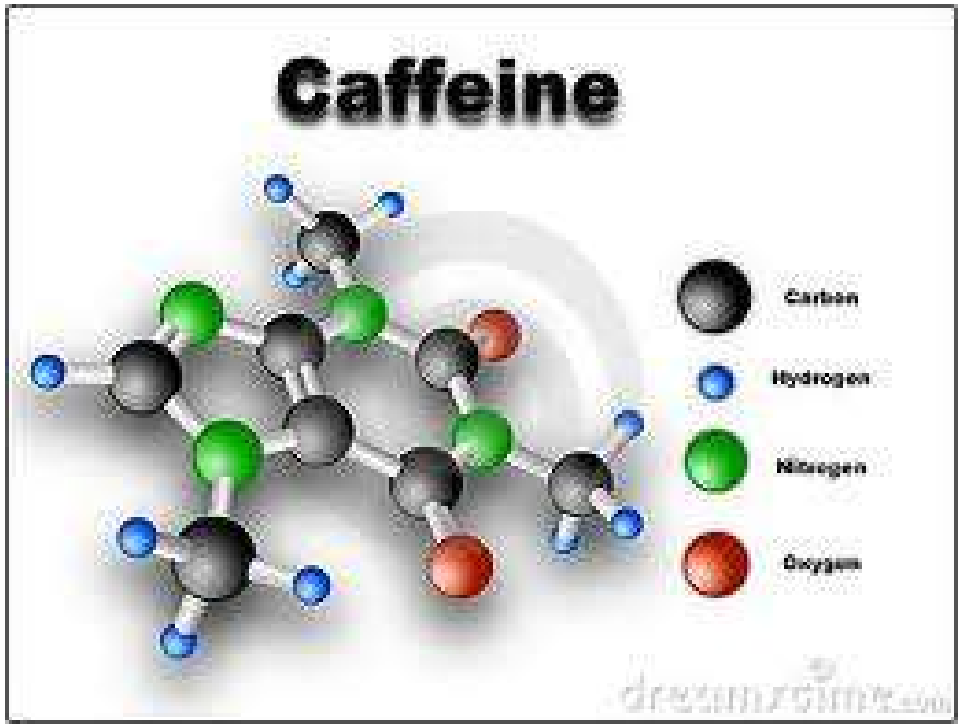
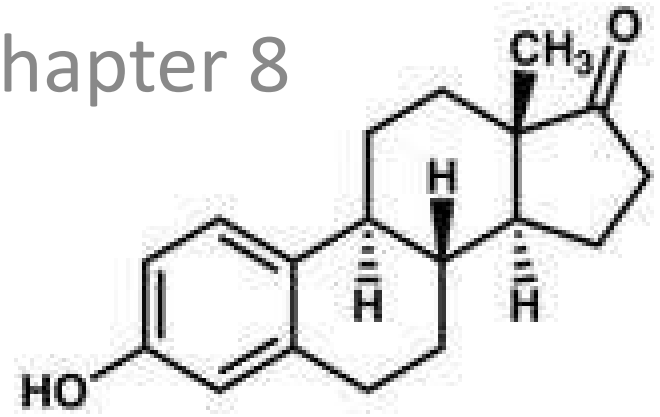
No Bellwork 10/13/15

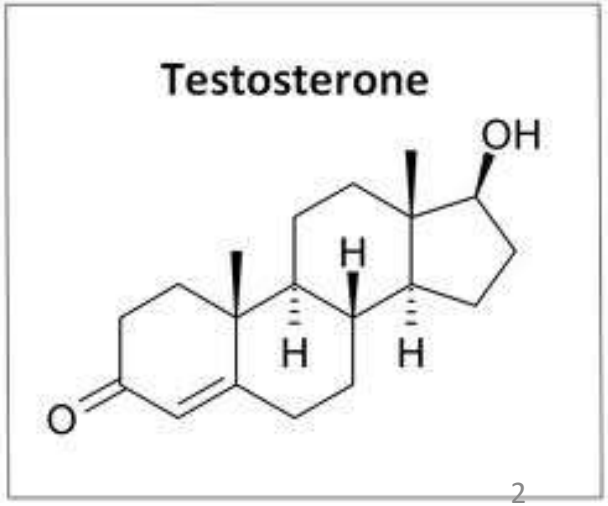
- Review your grade report. Questions after class.
- Missing assignments before 9/11 worth 50%
- Missing assignments 9/12-10/9 must be turned in by this Friday (10/16)
- After Friday, anything before 10/9 worth 50%
- Have parent/guardian sign grade report by Friday for extra credit
- ***Ionic Bonding & Naming Schoology Test will be available later today (due Tues 10/20 9am)

Covalent Bonding

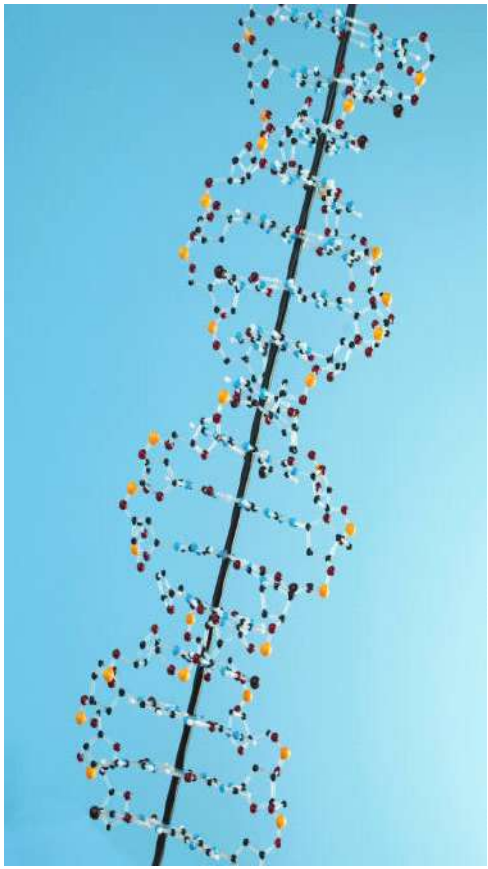


Chapter 8





8.1 Molecular Compounds



- Covalent Bond are atoms held together by sharing electrons.
- Molecule is a neutral group of atoms joined together by covalent bonds.
- Diatomic molecule is a molecule consisting of two atoms
- Molecular compound is a compound composed of molecules.
  - Example: water has two covalent bonds, the smallest particle of water is called a water molecule, and is a molecular compound

8.1 Molecular Compounds

- **Molecular compounds tent to have relatively lower melting and boiling points that ionic compounds**
- Most are gases or liquids at room temperature, and most molecular compounds are composed of two or more nonmetals.
- Molecular formula is the chemical formula of a molecular compound
  - Example: Water's formula is H_2O
- **A molecular formula shows**

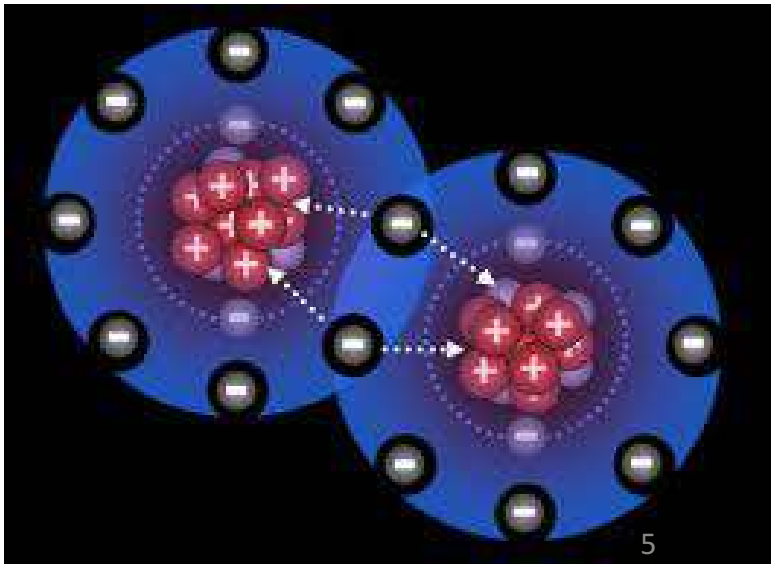
how many atoms of each element

a molecule contains

8.2 The nature of Covalent Bonding

- **In covalent bonds, electrons sharing usually occur so that atoms attain the electron configuration of noble gases.**
- In covalent bonds elements usually acquire a total of eight electrons (an octet) by sharing electrons.
- Single covalent bond is

