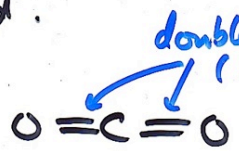
The Covalent Bond

Lewis: Sharing of $2e^-$ between 2 atoms = Covalent Bond.

ex:

single-bond ($2e^-$s)



double-bond (4e's)

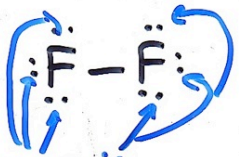
N≡N

triple-bond (6e's)

ex: F_2

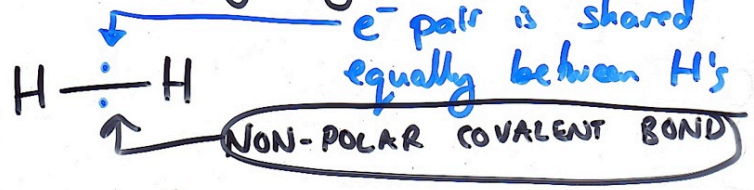
bonding pairs

or

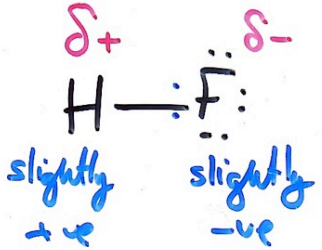


lone-pairs or non-bonding pairs

Electronegativity:



e⁻ pair is pulled towards the F.

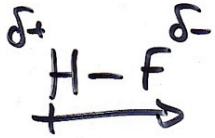


(small change)
δ : delta
Δ : Delta
(large change)

Santa

Penguins

2-poles magnetic dipole



electric dipole (moment)

POLAR COVALENT BOND

Electronegativity

we assign to an atom.

0 – 4

low # = atom is not good @ pulling e's towards itself.

high # = atom is very good @ pulling e's towards itself.

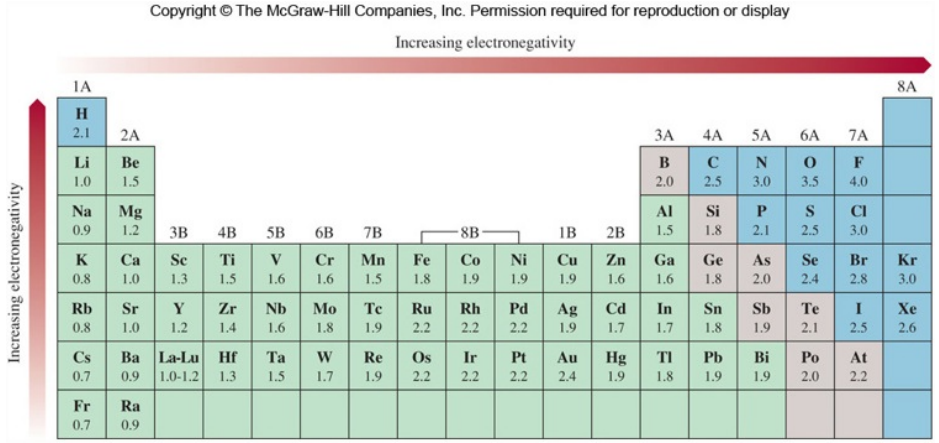
For each bond, the difference in the two electronegativities of the atoms dets. how polar (δ+, δ−) the bond is.

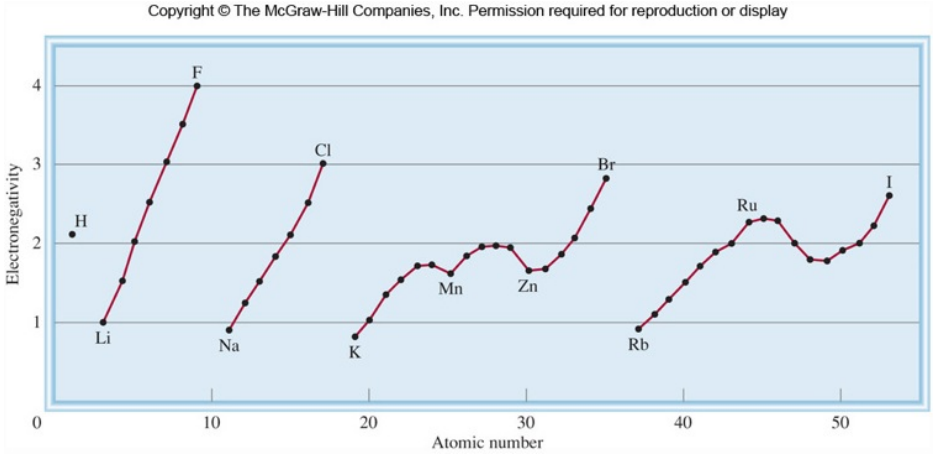
if ΔElectroneg ≈ 0 — Non-Polar Covalent

ΔElectroneg 0 – 0.4 — "

ΔElectroneg 0.4 – 2.0 — POLAR COVALENT

ΔElectroneg 2.0 – higher — IONIC BOND





ex: H—Cl (2.1, 3.0) electrons — $\Delta E_{neg} = 0.9$ — POLAR COVALENT

$\overset{\delta+}{H} \rightleftharpoons \overset{\delta-}{Cl}$

ex: $\overset{\delta+}{H}$ (2.1) — $\overset{\delta-}{F}$ (4.0) — (Really) POLAR COVALENT — $\Delta E_{neg} = 1.9$

ex: C (2.5) — H (2.1) — ignore! — $\Delta E_{neg} = 0.4$ — NON-POLAR COVALENT

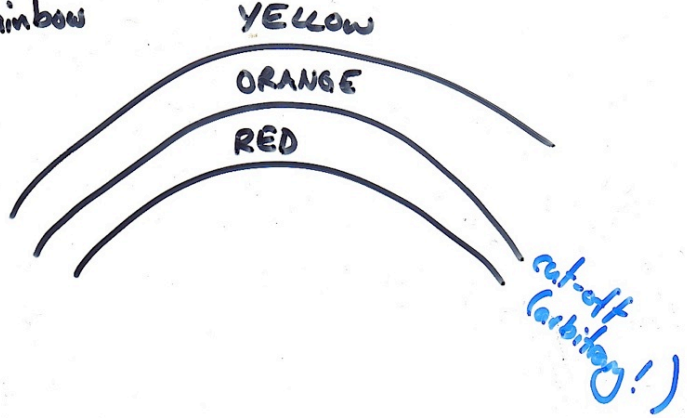
So, in general, if you have a bond formed between 2 atoms in the same period / group, the further apart they are, the more POLAR the bond is.

ex: Li — F (1.0, 4.0) $\Delta E_{neg} = 3.0$ IONIC

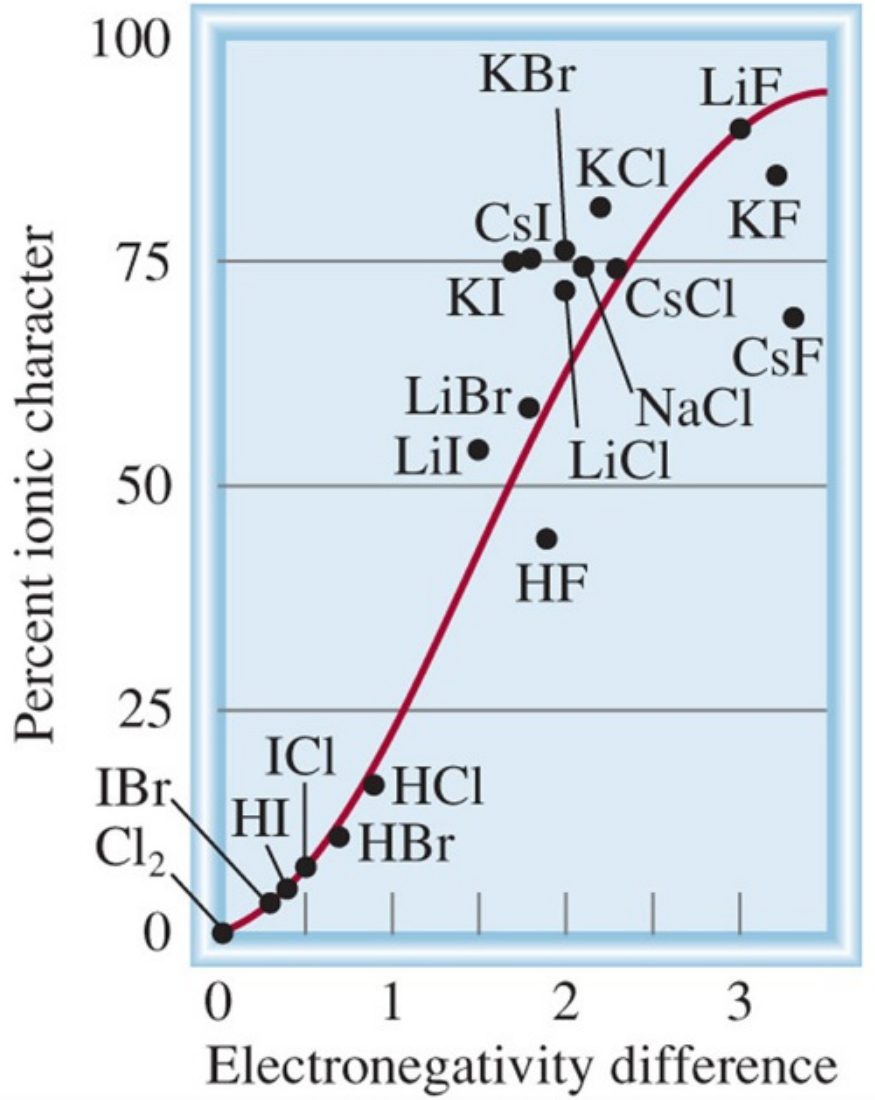
ex: B — F (2.0, 4.0) $\Delta E_{neg} = 2.0$ POLAR-COVALENT

IONIC

Rainbow



cut-off (arbitrary!)



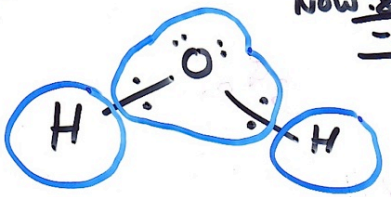
Oxidation Number

Hypothetical charge we give to every atom in a compound. (Pretend it's ionic!)

- Draw Lewis Structure.
- Lone-pairs → assigned to atom
- Bonding pairs → assigned to atom w/ greatest electrons.

Ox# = Charge compared to orig. atom.

ex: H_2O (+1, −2)



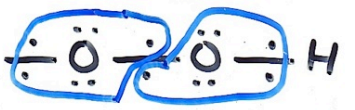
ORIG: 6 NOW: 8 → −2 Ox. #

ORIG: 1 NOW: 0 → +1

ORIG: 1 NOW: 0 → +1

ex: H_2O_2

share 50:50 e's when 2 atoms have same electrons!



ORIG: 1 NOW: 0 → +1 (H)

ORIG: 6 NOW: 7 → −1 (O)

ORIG: 6 NOW: 7 → −1 (O)

ORIG: 1 NOW: 0 → +1 (H)

ex: F_2O

ORIG: 7 NOW: 8 → −1

ORIG: 6 NOW: 4 → +2