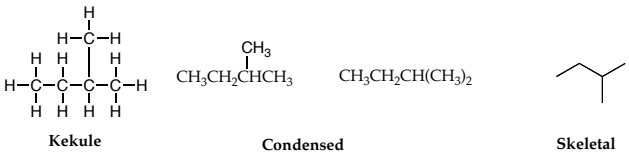
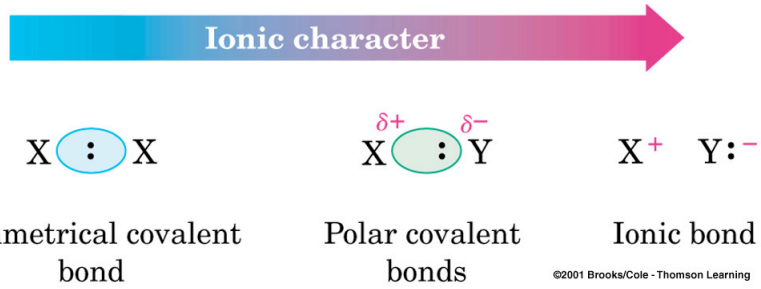
Writing (Drawing) Chemical Structures



Skeletal Notation

1. Carbon atoms are at the ends of lines and at the intersection of two lines
2. Hydrogens on carbon atoms are **not** shown.
3. All non-carbon and non-hydrogen atoms (heteroatoms) **are** shown.
4. Hydrogens on heteroatoms **are** shown
5. Formal Charges **are** shown

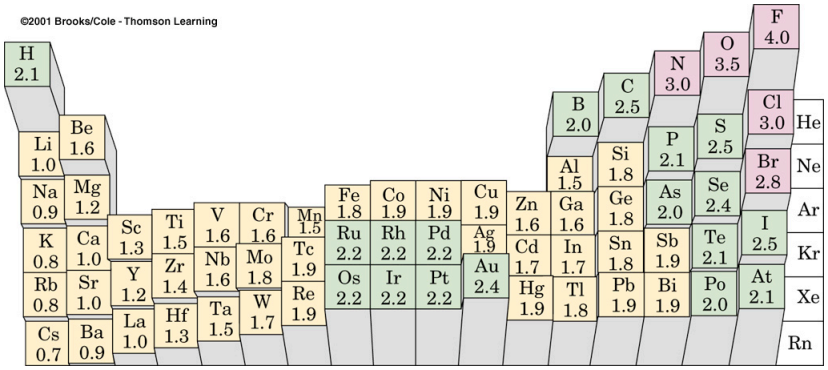
Chapter 2: Polar Covalent Bonds and Their Consequences



Polar Covalent Bonds: covalent bonds in which the electrons are not equally shared between the two atoms. ⇒ The is a net dipole.

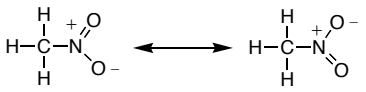
Electronegativity: intrinsic ability of an atom to attract electrons

Inductive Effect: atom's (or group of atoms) ability to polarize a bond through electronegativity differences

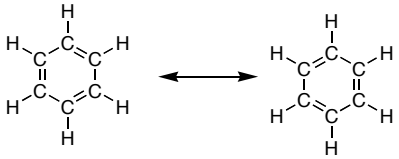


Electronegativity tends to decrease down a period, and increase across a row (from left to right

Resonance



nitromethane



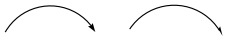
benzene

Which is the correct structure?

Curved Arrow Convention

1. Curved arrows show the movement (flow) of electron during bond breaking and/or bond making processes. The foot of the arrow indicates where the electron or electron pair originates, the head of the arrow shows where the electron or electron pair ends up. .

   A. The movement of a single electron is denoted by a curved single headed arrow (fishhook or hook).

   B. The movement of an electron pair is denoted by a curved double headed arrow.

2. If an electron pair moves in on a new atom, another electron pair must leave so that the atom does not exceed a full valance of eight electrons. There are two common exceptions:

   A. When an atom already has an incomplete valance (R_3C+).
   B. With second row (or below) elements the octet rule may be violated.

3. The arrows completely dictate the Lewis structure of the product.

Drawing and Interpreting Resonance Forms

1. No one resonance forms accurately depicts the structure of the molecule. The real structure is a composite or hybrid of all resonance forms

2. Resonance forms differ only by the placement of □- or non-bonding electrons. Neither the position or hybridization of the atoms changes.

3. Resonance forms are not necessarily equivalent. While all resonance forms contribute to the actual structure (resonance hybrid), some forms may contribute more.

4. All resonance forms must be proper Lewis structures.

5. The actual resonance hybrid is more stable than any single resonance form.

6. The greater the number of resonance forms, the more stable the resonance hybrid.

TABLE 2.3 Relative Strengths of Some Common Acids and Their Conjugate Bases

	Acid	Name	pK_a	Conjugate base	Name	
Weaker acid	CH_3CH_2OH	Ethanol	16.00	$CH_3CH_2O^-$	Ethoxide ion	Stronger base
	H_2O	Water	15.74	HO^-	Hydroxide ion	
	HCN	Hydrocyanic acid	9.31	CN^-	Cyanide ion	
	CH_3COOH	Acetic acid	4.76	CH_3COO^-	Acetate ion	
	HF	Hydrofluoric acid	3.45	F^-	Fluoride ion	
Stronger acid	HNO_3	Nitric acid	−1.3	NO_3^-	Nitrate ion	Weaker base
	HCl	Hydrochloric acid	−7.0	Cl^-	Chloride ion	