when atoms are held together by sharing a pair of electrons



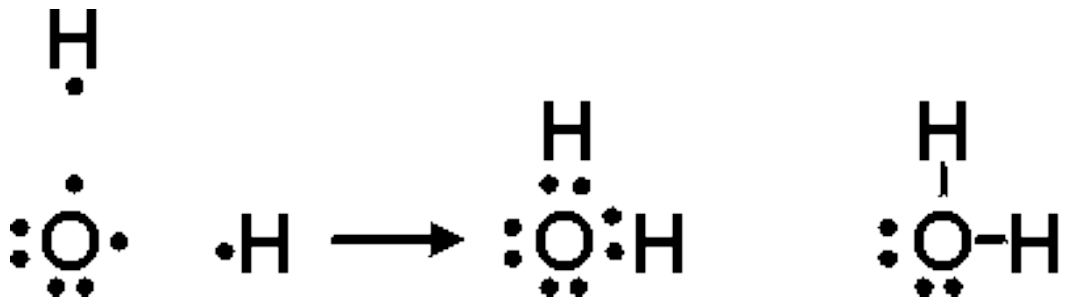
8.2 The nature of Covalent Bonding

- **An electron dot structure can be used to represent the shared pair of electrons of the covalent bond by two dots.**
- Structural formula represents covalent bonds by dashes and shows the arrangement of covalently bonded atoms.
- Unshared pair (or lone pair) is a pair of valence electrons that is not shared between the atoms

8.2 The nature of Covalent Bonding

- Single covalent bond example

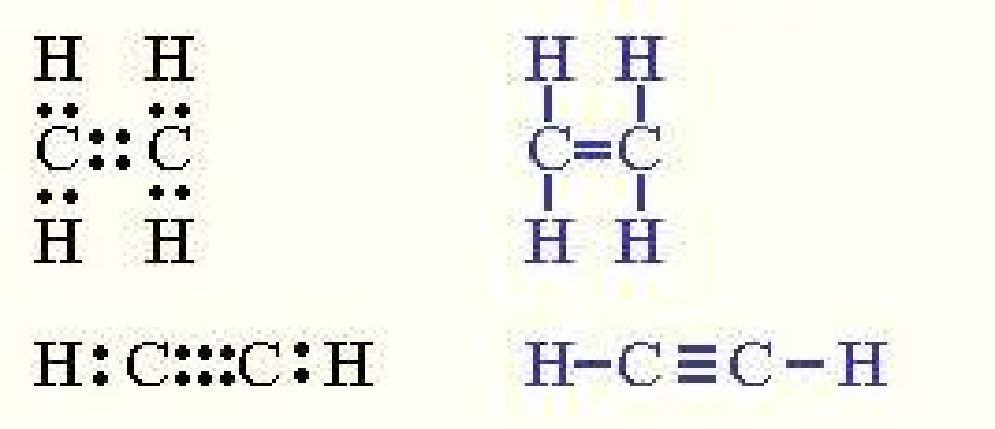
Water:



The oxygen atom has two unshared pair of electrons and two single covalent bonds.

8.2 The nature of Covalent Bonding

- **Atoms form double or triple covalent bonds if they can attain a noble gas structure by sharing two pairs or three pairs of electrons.**
- Double covalent bond is a bond that involves two shared pairs of electrons
- Triple covalent bond is a bond that involves three shared pairs of electrons



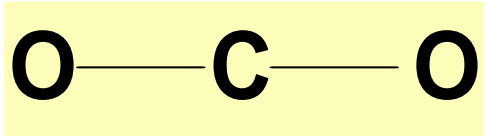
Steps for Building Lewis Structures

1. Decide on a central atom. Generally the LEAST electronegative atom is central atom. Hydrogen can NEVER be central atom because it can only form one bond.
2. Add up the number of valance electrons for ALL elements in compound
3. Form a single bond between the central atom and each of the other atoms
4. Add lone pair to elements to complete the octet (remember Hydrogen only want 2 electrons)
5. Check each element to make sure they have access to 8 electrons (H = 2). Ask are they happy?
6. Add up the number of electrons in drawing [count dots + 2(# of lines)] and see if this number match the number of valance electrons in step 2
   - If you have too many form double or triple bonds as needed
   - If you have too few than you made a mistake in your drawing.

