AP Chem
Take Home Exam Ch 6 – 9, 25
(35 pts)

Name: KEY
I have neither given nor received aid on this exam, except from my group; list names if applicable:
Period: 5 6 7 November 8, 2004

For problems involving calculations, no credit will be given if work is not shown. Use the atomic masses on the laminated Periodic Table provided. Use the values of the constants listed below for calculations. $E_n = \frac{-2.178 \times 10^{-18}}{n^2}$ **joule** $h = 6.63 \times 10^{-34}$ **J s** $c = 3.0 \times 10^{8}$ **m s^{-1}**

1. (8 pts) An electron is excited from the n = 1 ground state to the n = 3 state in a hydrogen atom. Read the statements below. In the space provided, write "TRUE" if applicable; if false, correct the statement(s) to make them true.

   2 a. It takes ~~more~~ less energy to ionize the electron from n = 3 than from the ground state. (FALSE)

   2 b. The electron is farther from the nucleus on average in the n = 3 state than in the n = 1 state.
   TRUE

   2 c. The wavelength of light emitted if the electron drops from n = 3 to n = 2 will be ~~shorter~~ than the wavelength of light emitted if the electron falls from n = 3 to n = 1. longer (F)
   $E = \frac{hc}{\lambda}$ 3 → 2 big E ↔ λ = ↑ν

   2 d. The frequency of light emitted when the electron returns to the ground state from n = 3 will be the same as the frequency of light absorbed to go from n = 1 to n = 3.
   TRUE

Al Si P S

2. (9 pts) The electron affinities of the elements from aluminum to argon are –44, -120, -74, -200, –385, and 0 kJ/mol, respectively. For each set of elements below, provide a brief explanation (1-2 sentences) in terms of atomic structure of the differences in electron affinity
Cl Ar

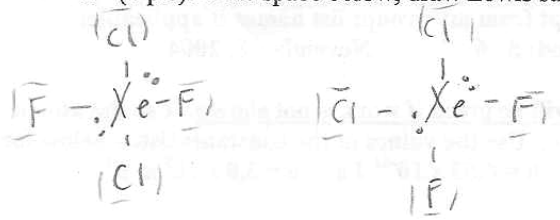
   3 a. Aluminum and silicon
   2,1 Si has greater effective nuclear charge (more protons), so it accepts an e⁻ more easily.
   Also, Si has $2p^2$ / needs 1 more e⁻ for stable half-filled shell

   3 b. Silicon and phosphorus
   2,1 Although P has greater effective nuclear charge, it has $2p^3$ e⁻, which is stable half-filled shell. To accept another e⁻ would be destabilizing

   3 c. Chlorine and argon
   2,1 Although Ar has greater eff. nuc. charge, it has a filled ($2p^6$) shell

$8 + 7 \times 4 = 36$

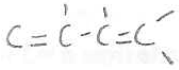
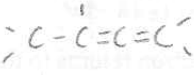
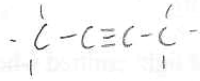
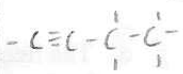
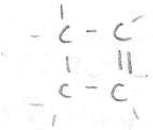
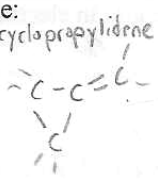
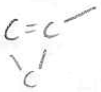
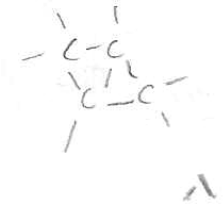
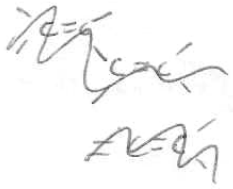
3. (9 pts) Two different compounds have the formula XeF_2Cl_2.
   a. (4 pts) In the space below, draw Lewis structures for these two compounds



   b. (1 pt) Name the electron-pair geometry these compounds share: octahedral
   c. (1 pt) Name the molecular geometry these compounds share: sq. planar
   d. (1 pt) Name the type of hybridization employed by the central atom in these compounds: sp^3d^2
   e. (2 pts) Describe what property could be used to distinguish these two compounds experimentally.

polarity: one is polar and one nonpolar

4. (9 pts) Draw and name all of the isomers of C_4H_6. Draw and name one isomer in each box below. All boxes need not be used, attach more paper if necessary.

me: 1,3-butadiene 	Name: 1,2-butadiene  if cis + trans -1	Name: 2-butyne 	Name: 1-butyne 
me: cyclobutene 	Name: cyclopropylidene 	Name: 1-methylcyclopropene 	Name: 3-methylcyclopropene 
me: bicyclo[1.1.0]butane 	Name: 	Name:	Name: