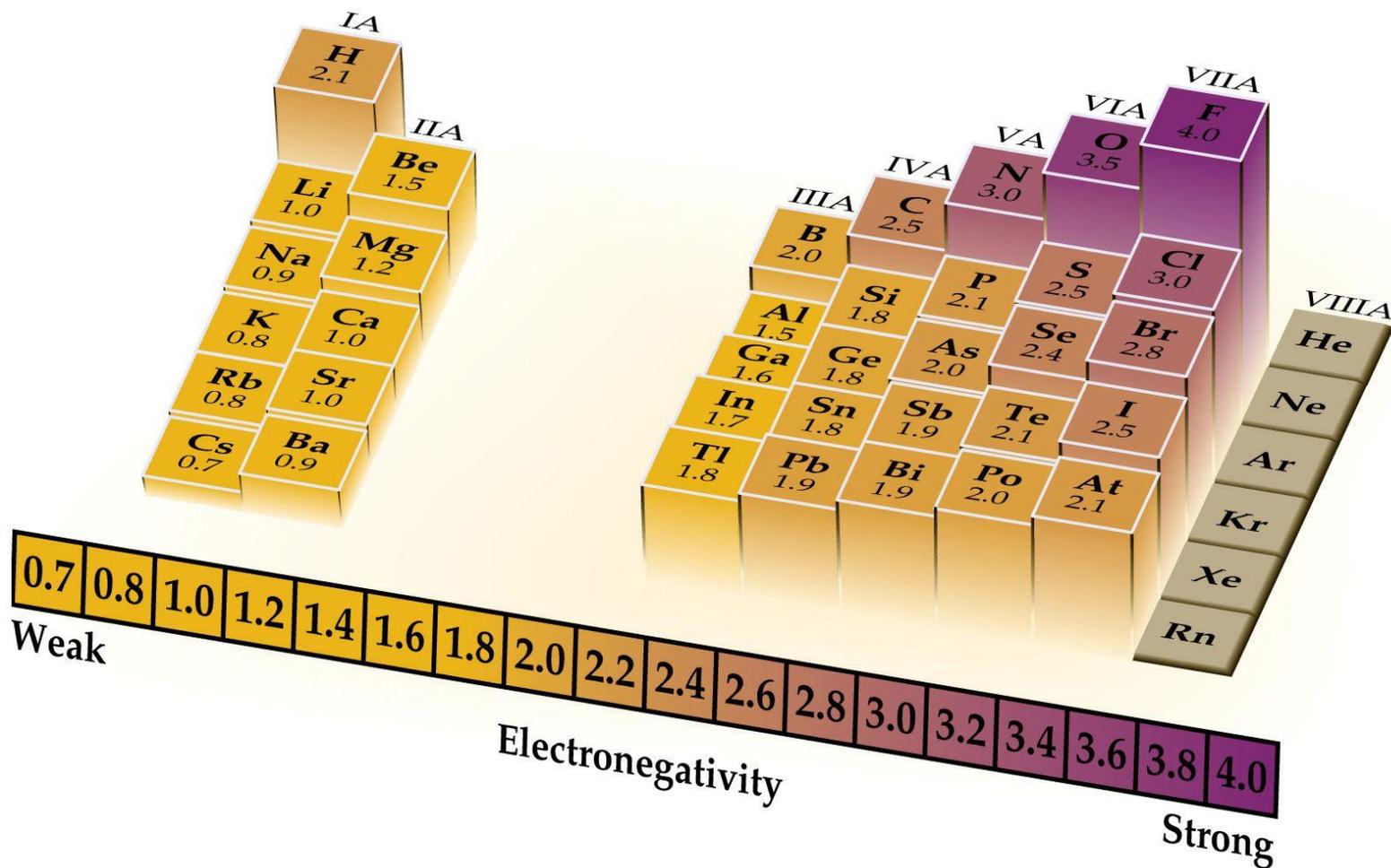


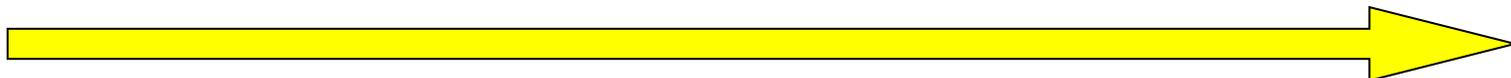


[WWW.CHEMSHEETS.CO.UK](http://www.chemsheets.co.uk)

BOND POLARITY

Electronegativity = the power of an atom to attract the electrons in a covalent bond

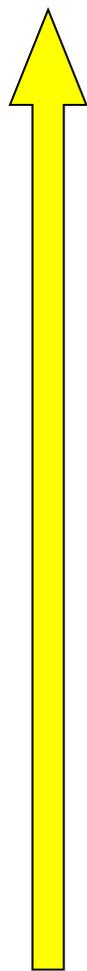




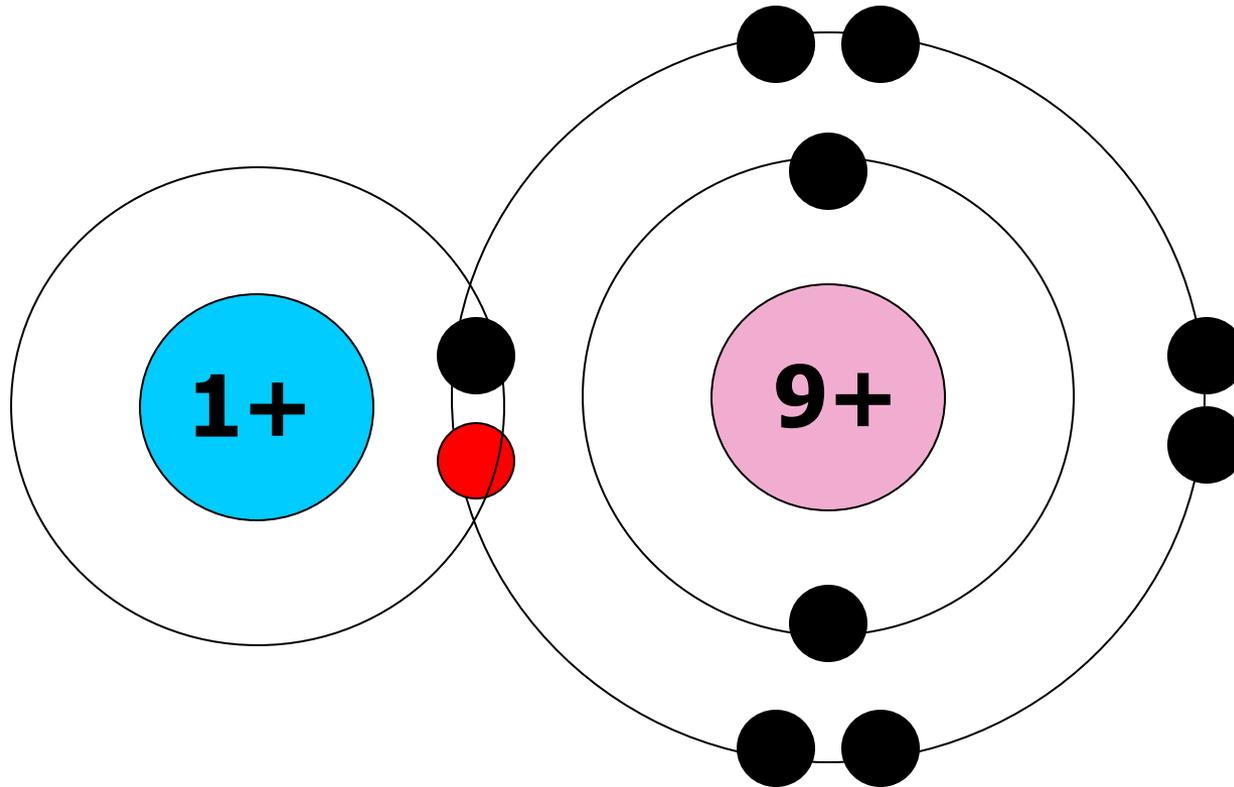
H
2.1

He

Li 1.0	Be 1.5											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
Na 0.9	Mg 1.2											Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe
Cs 0.7	Ba 0.9	La 1.1	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.8	Bi 1.9	Po 2.0	At 2.2	Rn



