

Chapter 6 Worksheet:

1. Explain the octet rule and how it applies to chemical bonding.

The octet rule states that atoms (minus the exceptions) want 8 electrons in their valence shell. Atoms will bond by transferring (ionic) or sharing (covalent) electrons.

2. What are the different types of bonds and how many electrons are associated with each type of bond?

Single bond (2 electrons); double bond (4 electrons); triple bond (6 electrons)

3. Describe a relationship between bond length and the strength of the bond.

As bond length increases, bond strength decreases (inverse relationship)

4. Identify the type(s) of bond(s) found in the following molecules:

- a. CCl_4 covalent
- b. Li_2O ionic
- c. NF_3 covalent
- d. CaSO_4 ionic and covalent
- e. SO_2 covalent
- f. $\text{Mg}(\text{OH})_2$ ionic and covalent

5. Define electronegativity.

Electronegativity is the ability for an atom in a molecule to attract electrons to itself.

6. Use electronegativity values to place the following elements in **increasing** order: F, N, H, P, Si, C, O

$\text{Si} < \text{C} \approx \text{P} = \text{H} < \text{N} < \text{O} < \text{F}$ or $\text{Si} < \text{H} < \text{P} < \text{C} < \text{N} < \text{O} < \text{F}$

7. Determine if the bond between atoms in each example below is nonpolar covalent, polar covalent, or ionic.

- a. H_2 nonpolar covalent b. PCl polar covalent

Name: _____

Section: _____

c. F_2 nonpolar covalent

f. MgO ionic

d. $NaBr$ ionic

g. CH nonpolar covalent

e. NF polar covalent

h. HCl polar covalent

8. Draw Lewis Structures for the following molecules:

a. CO_2 (double bonds from C to each O, no lone pairs)

j. NF_3 (3 single bonds, 1 lone pair)

b. $BeCl_2$ (single bond to each Cl, no lone pairs)

k. CO (triple bond, lone pair on C and O)

c. H_2O (single bond to O, 2 lone pairs on O)

l. O_3 (1 single bond, 1 double bond, 1 lone pair)

d. BF_3 (single bonds to F, no lone pairs)

m. CO_3^{2-} (2 single bonds, 1 double bond)

e. CCl_4 (single bonds to Cl, no lone pairs)

n. SO_2 (1 single bond, 1 double bond, 1 lone pair)

f. NH_3 (single bonds to H, 1 lone pair on N)

o. PF_5 (5 single bonds, no lone pairs)

g. NO_3^- (2 single bonds, 1 double bond, no lone pairs)

p. PCl_5 (5 single bonds, no lone pairs)

h. SO_3 (2 single bonds, 1 double bond, no lone pairs)

q. SF_6 (6 single bonds, no lone pairs)

i. SO_3^{2-} (3 single bonds, 1 lone pair)

r. TeF_6 (6 single bonds, no lone pairs)

Name: _____

Section: _____

9. Which of the above compounds (in number 8) require resonance structures to describe the structure properly? Draw them.

g, h, l, m, and n

10. Which of the above compounds (in number 8) are exceptions to the octet rule?

b, d, o, p, q, r

11. What are the three basic rules when it comes to formal charges?

Zero formal charges are preferred, lower magnitudes are preferred above higher magnitudes, and the most electronegative element should have the most negative formal charge.

12. Draw the lewis structure and assign formal charges for the following:



Option 1: (4 single bonds to P, no lone pairs on central, formal charge of +1 on P and -1 on all O's)
Option 2: (3 single bonds to P, one double bond, formal charge of -1 on the O's w/ single bonds)



(2 single bonds to C, 1 double bond, no lone pairs on C, formal charge of -1 on O's w/ single bonds).



(1 double bond, 1 single bond, and 1 lone pair; formal charge of +1 on central O and -1 on terminal O w/ single bond).