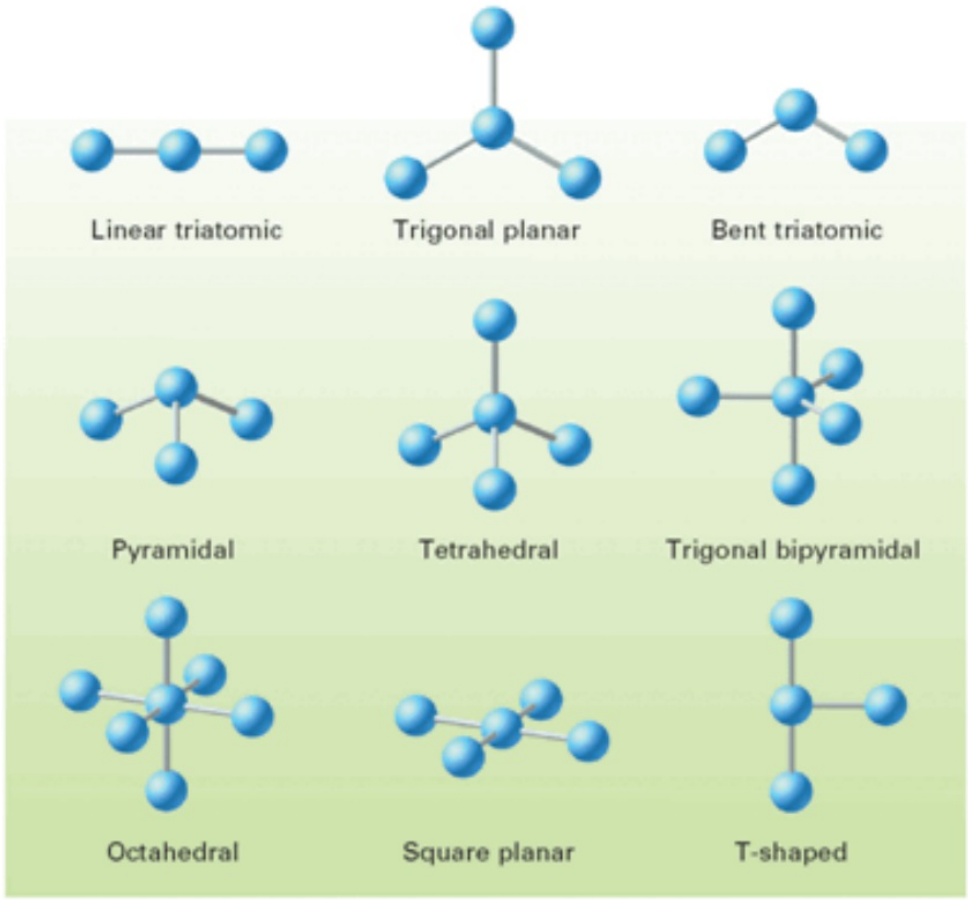
Warm Up

In the lab on the heating curve of water, what was the heat doing during the "flat spots" of the curve. It was NOT raising the temperature of the mixture, so what was it doing?

Is there a difference between the melting point and freezing point of water?

Nine Possible Molecular Shapes (p. 233 text)



Objectives:
TSWBAT:

Explain how the types of intermolecular forces present in a compound affect the physical properties of the compounds (e.g. polarity and molecular shape.)

Polar Covalent Bond

A polar covalent bond, known also as a polar bond,is a covalent bond between atoms in which the electrons are shared unequally.

The more electronegative atom attracts electrons more strongly and gains a slightly negative charge. The less electronegative atom has a slightly positive charge.

Polar Bonds and Molecules

Snow covers approximately 23% of the Earth's surface. Each individual snowflake is formed from as many as 100 snow crystals. The polar bonds in water molecules influence the distinctive geometry of snowflakes.

Bond Polarity

How do electronegativity values determine the charge distribution in a polar bond?

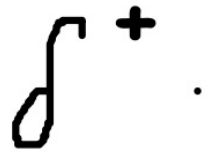
Turn to p. 177 of textbook.