Carbon Dioxide, CO_2

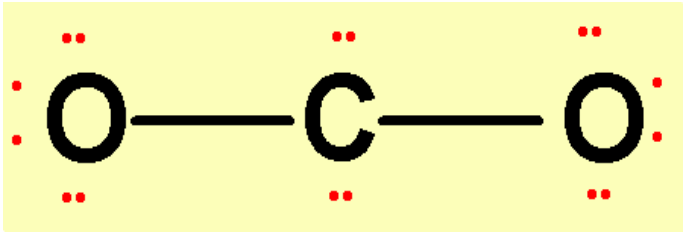
1. Central atom =
2. Valence electrons =
3. Form bonds.

C 4 e-
O 6 e- X 2 O's = 12 e-
Total: 16 valence electrons



This leaves 12 electrons (6 pair).

4. Place lone pairs on outer atoms.



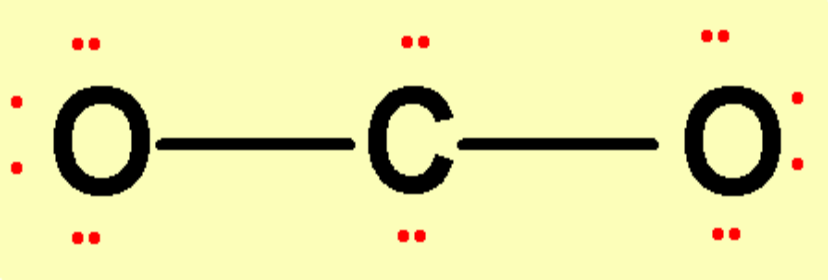
5. Check to see that all atoms have 8 electrons around it except for H, which can have 2.

Carbon Dioxide, CO_2

C 4 e-

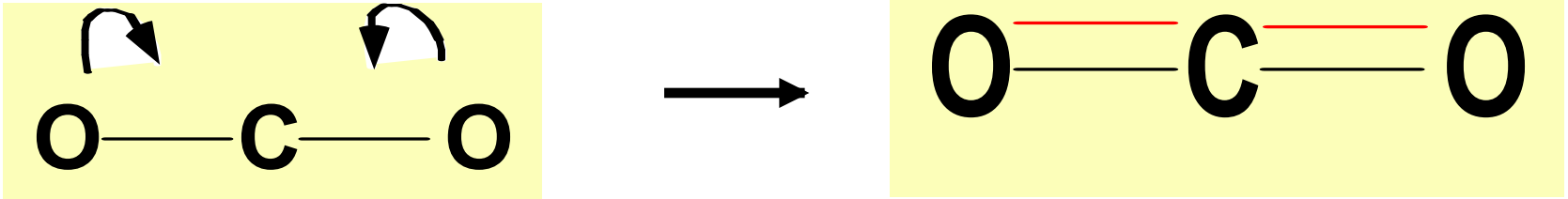
O 6 e- X 2 O's = 12 e-

Total: 16 valence electrons



How many are in the drawing?

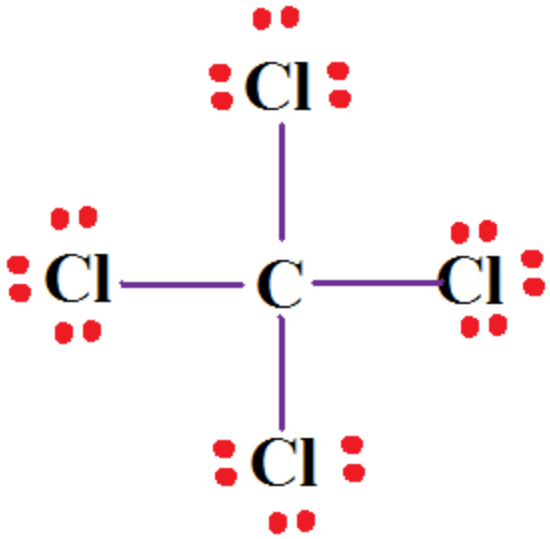
6. There are too many electrons in our drawing. We must form DOUBLE BONDS between C and O. Instead of sharing only 1 pair, a double bond shares 2 pairs. So one pair is taken away from each atom and replaced with another bond.