Factors affecting electronegativity



Factors affecting electronegativity

1) Nuclear charge

2) Atomic radius

3) Shielding

Factors affecting electronegativity

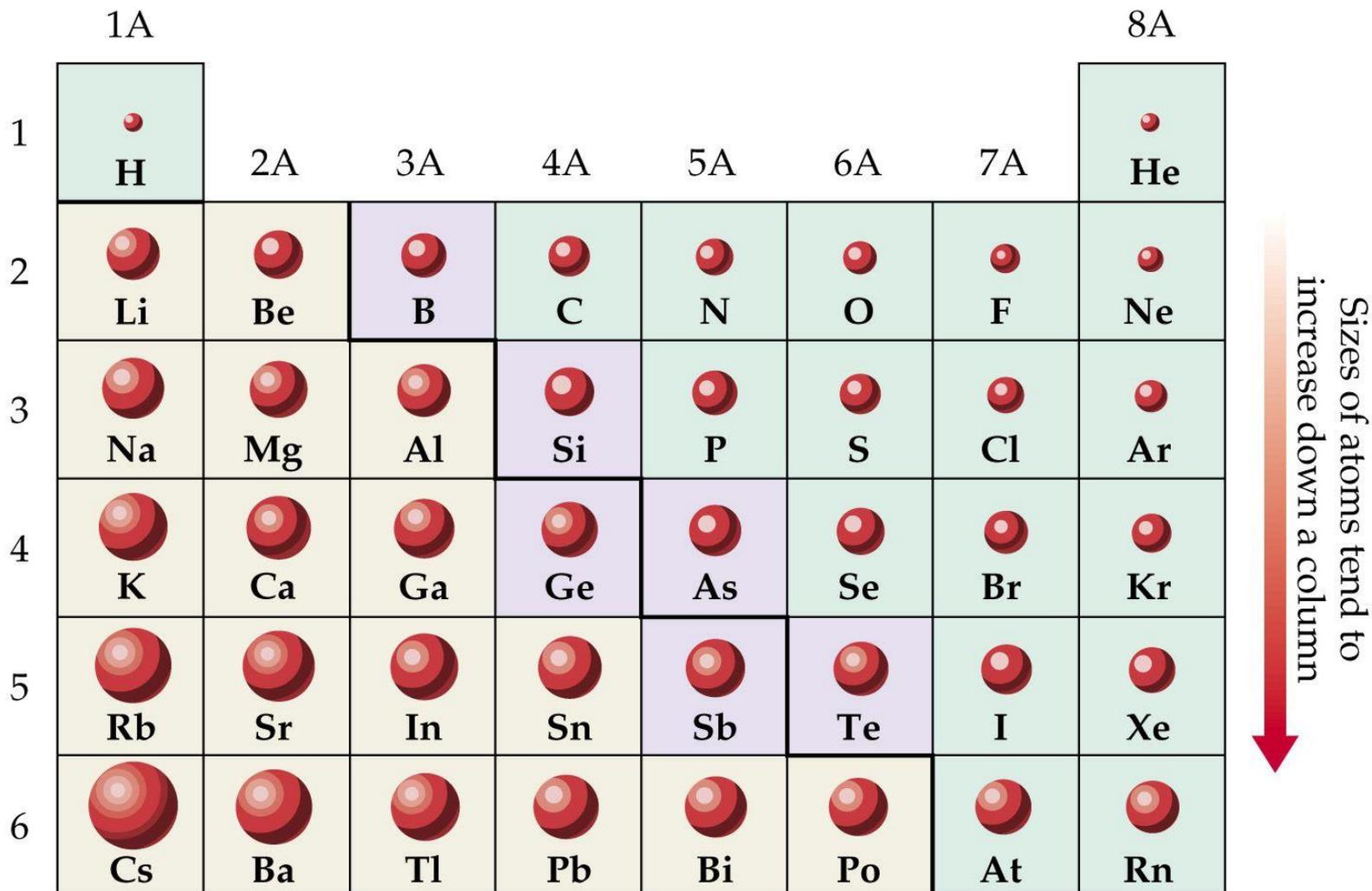
- 1) **Nuclear charge** – more protons, stronger attraction between nucleus and bonding pair of electrons.
- 2) **Atomic radius** – closer to the nucleus, stronger attraction between nucleus and bonding pair of electrons.
- 3) **Shielding** – less shells of electrons between the nucleus and the electrons, less shielding (less repulsion), stronger attraction between nucleus and bonding pair of electrons.

Trend down a group

Electronegativity decreases

- Atomic radius increases
- More shielding
- \therefore Less attraction between nucleus and bonding pair of electrons

Relative atomic sizes of the representative elements



Sizes of atoms tend to decrease across a period

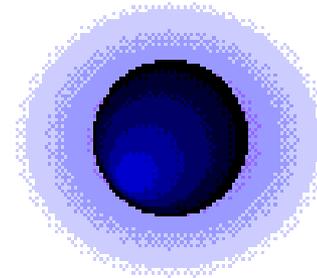
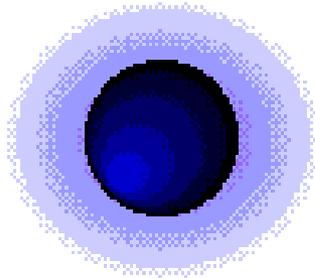