Table 6.2

Electronegativity Values for Selected Elements

H 2.1						
Li 1.0	**Be** 1.5	**B** 2.0	**C** 2.5	**N** 3.0	**O** 3.5	**F** 4.0
Na 0.9	**Mg** 1.2	**Al** 1.5	**Si** 1.8	**P** 2.1	**S** 2.5	**Cl** 3.0
K 0.8	**Ca** 1.0	**Ga** 1.6	**Ge** 1.8	**As** 2.0	**Se** 2.4	**Br** 2.8
Rb 0.8	**Sr** 1.0	**In** 1.7	**Sn** 1.8	**Sb** 1.9	**Te** 2.1	**I** 2.5
Cs 0.7	**Ba** 0.9	**Tl** 1.8	**Pb** 1.9	**Bi** 1.9		

The symbol for a "slightly positive charge" is a delta +:

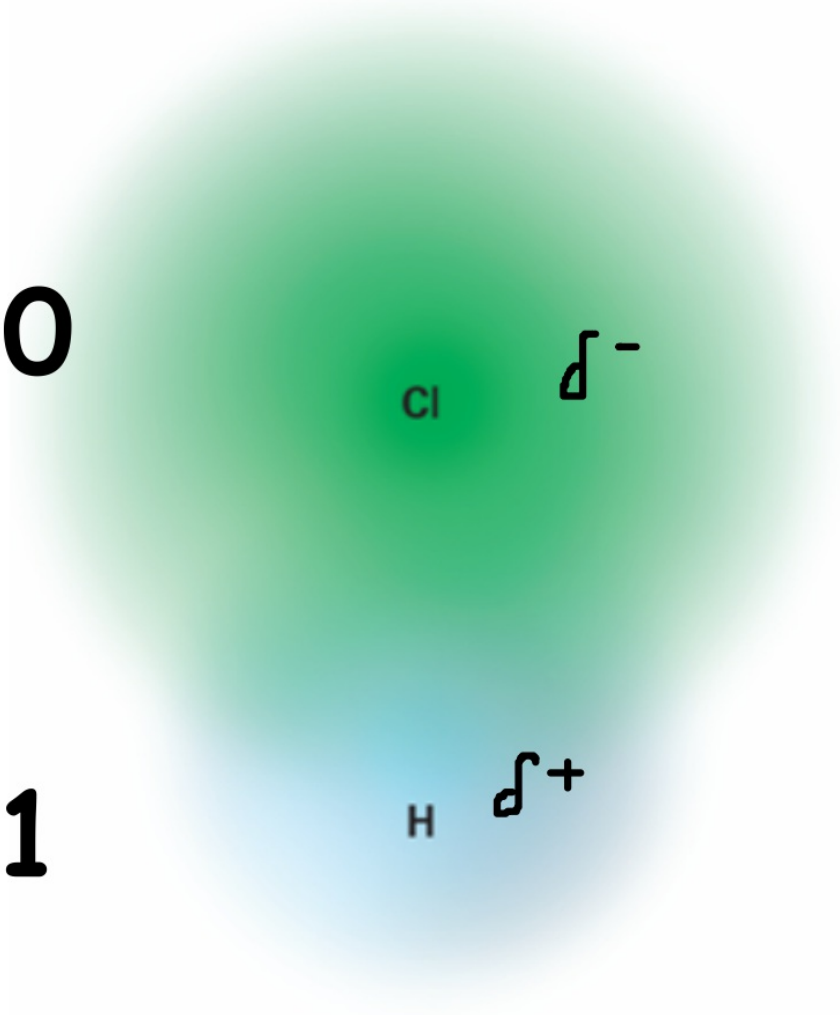


The symbol for a "slightly negative charge" is a delta -:

The chlorine atom attracts the electron cloud more than the hydrogen atom does.

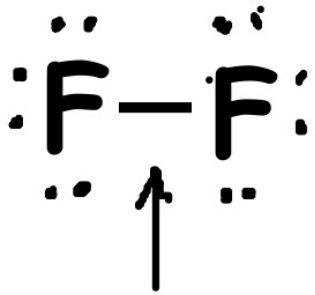
Cl = 3.0

H = 2.1



Nonpolar covalent bond

When the atoms in a bond pull equally
(as occurs when identical atoms are bonded),
the bonding electrons are shared equally, and the
bond is a **nonpolar covalent bond**.



this pair of electrons is being shared
equally by each atom.

