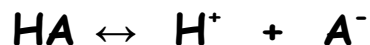


AP Chemistry Daily Videos

8.9 Henderson-Hasselbalch Equation

Video #1

1. Identify the following in the reaction below: weak acid and conjugate base.



2. What is the purpose of using the Henderson-Hasselbalch Equation?

3. Complete the table:

$\text{pH} = \text{pK}_a + \log \frac{[\text{A}^-]}{[\text{HA}]}$		
Concentrations	Is Log 0, neg, or positive?	What is the relationship of pH to pKa?
[HA]=[A-]		
[A-]>[HA]		
[A-]<[HA]		

4. Evaluate your work

The table to the right shows the values of K_a for four weak acids. Which of the following pairs of chemical species, when combined in equimolar amounts, results in a buffer with a pH closest to 7.5?

- A HNO_2 and OH^-
- B $\text{HC}_3\text{H}_5\text{O}_2$ and $\text{C}_3\text{H}_5\text{O}_2^-$
- C HClO and ClO^-
- D $\text{C}_6\text{H}_5\text{OH}$ and $\text{C}_6\text{H}_5\text{O}^-$

Acid	Structure	K _a
HNO_2		4.0×10^{-4}
$\text{HC}_3\text{H}_5\text{O}_2$		1.3×10^{-5}
HClO		3.0×10^{-8}
HOC_6H_5		1.6×10^{-10}

5. Evaluate your work

Answer the following questions that relate to the chemistry of halogen oxoacids.

(c) A 1.2 M NaOCl solution is prepared by dissolving solid NaOCl in distilled water at 298 K. The hydrolysis reaction $\text{OCl}^-(aq) + \text{H}_2\text{O}(l) \rightleftharpoons \text{HOCl}(aq) + \text{OH}^-(aq)$ occurs.

- Write the equilibrium-constant expression for the hydrolysis reaction that occurs between $\text{OCl}^-(aq)$ and $\text{H}_2\text{O}(l)$.
- Calculate the value of the equilibrium constant at 298 K for the hydrolysis reaction.
- Calculate the value of $[\text{OH}^-]$ in the 1.2 M NaOCl solution at 298 K.

Acid	K_a at 298 K
HOCl	2.9×10^{-8}
HOBr	2.4×10^{-9}

(d) A buffer solution is prepared by dissolving some solid NaOCl in a solution of HOCl at 298 K. The pH of the buffer solution is determined to be 6.48.

- Calculate the value of $[\text{H}_3\text{O}^+]$ in the buffer solution.
- Indicate which of $\text{HOCl}(aq)$ or $\text{OCl}^-(aq)$ is present at the higher concentration in the buffer solution. Support your answer with a calculation.