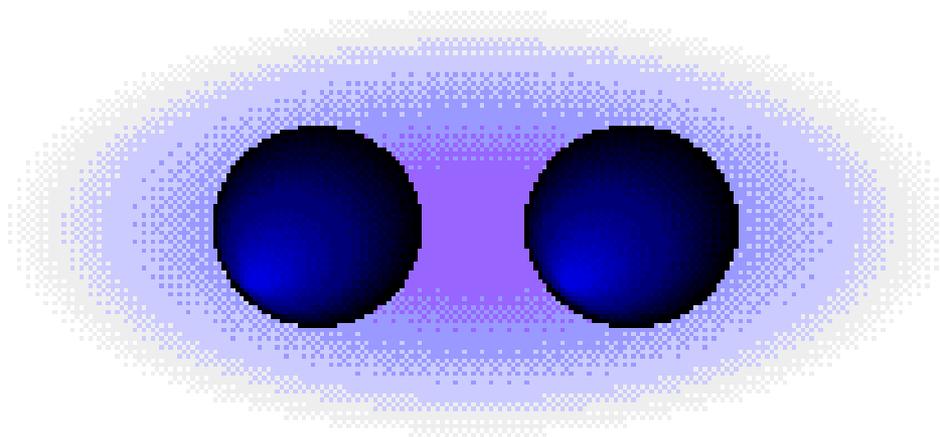
Trend across a period

Electronegativity increases

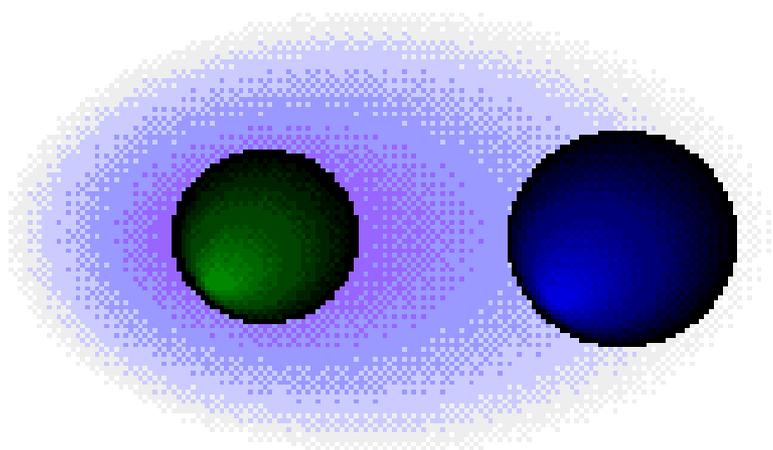
- Atomic radius decreases
- More nuclear charge
- \therefore Stronger attraction between nucleus and bonding pair of electrons

