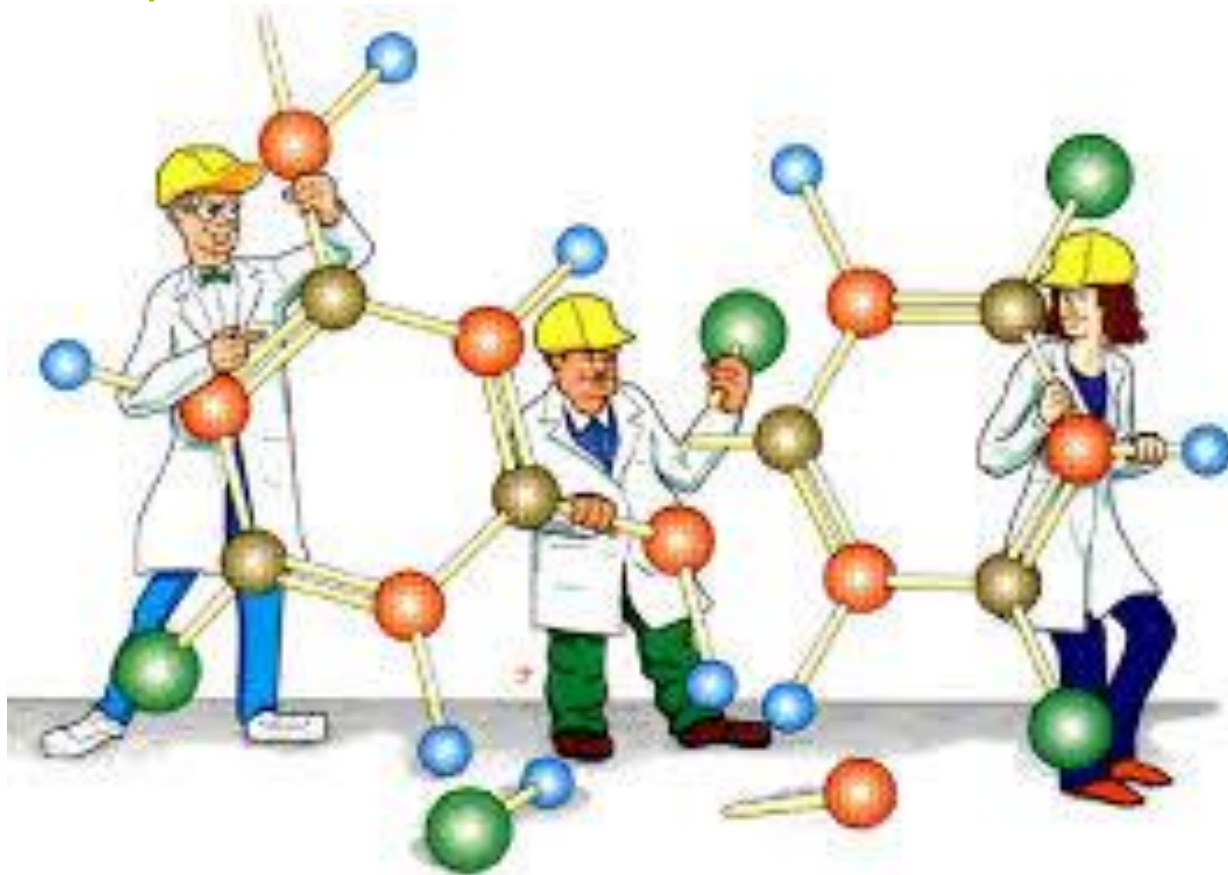


Chapter 8 (with a little chapter 7 added!)



Types of Covalent bonds

- Covalent bonds are formed when atoms share valence electrons to get a total of 8.
- Sharing is not always equal
- Bonds are polar (unequal sharing of electrons) or nonpolar (equal sharing of electrons) depending on the electronegativity of the atoms.

Using electronegativity...

