

During Class Invention #

Name(s) with Lab section in Group

Acids, Bases and pH

1a. Based on the lecture demonstration, complete the following table.

Solution	pH	Equilibrium $[H^+]$ or $[OH^-]$
0.100 M HCl	1	$[H^+] = 1 \times 10^{-1} \text{ M}$
0.100 M H_2SO_4	0.9	$[H^+] = 1.25 \times 10^{-1} \text{ M}$
0.100 M $HC_2H_3O_2$	2.87	$[H^+] = 1.33 \times 10^{-3} \text{ M}$
0.100 M NaOH	13	$[H^+] = 1 \times 10^{-13} \text{ M}$
0.100 M NH_3	11.1	$[H^+] = 7.56 \times 10^{-12} \text{ M}$

b. How does the measured concentration of the H^+ compare to the concentration of HCl?

The $[H^+]$ is equal to the $[HCl]$.

c. Briefly describe the qualitative relationship between the concentration of a strong acid and its pH.

Strong acids completely dissociate in aqueous solution. Therefore, the $[H^+]$ equals the concentration of the acid formed. The pH of a solution of an acid is $-\log[H^+]$, or, for strong acids, $-\log[\text{acid}]$.

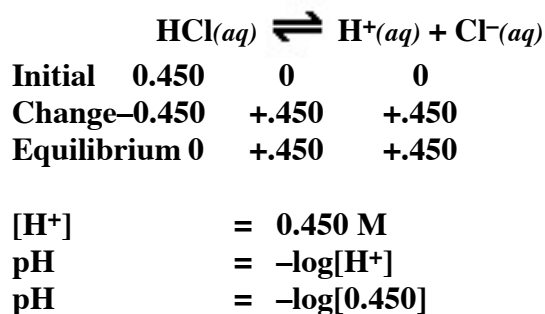
d. How does the measured concentration of the OH^- compare to the concentration of NaOH?

The $[OH^-]$ equals the $[NaOH]$.

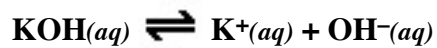
e. Briefly describe the qualitative relationship between the concentration of a strong base and its pH.

Strong bases completely dissociate in aqueous solution. Therefore, the $[OH^-]$ equals the concentration of the base formed. The pH of a solution of a base is $14 - (-\log[OH^-])$, or, for strong bases, $14 - (-\log[\text{base}])$.

f. Calculate the pH of a 0.450 M HCl solution.



g. Calculate the pH of a 0.710 M KOH solution.



Initial	0.710	0	0
Change	-0.710	+0.710	+0.710
Equilibrium	0	+0.710	+0.710

$$[\text{OH}^-] = 0.710 \text{ M}$$

$$K_w = [\text{H}^+][\text{OH}^-]$$

$$1.0 \times 10^{-14} = [\text{H}^+](0.710)$$

$$\frac{1.0 \times 10^{-14}}{0.710} = [\text{H}^+] = 1.41 \times 10^{-14} \text{ M}$$

$$\text{pH} = -\log[\text{H}^+]$$

$$\text{pH} = -\log[1.41 \times 10^{-14}] = 13.85$$