Formation of a covalent bond

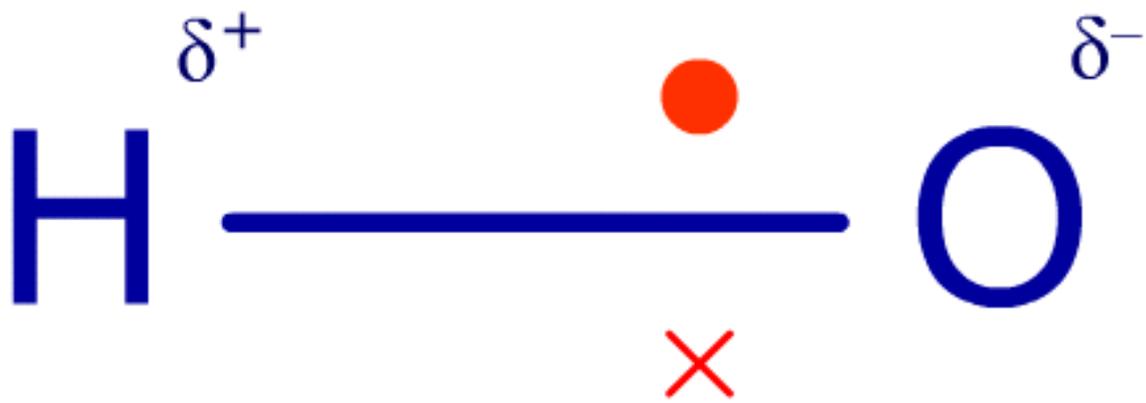


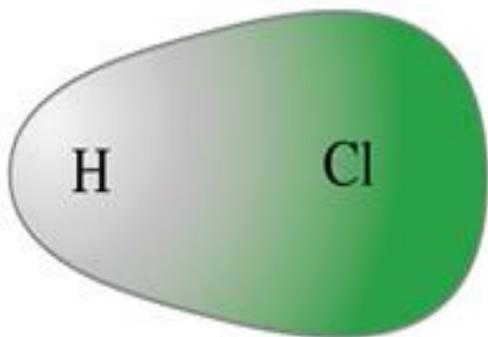


Non-polar bond

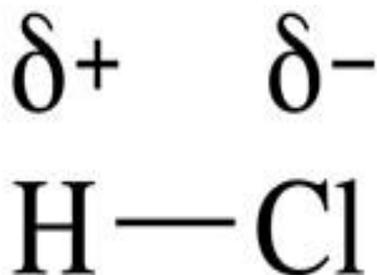


Polar bond

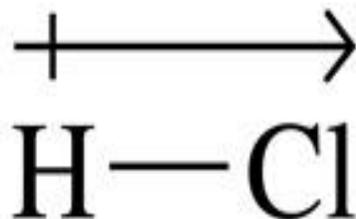




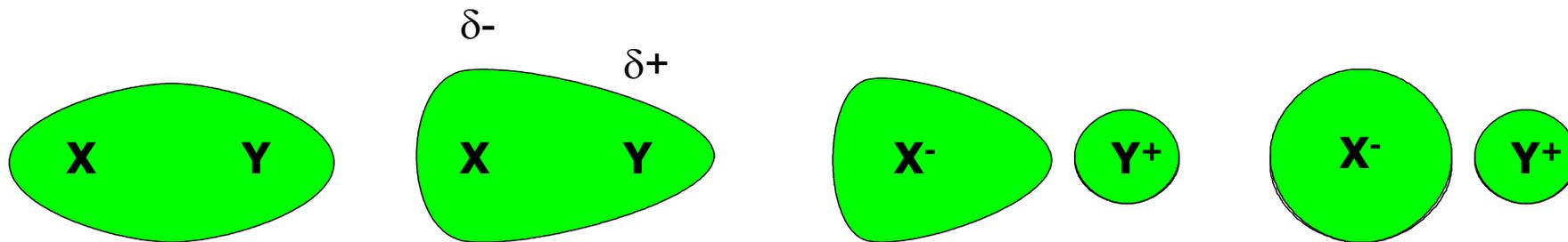
HCl polar bond showing the unequal sharing of a cloud of electron density.



HCl polar bond showing the partial (δ^+) change on hydrogen and the partial (δ^-) change on chlorine.



HCl polar bond showing the direction of the dipole with an arrow pointing toward the more negative atom. The + on the opposite end also reminds us which atom is more positive.



