Announcements

To join clicker to class today (Clickers with LCD display joins automatically):

- Turn on the Clicker (the red LED comes on).
- Push “Join” button followed by “20” followed by the “Send” button (switches to flashing green LED if successful).

- Now hiring students to prep for general chemistry next Fall. See Ms. Hauer in HS-449

- Last exam is one week from today. Review material is going up and should be complete by tomorrow sometime.

pH, pOH, pK_w

- $H_2O \rightleftharpoons H^+ + OH^-$
  - K_w (25 ˚C)= $[H^+][OH^-] = 1.0 \times 10^{-14}$
  - in pure water $[H^+] = [OH^-] = x$
    - $x^2 = 1.0 \times 10^{-14}$
    - $x = 1.0 \times 10^{-7} = [H^+] = [OH^-]$
- $pK_w = -\log(1.0 \times 10^{-14}) = 14.00$
  - $pk_w = -\log[H^+][OH^-] = -\log[H^+] + -\log[OH^-]$

  $= pH + pOH = 14.00$

Acid/Base "Strength"

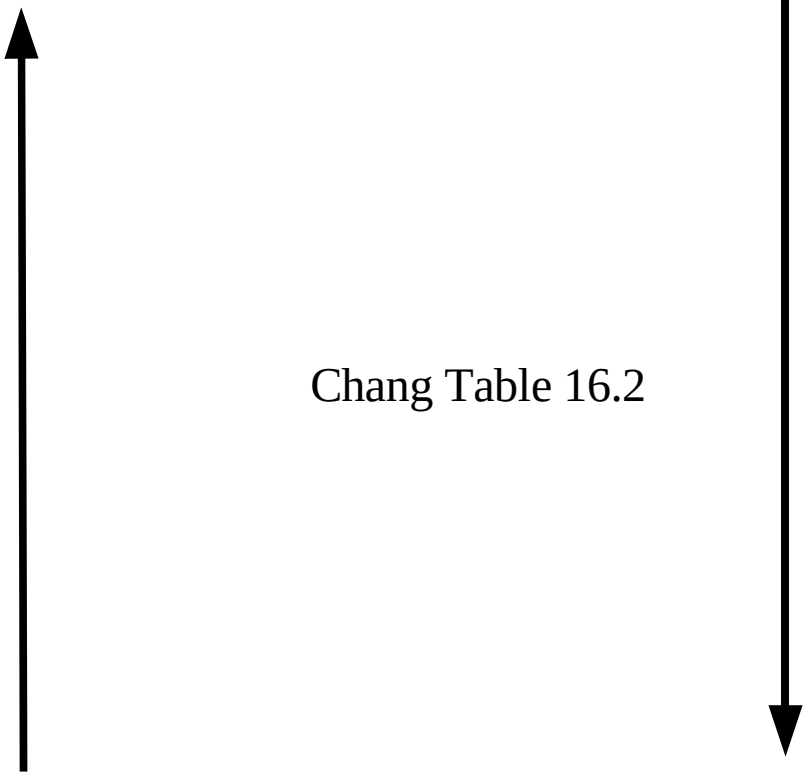
- "Strong" are strong electrolytes (100% dissociated)

$HCl(aq) \longrightarrow H^+(aq) + Cl^-(aq)$

Know (HI, HBr, HCl, HNO_3 and H_2SO_4)

- "Weak" do not dissociate completely (establish equilibrium)

$HF(aq) \rightleftharpoons H^+(aq) + F^-(aq)$



Chang Table 16.2

Acid Base Equilibria

	$HA \rightleftharpoons$	$H^+ + A^-$	
init	$[HA]_i$	0	0
Δ	-x	+x	+x
eq	$[HA]_i$ -x	+x	+x

$K_a = x^2/([HA]_i - x) \approx x^2/[HA]_i$ (if K_a small)

solve for x and check that $x/[HA]_i < 0.05$. If not, approximation is not valid.

Buffers

- Buffer = a solution that resists a change in its pH when either an acid or base is added.
- Buffers consist of a weak acid + the salt of its conjugate base. (alternately weak base + salt of its conjugate acid)
- Can calculate pH using standard equilibrium calculations.
- Buffering capacity ≈ the molarity of the acid and its conjugate base.
- If [salt] and [acid] reasonably high easier to use Henderson-Hasselbach: $pH = pK_a + \log([base]/[acid])$

Making a Buffer

- Pick acid with $pK_a \approx$ pH you want.
- Solve $pH \approx pK_a + \log([A^-]/[HA])$ for ratio of $[A^-]/[HA]$.
- Mix conjugate base salt and acid in proper ratio.

Acid	Ka	pKa
HF	3.5×10^{-5}	3.45
CH_3COOH	1.8×10^{-5}	4.75
HBrO	2.0×10^{-9}	8.69
NH_4^+	4.9×10^{-10}	9.25