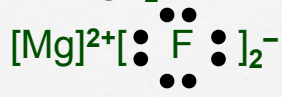
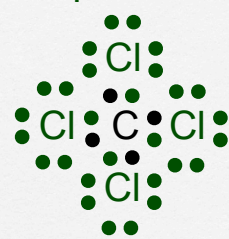


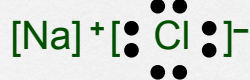
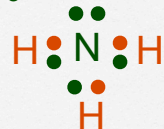
Q7

Covalent bonding

CCl_4 - Covalent HCl - Covalent MgF_2 - Ionic



NH_3 - Covalent NaCl - Ionic



H_2O - Covalent



What about OH^- ?

OH^-

- OH^-
- $\text{O} (6e), \text{H} (1e) = 7e^-$
- -1 Charge means: $8e^-$

Q7

Covalent bonding

OH^- - Covalent



Think of water as H^+ and OH^- ...some O from one water molecule can pull an H off another. At any given point in time you have some H^+ and some OH^- in your water.

Polyatomic Ions

- PO_4^{3-}
- $\text{O} (4 \times 6e), \text{P} (1 \times 5e) = 29e^-$
- Add your minus -3 charge = $32e^-$

Central Atom

- If you have more than 2 atoms, you must establish your central atom
- usually the least electronegative element - often times carbon (the atom with the most available binding sites) OR the element with the most binding sites

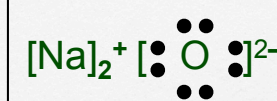
HCl - Covalent



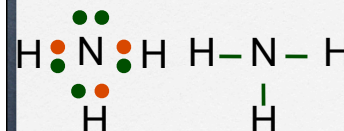
CO₂ - Covalent



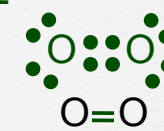
Na₂O - Ionic



NH₃ - Covalent



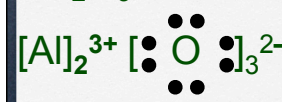
O₂ - Covalent



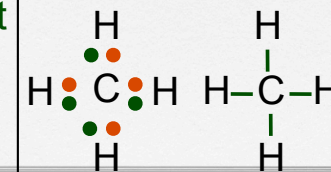
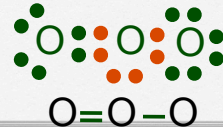
I₂ - Covalent



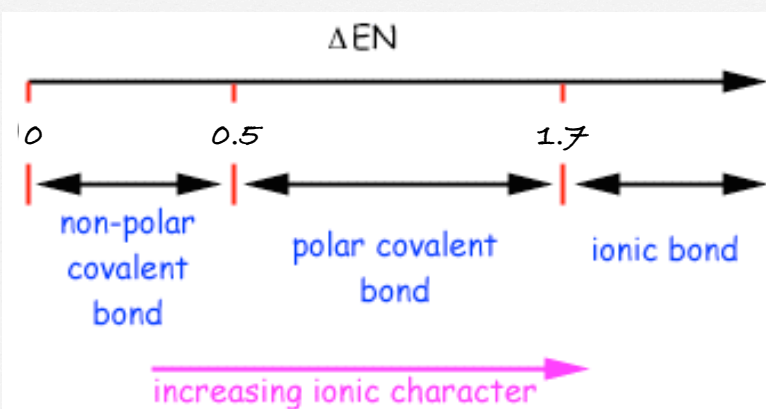
Al₂O₃ - Ionic



O₃ - Covalent

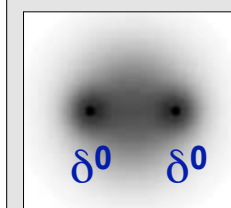


The Bonding Continuum



Electronegativity

H₂



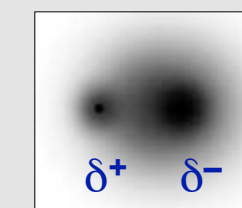
H:H

covalent (non-polar)

$$\Delta\text{EN}: 2.1 - 2.1 = 0$$

< 0.5

HCl



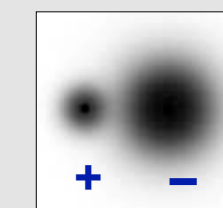
H:Cl:

polar covalent

$$\Delta\text{EN}: 3.0 - 2.1 = 0.9$$

0.5 - 1.7

LiCl



[Li]⁺:Cl:⁻

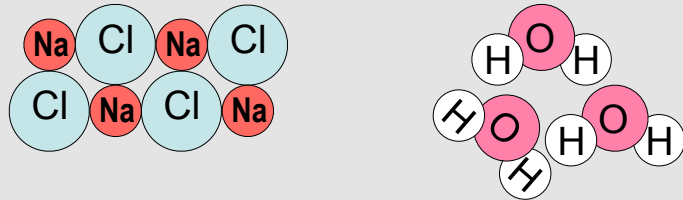
ionic

$$\Delta\text{EN}: 3.0 - 1.0 = 2.0$$

> 1.7

The basic units: ionic vs. covalent

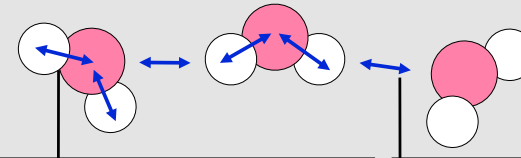
- Ionic compounds form repeating units.
- Covalent compounds form distinct molecules.
- Consider adding to NaCl(s) vs. H₂O(s):



- NaCl: atoms of Cl and Na can add individually forming a compound with millions of atoms.
- H₂O: O and H cannot add individually, instead molecules of H₂O form the basic unit.

Forces - Intra vs Inter molecular

Remember the penny experiment???



Intramolecular forces occur between atoms

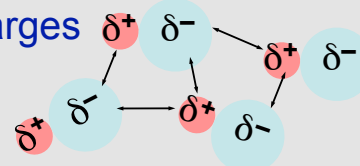
Intermolecular forces occur between molecules

Intramolecular forces are stronger!!!

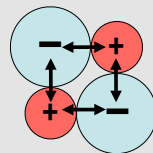
- There are no intermolecular forces in ionic bonding because there are no molecules.
- The type of intramolecular bond determines the type of intermolecular force.

Electronegativity & physical properties

- Lets look at HCl: partial charges keep molecules together.



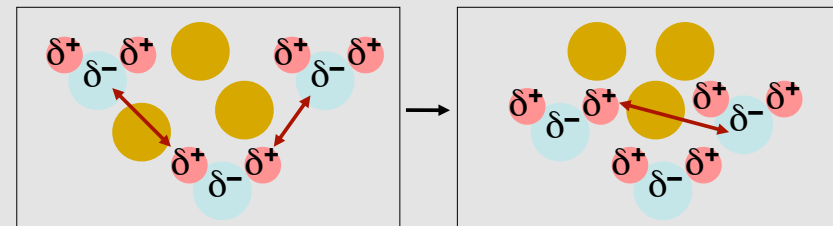
- The situation is similar in NaCl, but the attraction is even greater ($\Delta EN = 2.1$ vs. 0.9 for HCl).



- Which would have a higher melting/boiling point? NaCl because of its greater ΔEN .

Why oil and water don't mix

- Lets take a look at why oil and water don't mix (oil is non-polar, water is polar)



The partial charges on water attract, pushing the oil (with no partial charge) out of the way.