How many double bonds is Carbon making?
How many double bonds is one Oxygen making?
How many lone pairs are on Oxygen? Carbon?

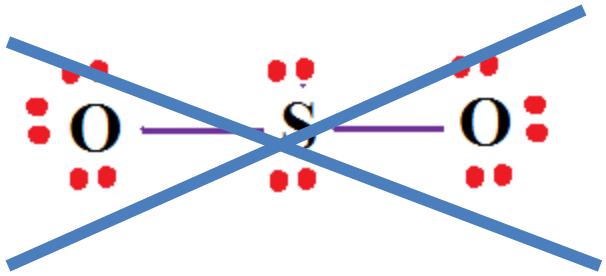
Now You Try One!
Draw Carbon tetrachloride

1. Central atom is Carbon
2. One C = 4 e-, Four Cl = 4 (7e-)
   Total: 32 e-
3. Form single bonds
4. Add Lone Pairs
5. Carbon has 4 single bond and is happy, each Chlorine has 1 single bond and 3 lone pairs and is happy
6. Check electrons used
   24 dots + 2 (4 lines) = 32 e-
   Structure is correct



Now You Try One!
Draw Sulfur Dioxide

1. Central atom is Sulfur
2. One S = 6 e-, Two O = 2 (6 e-)
   Total: 18 e-
3. Form single bonds
4. Add Lone Pairs
5. Sulfur has 2single bond and 2 lone pairs and is happy, each Oxygen has 1 single bond and 3 lone pairs and is happy
6. Check electrons used
   16 dots + 2 (4 lines) = 20 e-
   Structure is NOT Correct

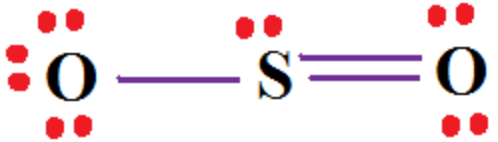


Make double bonds

Check electrons used

12 dots + 2 (3 lines) = 18

structure is correct



Diatomic Molecules

- There are 7 elements that do not exist in nature as a single atom; they always appear as pairs
- When atoms turn into ions, this NO LONGER HAPPENS! They can form bonds as single atoms.
  - Hydrogen H_2
  - Nitrogen N_2
  - Oxygen O_2
  - Fluorine F_2
  - Chlorine Cl_2
  - Bromine Br_2
  - Iodine I_2
- **Remember: BrINClHOF**
- **Or remember the 7 elements in the shape of a 7 on the periodic table**

8.4 Polar Bonds and Molecules

- Nonpolar covalent bond (nonpolar bond) is when the bonding electrons are shared equally.
- ALL diatomic halogen molecules are nonpolar
- Polar covalent bond (polar bond) is when the bonding electrons are NOT shared equally
- **The more electronegative atom attracts electrons more strongly and gains a slightly negative charge. The less electronegative atom has a slightly positive charge.**
- **When polar molecules are placed between oppositely charges plates they tend to become oriented with respected to the positive and negative plates.**

8.4 Polar Bonds and Molecules

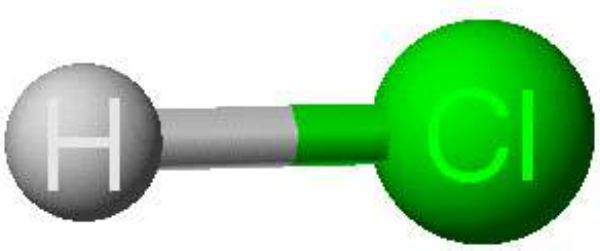
- To determine if a bond is polar or nonpolar look at the difference in electronegativity values
  - Nonpolar covalent is electronegativity difference range of 0.0 to 0.5
  - polar covalent is electronegativity difference range of 0.51 to 1.6
  - Ionic bonds is electronegativity difference range above 1.7 to 4.0