Pure covalent

Polar covalent
Electrons not
equally shared

Polar ionic
Distorted ions

Pure ionic

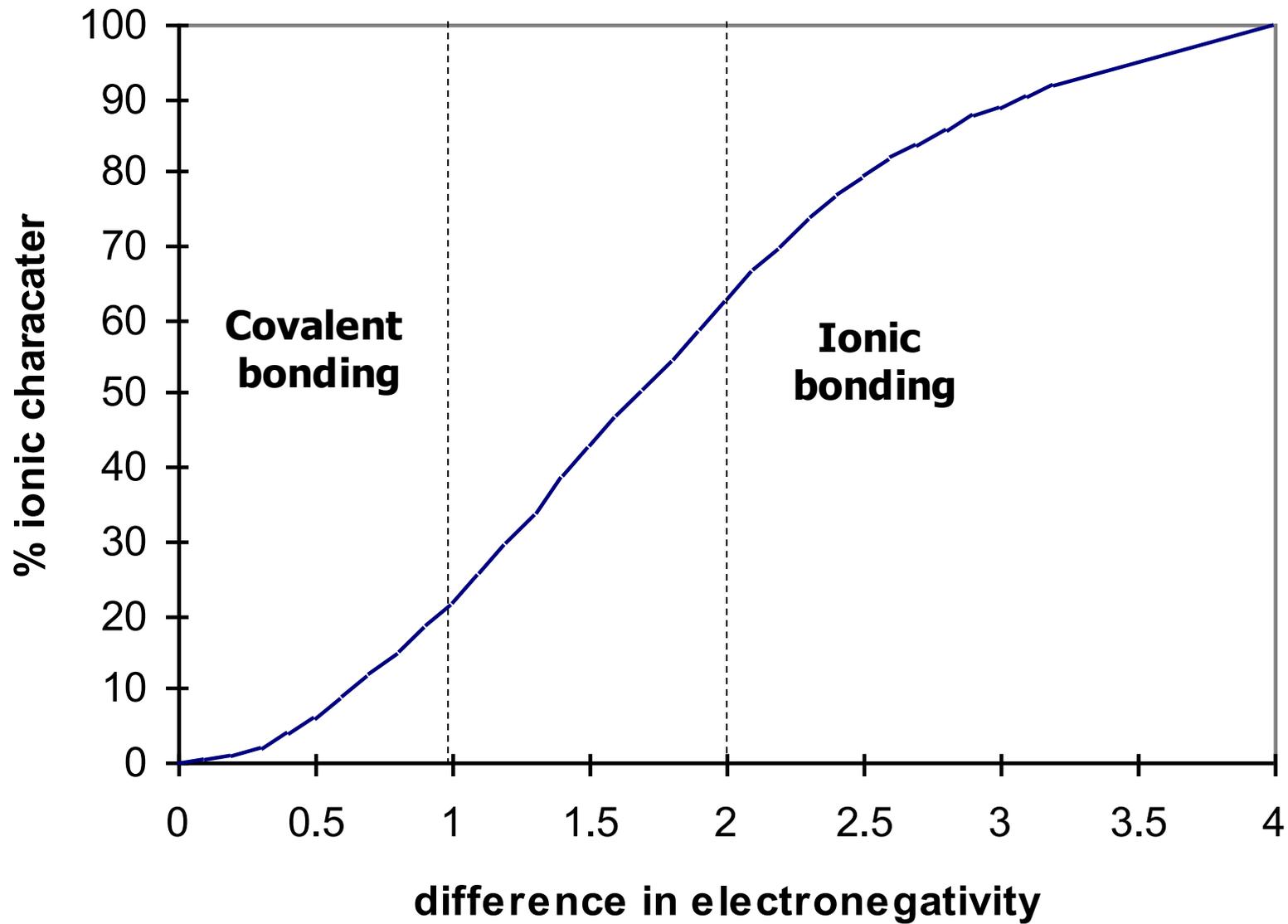


Polarisation of covalent bonds



Polarisation of ions

Favoured by small,
highly charged +ve
ions, e.g. Li⁺, Be²⁺



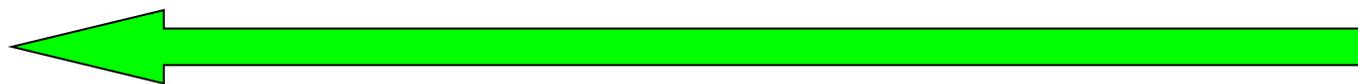
	NaCl	MgCl ₂	AlCl ₃	SiCl ₄
Mpt	801°C	714°C	190°C	-70°C
Structure	Ionic	Polar ionic	Polar covalent	Covalent



Difference in electronegativity decreases

+ve ion gets smaller and more highly charged, so -ve polarised more

	BeCl ₂	MgCl ₂	CaCl ₂	SrCl ₂	BaCl ₂
Mpt	401°C	714°C	782°C	870°C	963°C
Structure	Polar covalent	Ionic	Ionic	Ionic	Ionic

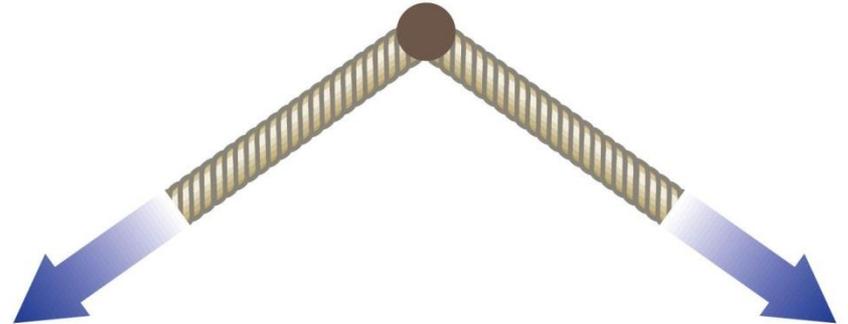
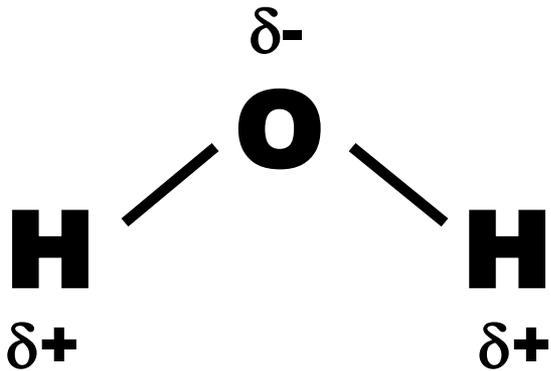