- Difference of 0 – 0.4 NONPOLAR covalent bond
- Difference of 0.5 – 1.9 POLAR covalent bond
- Difference > 1.9 **not** covalent... IONIC bond

Special bonding situations...

- Single Covalent bond – 1 pair of electrons (2 electrons between 2 atoms)
- Double Covalent bond – 2 pairs of shared electrons (4 electrons between 2 atoms)
- Triple Bond – 3 pairs of shared electrons (6 electrons between 2 atoms)
 - Note: Use a line to indicate each bond (or 2 electrons). Use dots to show electrons that are unshared.

Formulas

- Structural formula – shows which atoms bond in a molecule.
- Lewis Structures
 - Based on the Lewis Dot diagrams
 - The electrons between the 2 elements are the shared electrons.

Exceptions

- Exception to the octet rule
- Atoms with less than an octet -
Boron
 - Ex. BF_3
- Atoms with more than an octet -
Sulfur
 - Ex. SF_4

Lewis Dot Structures for compounds

1. Use the formula to add up the total number of valence electrons allowed
2. Create a skeleton structure of the most likely arrangement of atoms paying attention to the formula
3. Attach the atoms that are adjacent to each other in the skeleton formula with a dash
4. Counting the dash as two electrons, add electron pairs so that all atoms have 8 electrons (do not do this for H, Be, B, or Al)
5. Count the total number of electrons, including dashes (as two electrons) and compare this number to your value from step number 1.

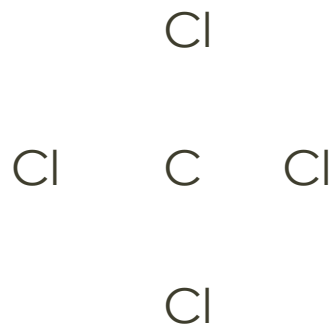
Example: CCl_4

Step 1 C...1C * 4 valence electrons = 4
Cl...4Cl * 7 valence electrons = 28
32

Step 2



Step 3



Step 4

Step 5

Another example...CO₂

Step 1 C...1C *4 valence electrons = 4
O...2 O * 6 valence electrons = 12
16

Step 2 O C O

Step 3 O C O Step 4

Step 5

Molecular Shapes and VSEPR theory

- V
 - S
 - E
 - P
 - R
-
- Used to predict the shapes of smaller molecules based on bond angles from center atom to terminal atoms

VSEPR made easier!

Shape	# of atoms bonded to the center atom	# of pairs of unbonded electrons around the center atom	Bond angle
Linear			
Trigonal planar			
Tetrahedral			
Trigonal pyramidal			
Bent			

Predicting molecule shape...

1. Use the formula to draw the dot structure
2. Identify the center atom (or atoms)
3. Count the number of atoms bonded to the center atom
4. Count the number of unbonded electrons on the center atom
5. Use the chart to identify the shape and bond angle

Let's try some...WS 8-1 PP

- #1 CCl_4

- #6 NF_3

- HWK...do the rest of the worksheet

Polarity

- The presence of poles or partially charged regions created by an imbalance of electrons
- Bond polarity results when electrons are shared UNEVENLY between two atoms
- This created partial + or – charges or POLES

Molecular Polarity

- A polar molecule has one end with a positive charge and one end with a negative charge.
- Dipole is another name for a polar molecule (di...means two)

Determining Molecular Polarity

- Need to look at the shape of the molecule and bond polarities
 - Bond polarities use electronegativity differences
 - Shapes ... need to know which are symmetrical (linear, trigonal planar, and tetrahedral) and which are NOT symmetrical (trigonal pyrimidal and bent)

Determining Molecular Polarity (continued)

- If all bonds are nonpolar...NONPOLAR
- If any bonds are polar and molecule is symmetrical...NONPOLAR
- If any bonds are polar and molecule is non-symmetrical...POLAR

Molecule behavior

- Polar Molecules interact with other polar molecules
- Nonpolar molecules interact with other nonpolar molecules
 - “LIKES LIKE LIKES”
- Polar molecules do NOT interact with nonpolar molecules