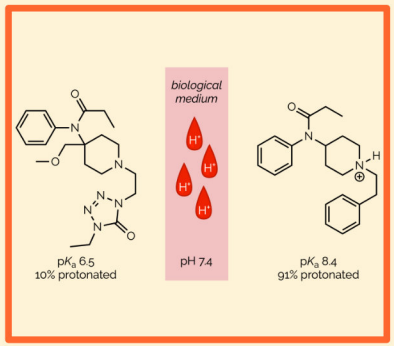
HIGHLIGHTS

- The acid-base reaction & the position of the equilibrium given by K_a or pK_a.
- The measure of hydronium [H_3O^+] concentration & the pH scale.
- What makes a strong acid & base.
- Predicting which side of a reaction is favored.
- A mini pK_a table.



Proton transfer is one of the most important reactions there is. It is a fundamental process at the heart of many enzyme catalyzed reactions. Without it there is no life. It is also a key learning tool. The reaction itself is simple, it is the transfer of a proton from one molecule, the ***acid***, to another, the ***base***, but what it can teach us about stability and reactivity can be applied to many other organic transformations.

The strength of an acid can be quantified, and chemists use the pK_a of a compound to communicate both acid & base strengths. The acidity of an aqueous solution is given by the pH scale. Using pK_a & pH in conjunction allows a chemist to determine if a compound is protonated or deprotonated. A subsequent summary will show you how we can predict the relative acidity of various compounds from structural features & that this will match the quantitive values found here.

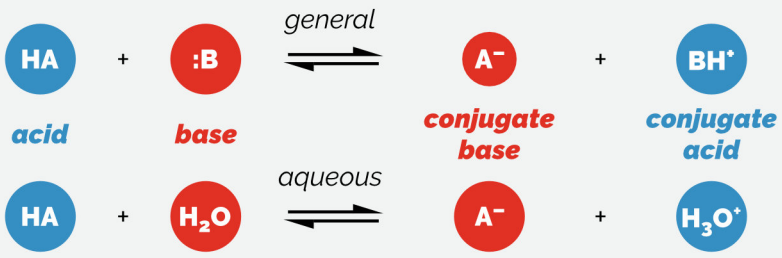
CHEMISTRY CLASSICS

ACIDS AND BASES

pK_a AND pH

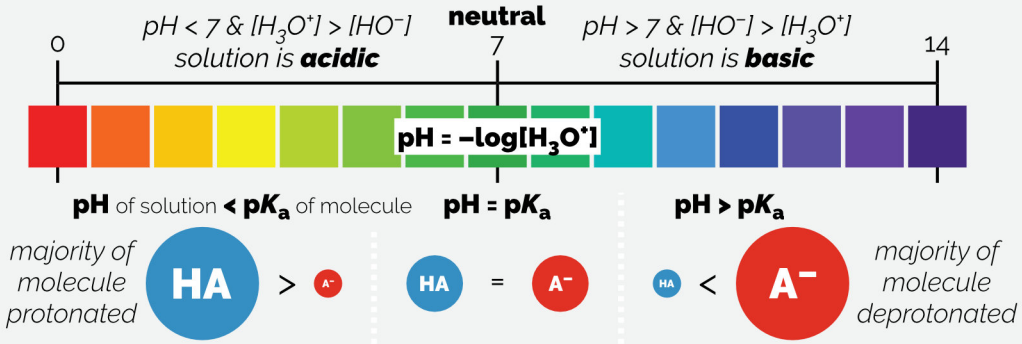
Acids & Bases

1. Acid & Base Reaction

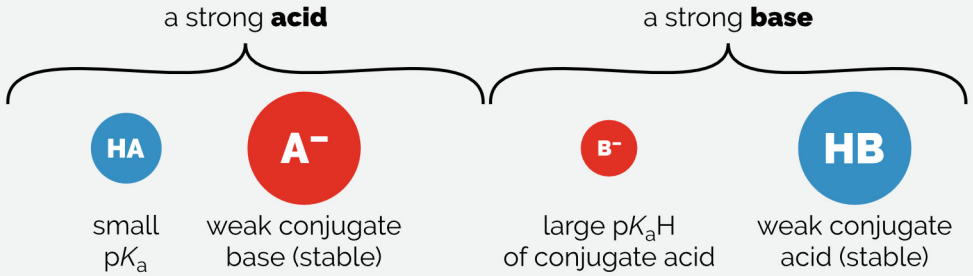


$$K_a = \frac{[A^-][H_3O^+]}{[HA]} \qquad pK_a = -\log K_a \qquad K_a = 10^{-pKa}$$

2. The pH Scale

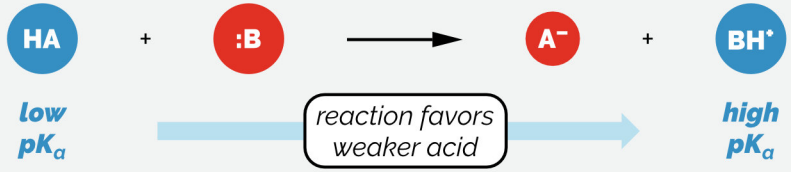


3. Strong Acids & Bases



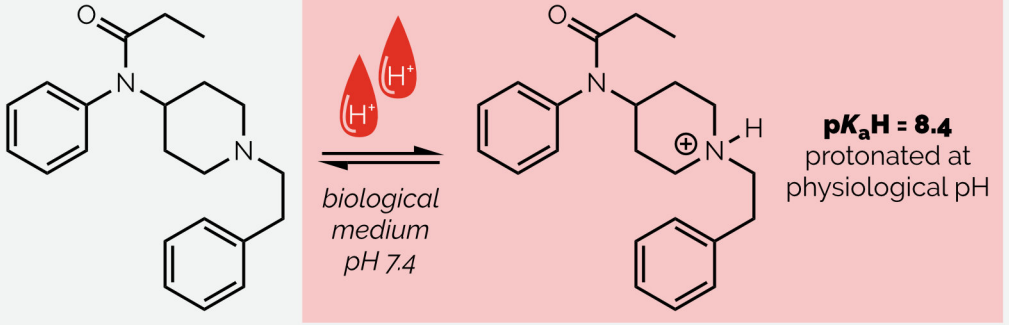
A strong acid **HA** has a small (negative) pK_a, while weak acids have high pK_a.
A strong base **B⁻** has a weak conjugate acid **BH**, which will have with a large pK_aH.

4. Direction of the Reaction



Reactions proceed downhill, giving ***more stable***, ***less reactive*** products. A ***strong acid*** (small pK_a) transfers a proton to a base with ***a weaker conjugate acid*** (higher pK_aH). Reactions favor the side with the ***weaker acid*** (higher pK_a) or ***weaker base.***

5. pK_a in Action



pH of solution is lower than pK_aH of conjugate acid so molecule will be protonated.

6. A Brief pK_a Scale (with values rounded & from multiple sources)