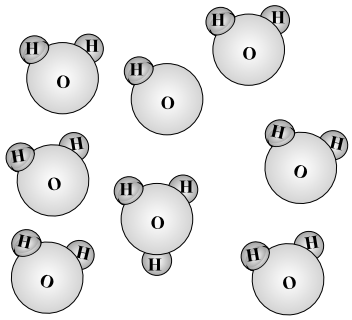
Acids and Bases in Water

Acids are polar molecules that contain hydrogen as a metal. When they are added to water, they ionize to produce hydronium ions. In pure water, only about 1 in every 555,555,555 particles is a hydronium ion [10^{-7} *M*]. Addition of acid to water causes the amount of hydronium in the water to increase. Bases are ionic compounds that contain hydroxide as a nonmetal. When they are added to water, they dissociate to release hydroxide ions. In pure water, only about 1 in every 555,555,555 particles is a hydroxide ion [10^{-7} *M*]. Addition of base to water causes the amount of hydroxide in the water to increase. Whenever the hydronium ion concentration in water increases, the excess hydronium reacts with hydroxide in water to form more water and reduce the amount of hydroxide present. This is what happens when acids are added to water. Whenever the hydroxide ion concentration in water increases, the excess hydroxide reacts with hydronium in water to form more water and reduce the amount of hydronium present. This is what happens when bases are added to water.



Pure water ionizes to form equal amounts of hydronium and hydroxide

Answer the questions below based on the reading and on your knowledge of chemistry.

1. Complete the following equation showing the ionization of water: $2H_2O \rightarrow$ _____

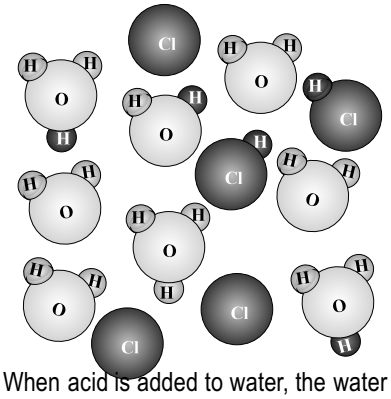
   _____

2. Complete the following equation showing the ionization of hydrochloric acid in water:

   $H_2O + HCl \rightarrow$ _____

3. Complete the following equation showing the dissociation of sodium hydroxide in water:

   $H_2O + NaOH \rightarrow$ _____



When acid is added to water, the water molecules pick up hydrogen to form hydronium. Some of the extra hydronium reacts with hydroxide ions to form water.

4. What happens to the hydroxide ion concentration in water when an acid is added? Why?

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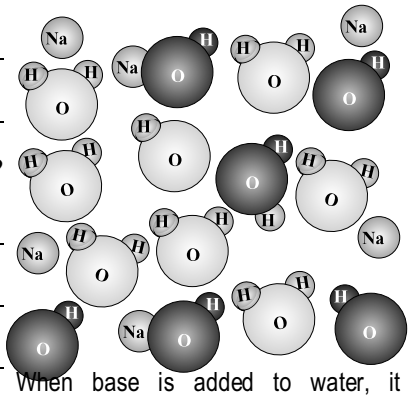
   _____

   _____



When base is added to water, it releases hydroxide ions, some of which combine with hydronium to form water

5. What happens to the hydronium ion concentration in water when a base is added? Why?

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   _____

6. Acids and bases are often considered opposites. Why? _____

   _____

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