Difference in electronegativity decreases

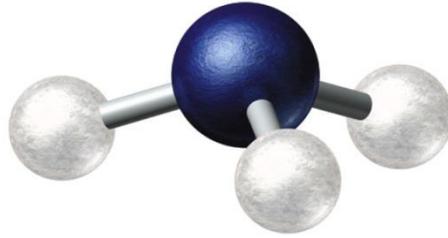
+ve ion gets smaller and more highly charged, so -ve polarised more



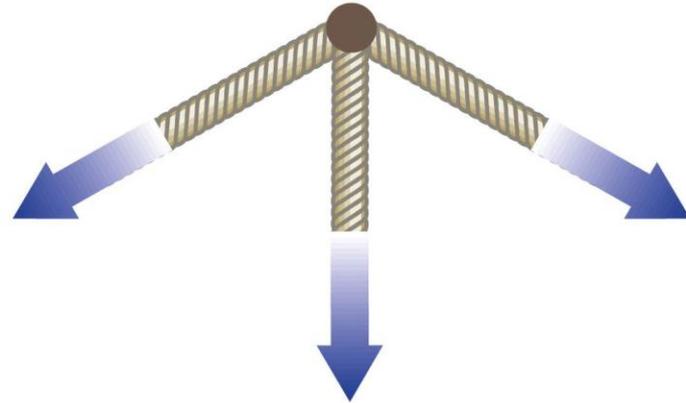
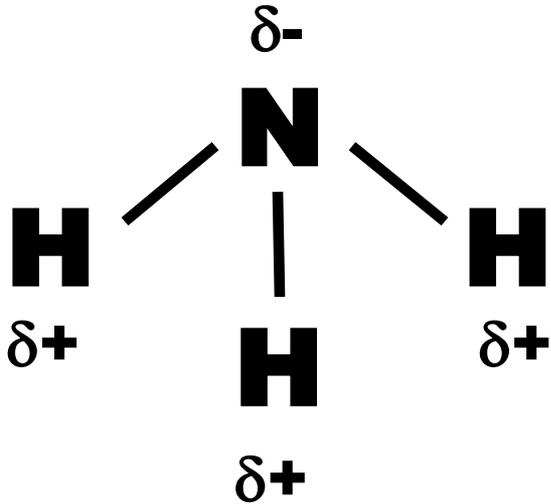
Bent structure



Bonds: polar
Molecule: polar

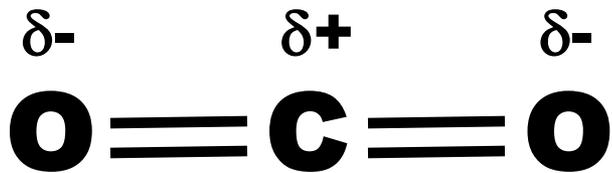
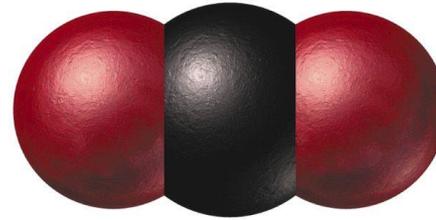


Pyramidal structure



Bonds: polar

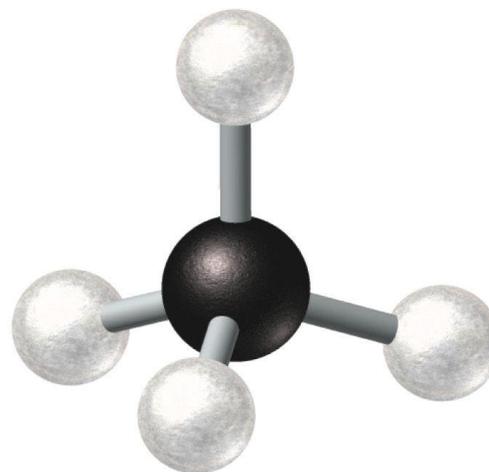
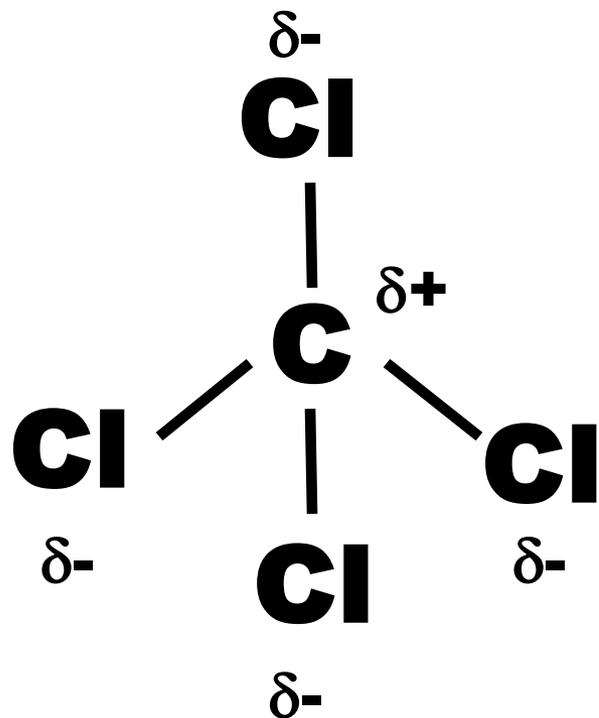
Molecule: polar



