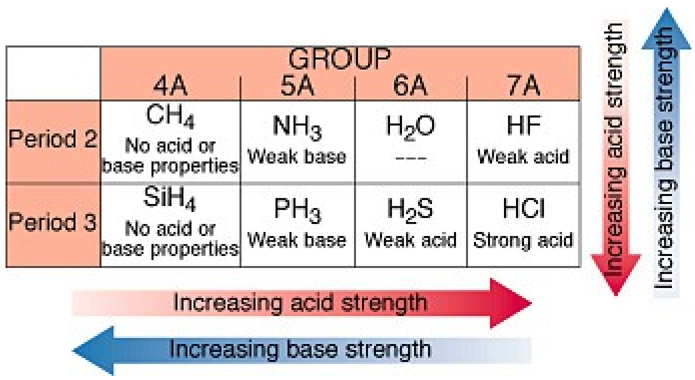
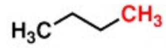
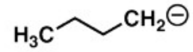
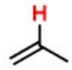
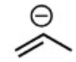
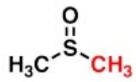
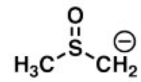
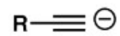
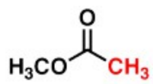
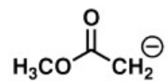
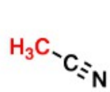
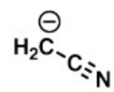
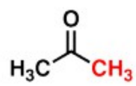
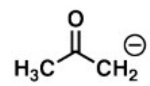
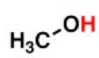
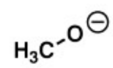
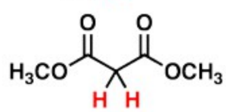
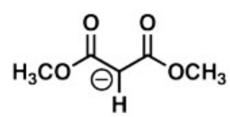
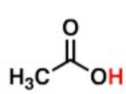
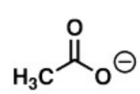
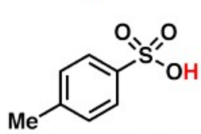
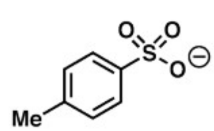
- Acid and base definitions
  - **Bronsted-lowry acid** is a proton (H+) donor
  - **Bronsted-lowry base** is a proton (H+) acceptor
  - **Lewis acid** is an electron acceptor
  - **Lewis base** is an electron donor
- Acid strength
  - MAJOR TIP: memorize pKa values as it will make ranking acids much easier. I put a terrific table on the very last page of this chapter: memorize the values.
  - General factors that determines acidity (most important to least important):
    - 1) Acidity of H-A increases left to right across a row and down the periodic table (**polar and polarizeable**). The opposite trend applies to base strength.



    - 2) Acidity of H-A increases if the conjugate base can resonate
      - NOTE: if a ring, when deprotonated, becomes an aromatic ring, then acidity greatly increases.
    - 3) Acidity of H-A increases with the presence of electronegative atoms in A (**inductive stabilization**)
      - NOTE: distance matters! When an electronegative atom is closer to the proton, the effect is stronger and acidity increases.
    - 4) Acidity of H-A increases as the % s character of the conjugate base increases ($sp > sp^2 > sp^3$).
  - NOTE: <u>intramolecular</u> H-bonding decreases acidity as the hydrogens are less likely to be deprotonated.
- Basicity of amines and aromatics
  - Alkyl amines are more basic than NH_3 because of electron donating R-groups.
  - Alkyl amines are more basic than aryl amines.
  - Electron donating groups (refer to EAS chapter) increase basicity/decrease acidity on aryl amines.
  - Electron withdrawing groups (refer to EAS chapter) decrease basicity/increase acidity on aryl amines.
  - In heterocylic aromatic compounds, if the heteroatom's (nitrogen, oxygen, etc.) electrons do not contribute to aromaticity, then it is more basic.
  - Higher % s character ($sp > sp^2 > sp^3$) of the orbital containing the lone pair, the less basic/more acidic the compound is.
- Determining K_{eq}
  - $K_{eq} = 10^{pKa\ conjugate\ acid\ -\ pKa\ acid}$

Functional group	Example	pKa	Conjugate Base
Alkane		~50	
Alkene		~43	
Hydrogen	H–H	36	H^{-}
Amine	NH_3	~35	NH_2^{-}
Sulfoxide		31	
Alkyne		25	
Ester		25	
Nitrile		25	
Ketone/ aldehyde		20-24	
Alcohol		17	
Water	HO–H	16	HO^{-}
Malonates		13	
Thiols	CH_3S–H	13	CH_3S^{-}
Protonated amines	NH_4^{+} Cl^{-}	9-11	NH_3
Carboxylic acids		4	
Hydrofluoric acid	H–F	3.2	F^{-}
Sulfonic acids	 (tosic acid)	–1	
Hydronium ion	H_3O^{+}	–1.7	H_2O
Sulfuric acid	H_2SO_4	–3	HSO_4^{-}
Hydrochloric acid	HCl	–6	Cl^{-}
Hydrobromic acid	HBr	–9	Br^{-}
Hydroiodic acid	HI	–10	I^{-}