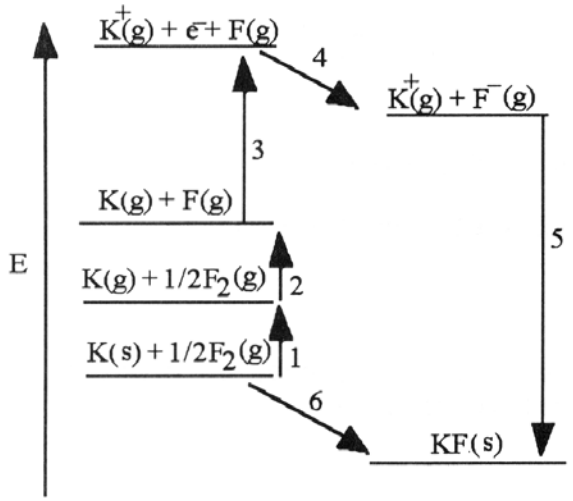
A.P. Chemistry Quiz: Ch. 8, Bonding
Lattice Energy, Bond Enthalpy, Electronegativity, and Polarity

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The diagram below is the Born–Haber cycle for the formation of crystalline potassium fluoride.



1) Which energy change corresponds to the negative lattice energy of potassium fluoride?
A) 5 B) 1 C) 6 D) 4 E) 2

2) Which energy change corresponds to the electron affinity of fluorine?
A) 2 B) 5 C) 6 D) 4 E) 1

3) Which energy change corresponds to the first ionization energy of potassium?
A) 2 B) 4 C) 3 D) 5 E) 6

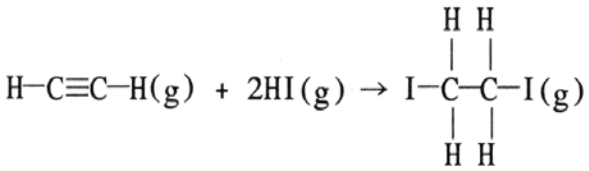
4) Given the electronegativities below, which covalent single bond is most polar?

Element:	H	C	N	O
Electronegativity:	2.1	2.5	3.0	3.5

A) C–H B) O–C C) O–H D) N–H E) O–N

5) Of the molecules below, the bond in _____ is the most polar.
A) HBr B) HCl C) HF D) HI E) H_2

6) Using the table of average bond energies below, the ΔH for the reaction is _____ kJ.



Bond:	C≡C	C–C	H–I	C–I	C–H
D (kJ/mol):	839	348	299	240	413

A) +160 B) –63 C) +63 D) –160 E) –217

7) Of the bonds C–N, C=N, and C≡N, the C–N bond is _____.

A) strongest/longest

B) weakest/longest

C) intermediate in both strength and length

D) strongest/shortest

E) weakest/shortest

Answer Key
Testname: QUIZ_BONDING_CH_08.TST

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A
ID: chem9b 8.1–31

2) D
ID: chem9b 8.1–32

3) C
ID: chem9b 8.1–33

4) C
ID: chem9b 8.1–49

5) C
ID: chem9b 8.1–50

6) E
ID: chem9b 8.1–108

7) B
ID: chem9b 8.1–107

Answer Key for A.P. Chemistry Quiz: Ch. 8, Bonding
Lattice Energy, Bond Enthalpy, Electronegativity, and Polarity (Version A)

Questions 1 through 3 (Born-Haber diagram):

Step 1 represents the sublimation of K. The only change that takes place in this step is K(s) becomes K(g). The arrow is going up because energy is required for this step.

Step 2 represents the breaking of the F-F bond; it represents the bond enthalpy of F-F. The only change that takes place in this step is 1/2 of a mole of F_2 molecules becomes one mole of F atoms. The arrow is going up because energy is required for this step.

Step 3 represents the (first) ionization energy of K (g). The only change that takes place in this step is the K(g) atom becomes the K^+(g) ion plus one e^-. The arrow is going up because energy is required for this step.

Step 4 represents the electron affinity of F. The only change that takes place in this step is F atoms and the one e^- join together to become the F^- ion. The arrow is going down because energy is released in this step.

Step 5 represents the lattice energy of KF(s). The only change that takes place in this step is the gaseous K^+ and F^- ions join together to make KF(s). The arrow is going down because energy is released in this step.

Arrow 6 is not a step. The difference in energy between the beginning of the diagram (the reactants) and the end of the diagram (the products) represents the overall enthalpy change of the reaction, $\Delta H_f°$. (The enthalpy change in this case is also an enthalpy of formation because this reaction shows the formation of KF from its elements in their standard states.) The arrow is going down because, overall, energy is released in the formation of KF from its constituent elements.

Question 4: The biggest difference in electronegativities indicates the most polar bond. Making your task is easier is the list of electronegativities for the relevant elements.

Question 5: The biggest difference in electronegativities indicates the most polar bond. In this case, you had to make use of the period and group trends for electronegativity in order to solve the problem. All of the bonds had some atom attached to hydrogen, so the biggest difference in electronegativities would be the H-F bond. Electronegativity tends to increase l to r across a period (excluding noble gases) and decrease from top to bottom down a group (excluding noble gases). (Noble gases have no electronegativity values because they do not readily form bonds with other elements.)

Question 6:

Reactants side:

Energy which must be USED to break all of these bonds =

(2 x 413) + (839) + (2 x 299) = 2269 kJ/mol

Products side:

Energy which will be RELEASED when all of these bonds form =

(2 x 240) + (348) + (4 x 413) = 2480 kJ/mol

Therefore, more energy is RELEASED than is used up; specifically, 217 more kJ/mol is released than is used up. Because more energy is released than is used up, the sign of ΔH is negative.

ΔH = -217kJ/mol

Question 7: The shorter a bond is between two particular atoms, the stronger it is. *For a particular pair of atoms,* triple bonds are stronger than double bonds and double bonds are stronger than single bonds. (You can't use this trend to compare the bond length and strength, of, say, the single bond between H-F with the those of the double bond between C=O.)