Table of Electronegativity Values

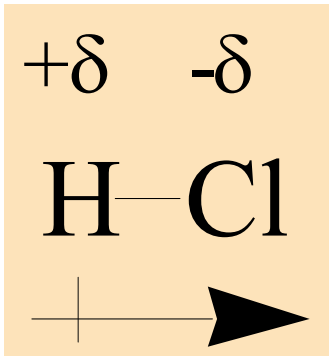
	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1 **H** 2.1																	2 **He**
2	3 **Li** 1.0	4 **Be** 1.5											5 **B** 2.0	6 **C** 2.5	7 **N** 3.0	8 **O** 3.5	9 **F** 4.0	10 **Ne**
3	11 **Na** 0.9	12 **Mg** 1.2											13 **Al** 1.5	14 **Si** 1.8	15 **P** 2.1	16 **S** 2.5	17 **Cl** 3.0	18 **Ar**
4	19 **K** 0.8	20 **Ca** 1.0	21 **Sc** 1.3	22 **Ti** 1.5	23 **V** 1.6	24 **Cr** 1.6	25 **Mn** 1.5	26 **Fe** 1.8	27 **Co** 1.8	28 **Ni** 1.8	29 **Cu** 1.9	30 **Zn** 1.6	31 **Ga** 1.6	32 **Ge** 1.8	33 **As** 2.0	34 **Se** 2.4	35 **Br** 2.8	36 **Kr**
5	37 **Rb** 0.8	38 **Sr** 1.0	39 **Y** 1.2	40 **Zr** 1.4	41 **Nb** 1.6	42 **Mo** 1.8	43 **Tc** 1.9	44 **Ru** 2.2	45 **Rh** 2.2	46 **Pd** 2.2	47 **Ag** 1.9	48 **Cd** 1.8	49 **In** 1.8	50 **Sn** 1.8	51 **Sb** 1.9	52 **Te** 2.1	53 **I** 2.5	54 **Xe**
6	55 **Cs** 0.7	56 **Ba** 0.9	57 **La**	72 **Hf**	73 **Ta**	74 **W**	75 **Re**	76 **Os**	77 **Ir**	78 **Pt**	79 **Au**	80 **Hg**	81 **Tl** 1.8	82 **Pb** 1.9	83 **Bi** 1.9	84 **Po** 2.0	85 **At** 2.2	86 **Rn**
7	87 **Fr** 0.7	88 **Ra** 0.9	89 **Ac**	104 **Rf**	105 **Db**	106 **Sg**	107 **Bh**	108 **Hs**	109 **Mt**	110	111	112		114		116		

Lanthanides	58 **Ce**	59 **Pr**	60 **Nd**	61 **Pm**	62 **Sm**	63 **Eu**	64 **Gd**	65 **Tb**	66 **Dy**	67 **Ho**	68 **Er**	69 **Tm**	70 **Yb**	71 **Lu**
Actinides	90 **Th**	91 **Pa**	92 **U**	93 **Np**	94 **Pu**	95 **Am**	96 **Cm**	97 **Bk**	98 **Cf**	99 **Es**	100 **Fm**	101 **Md**	102 **No**	103 **Lr**

Bond Polarity



HCl is POLAR because it has a positive end and a negative end. (difference in electronegativity)