So, how do you know whether a bond is highly polar or only slightly polar?

Use electronegativities.

Table 8.3

Electronegativity Differences and Bond Types

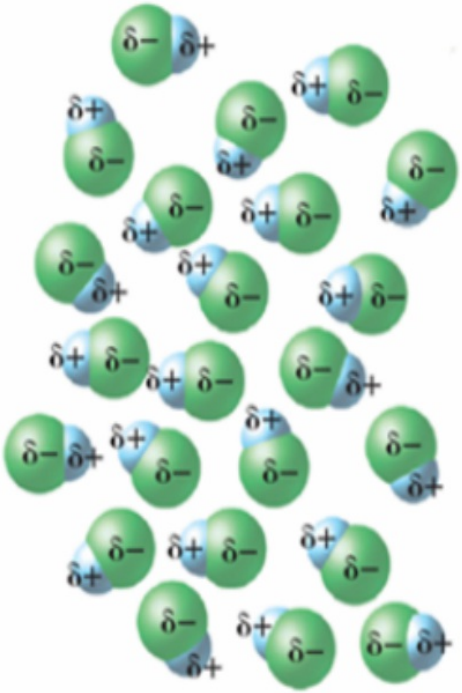
Electronegativity difference range	Most probable type of bond	Example
0.0–0.4	Nonpolar covalent	H—H (0.0)
0.4–1.0	Moderately polar covalent	$\overset{\delta+}{H}-\overset{\delta-}{Cl}$ (0.9)
1.0–2.0	Very polar covalent	$\overset{\delta+}{H}-\overset{\delta-}{F}$ (1.9)
≥ 2.0	Ionic	Na^+Cl^- (2.1)

Warm Up

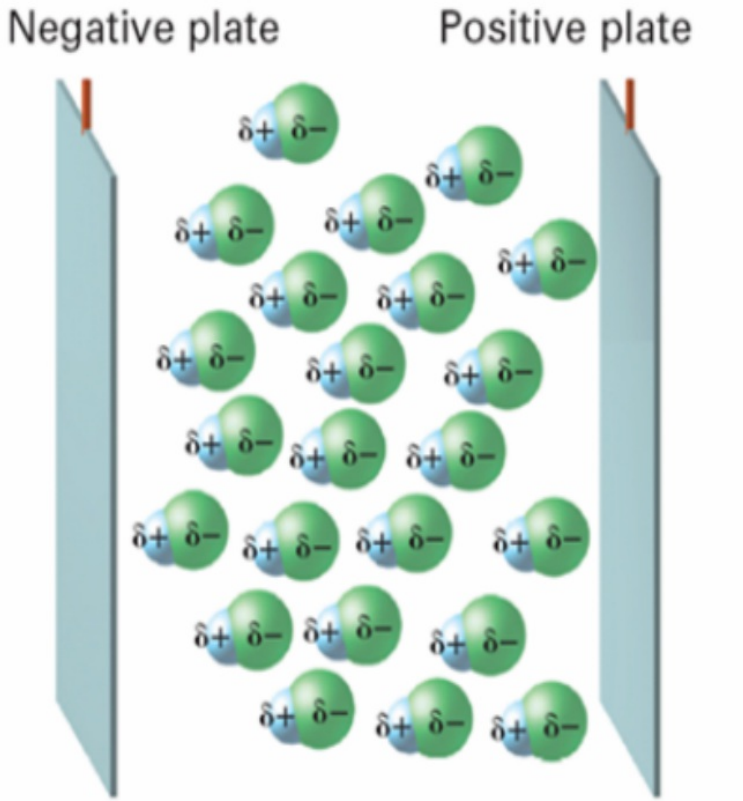
What causes bond polarity?

Another way to tell if a molecule possesses a dipole is to place it in an electric field. Due to the charge difference in a polar molecule the + and - ends of the molecule will line up:

A hydrogen chloride molecule is a dipole



Electric field absent.
Polar molecules orient randomly.



Electric field on.
Polar molecules line up.

Intermolecular Attractions: attraction of one molecule to another separate molecule.

There are 3 types of intermolecular attractions.

(We looked at these in the lab on the heating curve of water)