

Acids and Bases
Learning Objectives

As you study Acids & Bases, you should:

1) be able to apply all the concepts you learned previously to acids & bases (e.g. resonance, electronegativity, etc.)
2) be able to recognize when a compound can act as
   A) a Lewis acid
   B) a Lewis base
   C) a Brønsted-Lowry acid
   D) a Brønsted-Lowry base
3) be able to spot the most acidic proton in a molecule (and be able to explain why it is the most acidic proton using words and pictures)
4) be able to spot the most basic part of a molecule (and be able to explain why it is the most basic using words and pictures)
5) be able to decide whether a molecule is more acidic or basic than another (and be able to explain why it is so using words and pictures)
6) be able to predict the products of any acid-base reaction
7) be able to determine the favored direction of equilibrium in any acid-base reaction
8) be able to determine the general strength of any base given its conjugate acid (and vice versa)
9) be able to determine the charge of a molecule at any given p*H* based on the pK_a values of its acidic groups.
10) be able to determine the ratio of the acidic:basic form of a molecule at any given p*H*.
11) be able to predict the p*H* necessary to give predominantly one form of an acid-base pair.
12) be able to draw the mechanism of any acid-base reaction
13) know the relative acidities of certain acidic functional groups (from the list we generated on the board in class).

Quantitative Treatment of Acids and Bases (Gen. Chem. Review)

The equations below (you should recognize them from general chemistry) are often used in describing acids:

$$K_a = \frac{[H_3O^+][A^-]}{[HA]} \qquad (1)$$

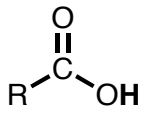
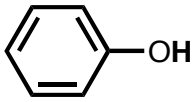
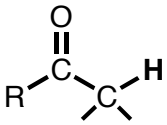
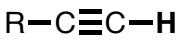
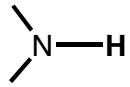
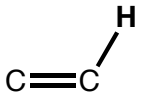
$$pK_a = -\log K_a \qquad (2)$$

$$pH = -\log[H_3O^+] \qquad (3)$$

$$pH = pK_a + \log\frac{[A^-]}{[HA]} \qquad (4)$$

There will be many times in your studies of organic chemistry where it will be useful to know how acidic a compound is. The following table is far from being inclusive, but it is a good starting point for knowing the acidity of some sommonly encountered classes of molecules.

Relative acidities & pK_a values of common classes of compounds

Functional Group	Example	pK_a
Carboxylic acid		**5**
Phenol		**10**
Water	H_2O	**15.7**
Alcohol	ROH	**16-19**
α-proton of a carbonyl		**19-21**
Terminal alkyne		**25**
Amine		**35**
Alkene		**40**
Alkane	R–H	**>50**

***More will be added as your studies progress.**