During Class Invention #

Name(s) with Lab section in Group

Acids, Bases and pH

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

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

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

$$\mathbf{HCl}_{(aq)} \rightleftharpoons \mathbf{H^+}_{(aq)} + \mathbf{Cl^-}_{(aq)}$$

Initial	**0.450**	**0**	**0**
Change	**–0.450**	**+.450**	**+.450**
Equilibrium	**0**	**+.450**	**+.450**

$[H^+]$ = 0.450 M

pH = –log$[H^+]$

pH = –log[0.450]

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

$$\mathbf{KOH}_{(aq)} \rightleftharpoons \mathbf{K^+}_{(aq)} + \mathbf{OH^-}_{(aq)}$$

Initial	**0.710**	**0**	**0**
Change	**–0.710**	**+.710**	**+.710**
Equilibrium	**0**	**+.710**	**+.710**

$[OH^-] = 0.710$ M

$K_w = [H^+][OH^-]$

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

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

$pH = -\log[H^+]$

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