Chemistry 2.4
Structural, bonding and Thermodynamics

Electronegativity,
Polarity of bond and
Polarity of molecules

Electronegativity

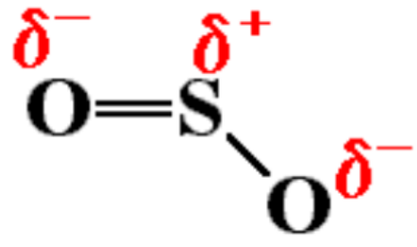
- Electronegativity is the ability of an atom to attract electrons in a chemical bond.
- The higher the electronegativity, the stronger the attraction.
- Electronegativity increases from left to right across the periodic table.
- Electronegativity decreases down the periodic table.
- Noble gas (group 18) does not usually form chemical bonds therefore electronegativity does not apply.
- Fluorine has the highest electronegativity

Polarity of bonds

- If a chemical bond is formed between two atoms with different electronegativity
- Then an uneven distribution of electrons between the two atoms will occur.
- The atom with a higher electronegativity slightly negative $\delta -$
- The atom with a lower electronegativity slightly positive $\delta +$

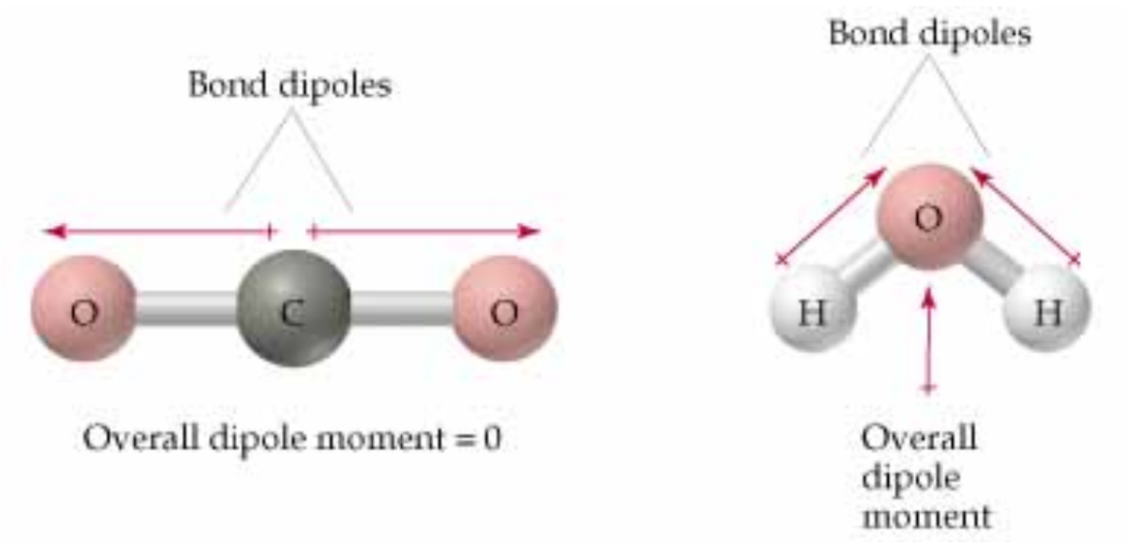
Example

- Sulfur dioxide SO_2
- Sulfur is below oxygen in the periodic table
- This mean oxygen has a higher electronegativity than sulfur
- Therefore the bond between sulfur and oxygen, sulfur would be slightly positive $\delta+$ and oxygen would be slightly negativity $\delta-$.



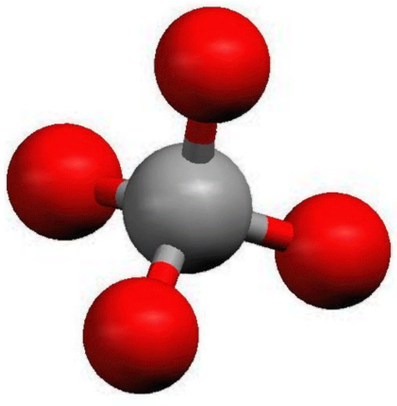
Dipole moment

- Dipole moment is the effect of polarity in a chemical bond
- However, a molecule is only polar when there is an overall dipole moment
- This means the dipole of each bond is not cancelled out

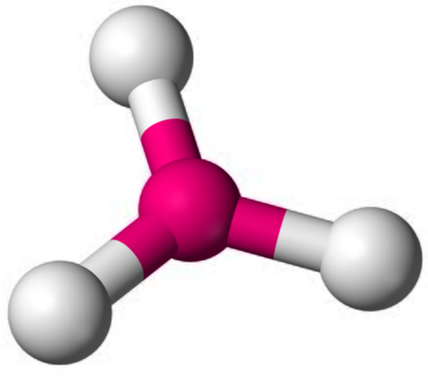


Molecular symmetry

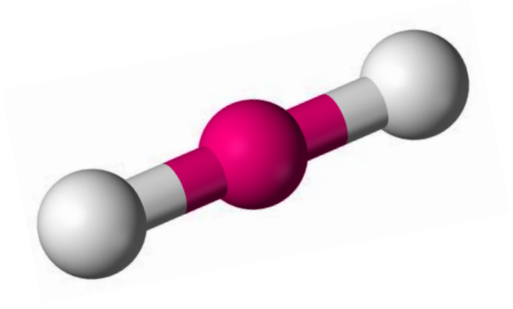
- Molecular symmetry is linked to the shape of the molecule.
- The molecule can only be symmetrical when all the outer atoms are the same
- The dipole moment will be cancelled out if the molecule is symmetrical
- The shapes below are symmetrical



Tetrahedrals

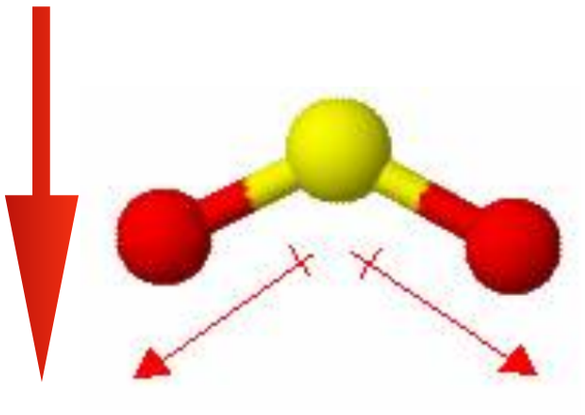


Trigonal Planar



Linear

Example



- Sulfur dioxide contains a polar bond
- The shape "Bent" is not symmetrical
- This results in an overall dipole moment
- As a result, the molecule is polar

Try these

- Carbon dioxide CO_2
- Sulfur trioxide SO_3
- Hydrogen sulfide H_2S