LECTURE 9

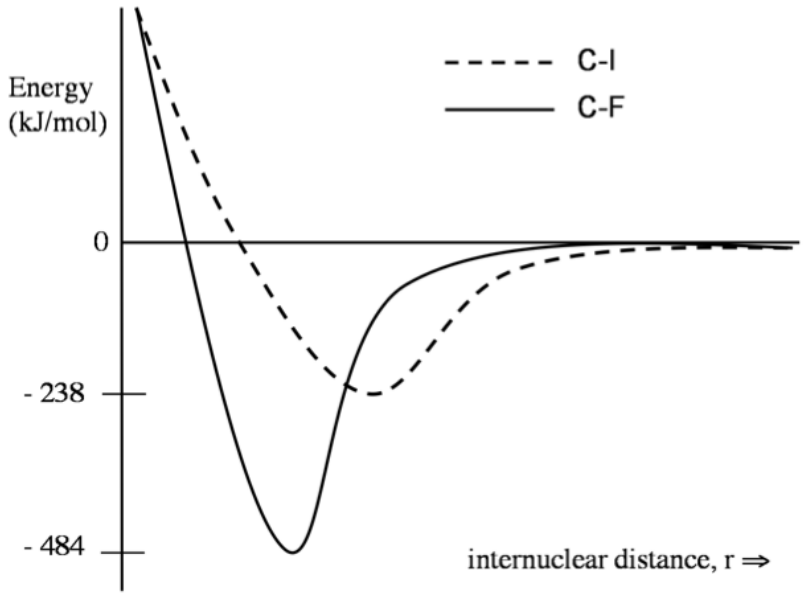
1. (a) Which atom or ion in each of the following pairs has the larger radius?
(i) V or Mo (ii) V or Zn (iii) Ca or Ca^{2+}
(b) Briefly explain the relationship between effective nuclear charge and atomic radius.

(a)
(i) Mo **(ii) V** **(iii) Ca**
(b) As effective nuclear charge increases, atomic radius decreases.

2. Consider the KF molecule, which has an ionic bond. The bond length is 2.17×10^{-10} m.
(a) Calculate the energy required to dissociate the KF molecule into the ions K^+ and F^-.
(b) The energy required to dissociate KF into neutral atoms is 498 kJ/mol. Given that the first ionization energy for K is 418 kJ/mol, calculate the electron affinity (in kJ/mol) for F. Show your work for all calculations.

(a) $+6.40 \times 10^2$ kJ mol^{-1} or **$+1.06 \times 10^{-18}$ J**
(b) +276 kJ mol^{-1}

3. Draw an energy diagram (with energy on the y-axis and internuclear distance, r, on the x-axis) plotting a C–F and a C–I bond. You should include numbers on the y-axis. No numbers are needed on the x-axis, but relative distances should be correct. Bond dissociation energies are 238 kJ/mol and 484 kJ/mol for C-I and C-F respectively.



5.111 Principles of Chemical Science
Fall 2014