/60

AP Chemistry – More About Bonding – 13

Name _____Per ___

1. Does the lattice energy of an ionic solid increase or decrease:

(a) as the charges of the ions increases?

(b) as the sizes of the ions increases?

2. List the following substances from lowest lattice energy to highest: LiCl, NaBr, RbBr, MgO.

3. Explain the following trends in lattice energy:

(a) MgO > $MgCl_2$

(b) BaO > KF

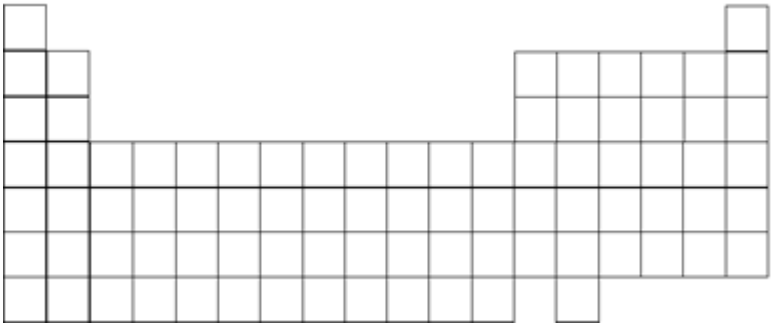
4. Which of these elements is unlikely to form covalent bonds: S, H, K, Ar, Si? Why not?

5. Use Lewis symbols to diagram the formation of NCl_3.

6. The C-S bond lengths in Carbon Disulfide are shorter than would be expected for C-S single bonds. Use a Lewis structure to diagram CS_2 and explain.

7. On the outline of the periodic table below draw a vertical and horizontal arrow for each of the following general trends:

(a) increasing atomic radius
(b) increasing ionic radius
(c) increasing ionization energy
(d) increasing electron affinity
(e) increasing electronegativity



8. Arrange the bonds in each of the following sets in order of increasing polarity:

(a) C-F, O-F, Be-F

(b) N-Br, P-Br, O-Br

(c) C-S, B-F, N-O

9. Which of the following molecules would you predict to have a nonzero dipole moment? Explain your answer in each case.

(a) ClF

(b) CO

(c) CO_2

(d) H_2O

AP Chemistry Lewis Structures Guidelines:

1. Draw a skeleton structure for the molecule or ion, joining atoms by single bonds initially. In some cases, only one structure is possible; in others, experimental evidence must be used to decide between two or more alternative structures.
2. Count the number of valence electrons. (a) For a molecule, simply add up the valence electrons of the atoms present. (b) For a polyatomic anion, electrons are added to take into account the negative charge; for a polyatomic cation, a number of electrons are subtracted to account for the positive charge.
3. Deduct two valence electrons for each single bond written in step 1. Distribute the remaining electrons as lone pairs so as to give each atom eight electrons, if possible.
4. If in step 3, there are too few electrons to go around, make a double bond to correct a deficiency of two electrons. Make a triple bond to correct for a deficiency of four electrons.
5. Resonance forms may have to be written in cases where the Lewis Structure is not consistent with the experimentally measured bond properties. Two or three structures, which are equivalent, may be written. Such structures usually obey the octet rule, but no one structure is the "correct one". Resonance structures differ only in the placement of the electron pairs; the atoms do not move.
6. If in step 3, there are too many electrons, add the electrons to the central atom, which will be a 3rd period or greater atom. This is called an expanded octet.
7. Other exceptions to the octet rule: (a) Hydrogen only has two electrons. (b) Boron sometimes has only six. (c) Nitrogen sometimes has an odd electron.

Now try out these steps:

HOCl

BF_3

CH_2Cl_2

CH_2O

PF_3

AsO_3^-

SiF_4

SO_3