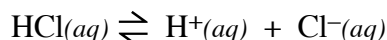


During Class Invention #

Name(s) with Lab section in Group

Strong Acids and the Equilibrium  
Constant

1. The chemical equation which describes how HCl dissociates in aqueous solution is,



- a. In the demonstration performed earlier, the initial concentration of HCl is 0.100 M. In the space provided below (ICE Table), enter the initial concentration of HCl, H<sup>+</sup> and Cl<sup>-</sup>. Based on the measured pH of this solution, calculate and enter the equilibrium concentration of H<sup>+</sup>.

	$\text{HCl}(aq)$	$\rightleftharpoons$	$\text{H}^+(aq)$	+	$\text{Cl}^-(aq)$
Initial Concentrations	0.100 M		~ 0 M		0 M
Change	-0.1 M		+0.1 M		+0.1 M
Equilibrium Concentrations	0 M		+0.1 M		+0.1 M

- b. Calculate the change in [H<sup>+</sup>].

**The [H<sup>+</sup>], based on the measured pH, is 0.1 M. Actually, the initial [H<sup>+</sup>]<sub>0</sub> is 1 x 10<sup>-7</sup> M. But, for our purposes, we can assume the initial [H<sup>+</sup>] is 0 M. So the change in [H<sup>+</sup>] is 0.100 M.**

- c. Using the balanced chemical equation and the calculated change in [H<sup>+</sup>], calculate the change in HCl and Cl<sup>-</sup>.

**Since the stoichiometry in the balanced chemical equation is 1 : 1, the change in the [HCl] must be equal to change in [H<sup>+</sup>]. Therefore,  
 $\Delta[\text{H}^+] = -\Delta[\text{HCl}]$  and  $\Delta[\text{H}^+] = \Delta[\text{Cl}^-] = 0.100 \text{ M}$**

- d. Calculate the equilibrium concentration of HCl and Cl<sup>-</sup>.

$$\begin{aligned}[\text{HCl}]_{\text{eq}} &= [\text{HCl}]_0 - \Delta[\text{HCl}] = 0.100 \text{ M} - 0.100 \text{ M} = \sim 0 \text{ M} \\ [\text{Cl}^-]_{\text{eq}} &= [\text{Cl}^-]_0 + \Delta[\text{Cl}^-] = 0 \text{ M} + 0.100 \text{ M} = 0.100 \text{ M}\end{aligned}$$

- e. Estimate the equilibrium constant for the dissociation of HCl(aq).

$$K_a = \frac{[\text{H}^+][\text{Cl}^-]}{[\text{HCl}]} = \frac{0.1 \text{ M} \cdot 0.1 \text{ M}}{\sim 0 \text{ M}} = \text{very large number}$$

**The value is approximately 1 x 10<sup>12</sup>.**