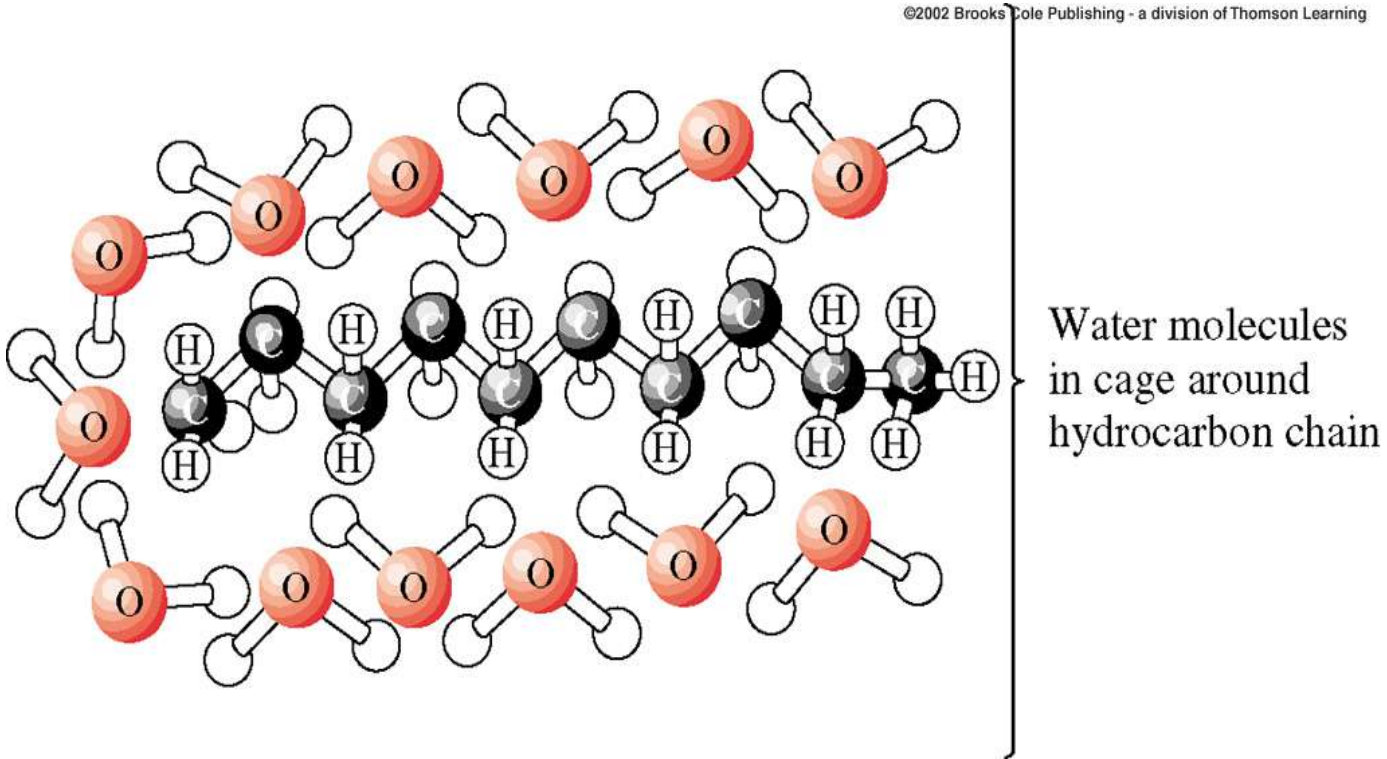


Cl has a greater share in bonding electrons than does H.

Cl has slight negative charge (-δ) and H has slight positive charge (+ δ)

Bond Polarity

- This is why oil and water will not mix! Oil is nonpolar, and water is polar.
- The two will repel each other, and so you can not dissolve one in the other



Bond Polarity

- "Like Dissolves Like"
  - Polar dissolves Polar
  - Nonpolar dissolves Nonpolar

Compare and contrast Ionic and Covalent bonds

Characteristic	Ionic Bonds	Covalent Bonds
Reason for forming	Because atoms want to have full outer energy levels	
How they form	Transferring Electrons	Sharing Electrons
Strength of bond	Very Strong Bond	Weak Bond
Melting/Boiling Points	Very High	Low
Phase at room temperature	Most are solids	Most are liquids or gases

Lewis Structure Summary

- The elements MOST of the time follow the guide lines below. There are a few exceptions
  - Carbon will form 4 bond
  - Nitrogen and Phosphorous will form 3 bonds and will have 1 lone pair
  - Oxygen, sulfur and Selenium will form 2 bonds and have 2 lone pairs
  - F, Cl, Br, and I will form 1 bond and have 3 lone pairs.
  - Hydrogen will from 1 bond
- The bonds can be any combination of single, double or triple bonds.