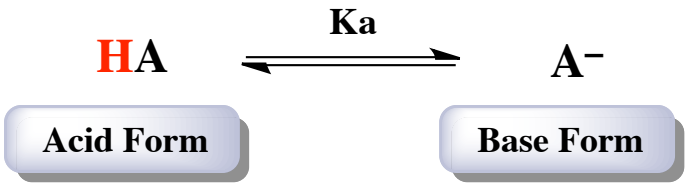
CONCEPT: MONOPROTIC & DIPROTIC BUFFERS

A diprotic buffer can be approached in a way similar to monoprotic buffers. The key difference is that a diprotic acid has 2 pKa values.

For Monoprotic Buffers

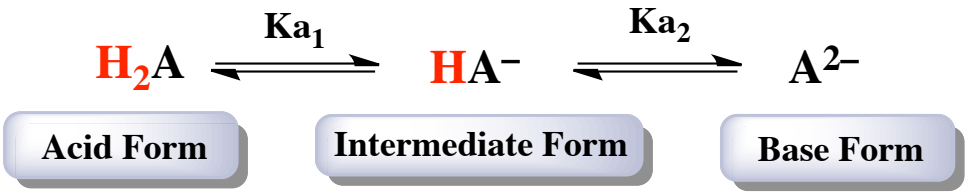


HClO + **NaClO (aq)**

Weak oxyacid — **Conjugate base** (Has 1 less Hydrogen)

$$pH = pKa + \log \frac{(\text{conjugate base})}{(\text{weak acid})}$$

For Diprotic Buffers



$$pH = pKa_1 + \log\left(\frac{HA^-}{H_2A}\right)$$

$$pH = pKa_2 + \log\left(\frac{A^{2-}}{HA^-}\right)$$

$0.20\ M\ H_2SO_3$ & $0.25\ M\ NaHSO_3$ $\quad Ka_1 = 1.6 \times 10^{-2}$

$30.0\ mL$ of $0.10\ M\ Na_2SO_3$ $\quad Ka_2 = 6.4 \times 10^{-8}$

$20.0\ mL$ of $0.20\ M\ NaHSO_3$

PRACTICE: MONOPROTIC & DIPROTIC BUFFERS CALCULATIONS 1

EXAMPLE 1: What is the pH of a solution consisting of 2.5 M potassium dihydrogen phosphite (KH_2PO_3) and 2.75 M phosphorus acid (H_3PO_3)? $K_{a1} = 3.0 \times 10^{-2}$ and $K_{a2} = 1.66 \times 10^{-7}$.

EXAMPLE 2: Sulfurous acid, H_2SO_3, is a major component in the creation of commercial fertilizers. What is the buffer component concentration ratio of a buffer that has a pH of 1.15? $K_{a1} = 1.39 \times 10^{-2}$ and $K_{a2} = 6.73 \times 10^{-8}$.

PRACTICE: Calculate the pH of a solution made by mixing 8.627 g of sodium butanoate in enough 0.452 M butanoic acid, $HC_4H_7O_2$, to make 250.0 mL of solution. $K_a = 1.5 \times 10^{-5}$.