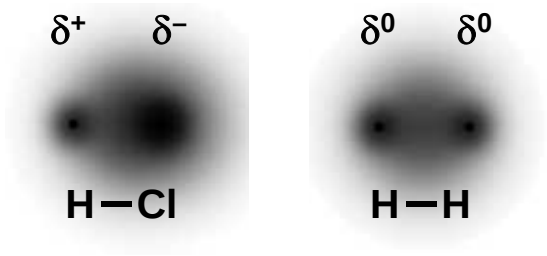
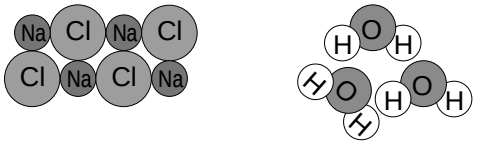
Electronegativity



The basic units: ionic vs. covalent

- Ionic compounds form repeating units.
- Covalent compounds form distinct molecules.
- Consider adding to NaCl(s) vs. H_2O(s):

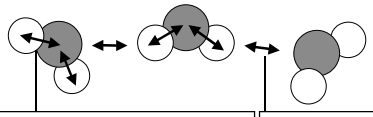


- NaCl: atoms of Cl and Na can add individually forming a compound with million of atoms.
- H_2O: O and H cannot add individually, instead molecules of H_2O form the basic unit.

Holding it together

Q: Consider a glass of water. Why do molecules of water stay together?

A: there must be attractive forces.



Intramolecular forces are much stronger

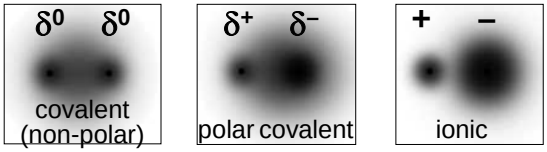
Intramolecular forces occur between atoms	Intermolecular forces occur between molecules

- We do not consider intermolecular forces in ionic bonding because there are no molecules.
- We will see that the type of intramolecular bond determines the type of intermolecular force.

I'm not stealing, I'm sharing unequally

- We described ionic bonds as stealing electrons
- In fact, all bonds share – equally or unequally.
- Note how bonding electrons spend their time:

H_2 H:H HCl H:Cl: LiCl [Li]+[:Cl:]−



- Point: the bonding electrons are shared in each compound, but are not always shared equally.
- The greek symbol δ indicates "partial charge".

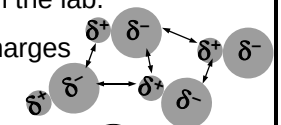
Electronegativity

- Recall that electronegativity is "a number that describes the relative ability of an atom, when bonded, to attract electrons".
- The periodic table has electronegativity values.
- We can determine the nature of a bond based on ΔEN (electronegativity difference).
- ΔEN = higher EN – lower EN
  NBr_3: ΔEN = 3.0 – 2.8 = 0.2 (for all 3 bonds).
- Basically: a ΔEN below 0.5 = covalent, 0.5 - 1.7 = polar covalent, above 1.7 = ionic
- Determine the ΔEN and bond type for these: HCl, CrO, Br_2, H_2O, CH_4, KCl

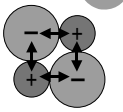
Electronegativity Answers

Electronegativity & physical properties

- Electronegativity can help to explain properties of compounds like those in the lab.
- Lets look at HCl: partial charges keep molecules together.



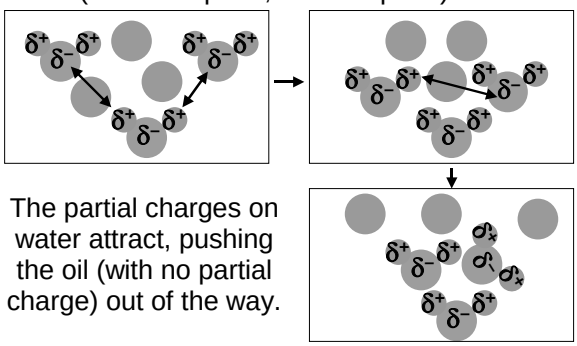
- The situation is similar in NaCl, but the attraction is even greater (ΔEN = 2.1 vs. 0.9 for HCl).



- Which would have a higher melting/boiling point?
- For each, pick the one with the lower boiling point a) $CaCl_2$, CaF_2 b) KCl, LiBr c) H_2O, H_2S

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.