

7.10

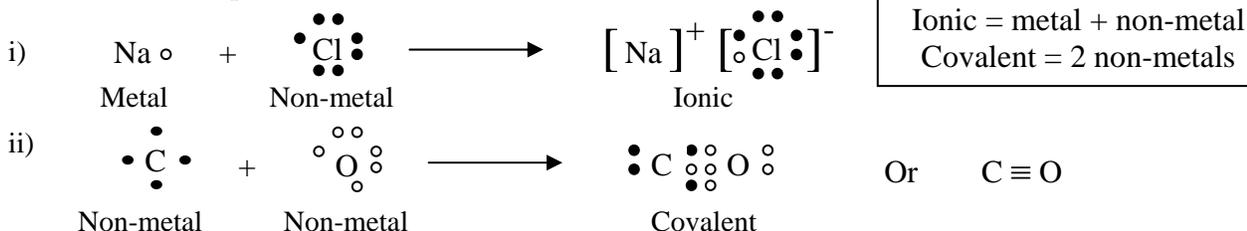
How does HCl differ from Cl ₂ with respect to the sharing of electrons?	In Cl ₂ there is an equal sharing of electrons between the two Cl atoms. In HCl, Cl has a greater pull on the electrons.
What happens in a molecule due to differences in the pull on electrons (give term and symbol)?	Partial charges result. A partial charge is represented by a lowercase delta (i.e. δ), where a positive partial charge is δ^+ and a negative partial charge is δ^- .
What name is given to a bond that has partial charges?	It is known as a polar bond (because it has + and - poles). The bond is also said to be a dipole (di meaning two).
How is a dipole represented graphically?	$\overset{+}{\times} \rightarrow$, where the arrow points to δ^- , and the cross on the arrow is at the positive pole (as a mnemonic, remember that the cross resembles a +).
What term is used to describe the relative attraction of an atom for the electrons in a bond?	Electronegativity.
What is the electronegativity table? Why is it useful?	A periodic table, where each element is assigned a numeric value for electronegativity. It is useful because it allows the determination of <i>the difference in electronegativity</i> , which in turn reveals the nature of a bond.
Upon what are electronegativity values based?	ENC, IE, EA, atomic radius.
What group is not included in the electronegativity (EN) table? Why?	Noble gases are not involved in chemical reactions (except in rare, and carefully controlled conditions). Thus, it does not make sense to assign them electronegativity values.
Give the EN values for H, C, N, O, F, Cl.	H- 2.1, C- 2.5, N- 3.1, O- 3.5, F- 4.1, Cl- 2.9. (notice the pattern of jumping from .1 to .5 when H, C, N, O, and F are listed in order).
What are the min. and max. values for EN?	0.9 - 4.1
In the compound XY, X has the higher EN number. Will X have a positive, negative, or zero δ .	X will have a δ^- since it attracts electrons with greater force.
What does the concept of EN tell us about the different types of bonds.	There is no sharp dividing line between covalent and ionic bonds. Instead we speak of % ionic or % covalent character.
A bond is 30% ionic character, what % covalent is it?	70%. (i.e. % ionic character + % covalent character = 100 %)
What EN difference will make a bond have 1) 0%, 2) 50%, and 3) 100% ionic character?	1) an EN difference of 0 (e.g. Cl ₂), 2) a difference of 1.7, 3) a bond cannot achieve 100% ionic character but at 2.5 - 3.2 it is about 90-95% ionic.
What are the general trends for EN in the periodic table? What is this similar to?	It increases as you move up and to the right. This is similar to the trend in EA. This should not be surprising since as the affinity for electrons (EA) increases so should the attraction for electrons (EN).

7.11

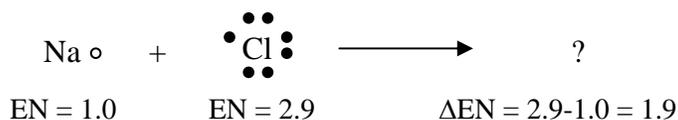
Why is the polarity of molecules important?	Because polarity affects physical properties such as melting and boiling point.
Why do polar molecules attract one another?	The positive dipole in one molecule attracts the negative dipole in another.
How can shape make a molecule with polar bonds, non-polar?	If a molecule is symmetrical and the pull on the central atom's electrons is the same from all directions, then the pulls cancel out leaving a non-polar molecule.
What is the polarity of CO ₂ and H ₂ O?	CO ₂ is non-polar. Despite a EN difference of 1.0 between C and O, CO ₂ is linear and therefore non-polar (fig 7.14). H ₂ O is polar. The EN difference between O and H is 1.4. Since the molecule is not linear the EN difference creates a polar molecule. (fig 7.17)

a) Predicting types of bonding: With the Octet Rule:

Atoms tend to complete their valence shells (8e-)

b) Predicting types of bonding: With Electronegativity (EN)

The EN chart allows us to predict the type of bond more precisely. The EN # is based on Atomic size, ENC, IE, EA
 The greater the EN #, the greater the pull of an atom on electrons. What bond type forms between Na and Cl?



See fig. 7.12 pg. 256: when $\Delta \text{EN} = 1.9$, the bond is about 70% ionic and 30% covalent:

