral lines with wavelengths 72.9411, 54.0304, 48.2414, 45.5882 nm.
    (a) Deduce the quantum numbers associated with these transitions.
    (b) Calculate the series limit (give your answer in cm^{-1}).
    (c) What is the nuclear charge on this atom?

31. Muonium (Mu) is often described as a light isotope of hydrogen. Is this reasonable?
    (a) Calculate the reduced mass for Mu and thence compare its Bohr radius and first ionization energy with those of H. (*The muon mass is 0.11343 u*.)
    (b) Predict the frequency (in cm^{-1}) of the $2p \rightarrow 1s$ atomic transition for Mu and compare with that for H. (*Do not make any assumption about the Rydberg constant for Mu*.)

32. Give the values of *L* and *S* and the possible values of *J* for each of the following term symbols: ^1S, ^2P, ^3P, ^2D, ^1D.

33. Write down the term symbols for the following electron configurations:
    (a) B^{++} $1s^2 2s$
    (b) Na* $1s^2 2s^2 2p^6 3p$
    (c) Cl $1s^2 2s^2 2p^6 3s^2 3p^5$