Bonds: polar

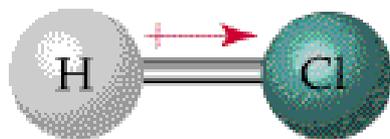
Molecule: non-polar

CCl₄

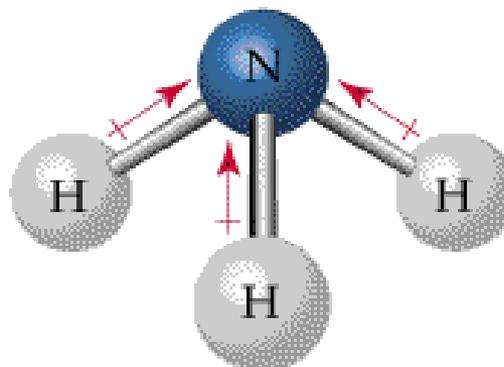


Bonds: polar

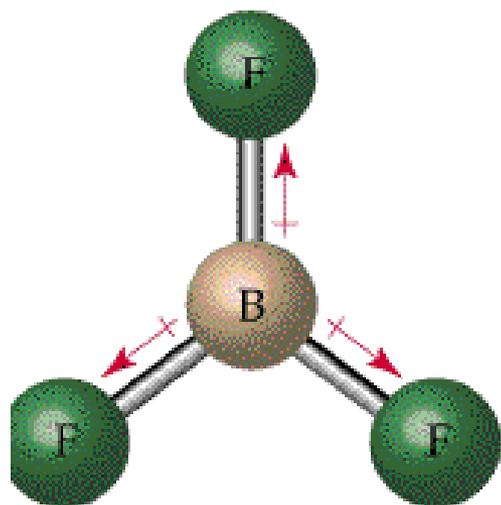
Molecule: non-polar



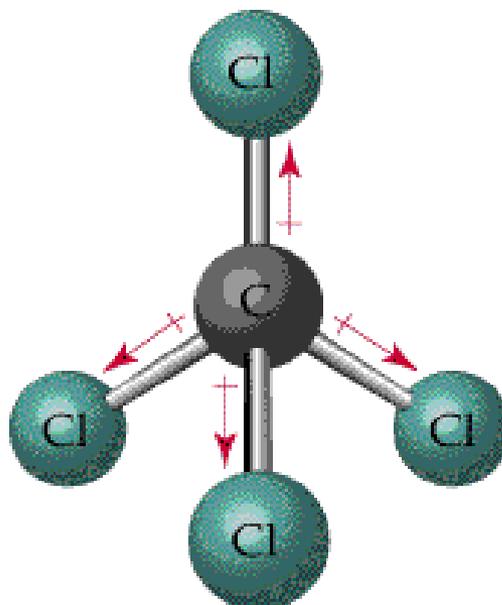
Polar



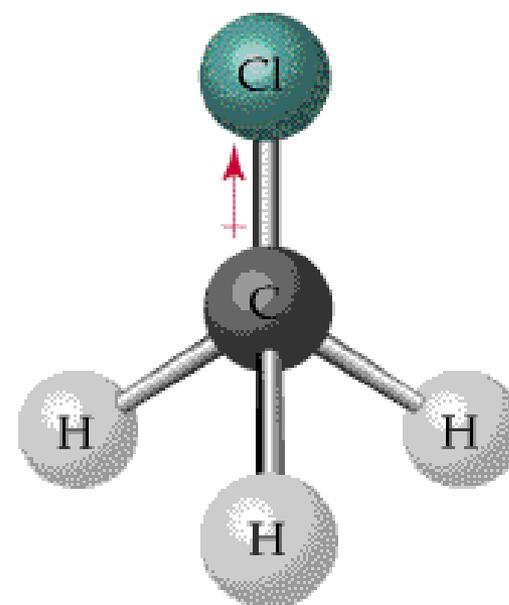
Polar



Nonpolar



Nonpolar



Polar