

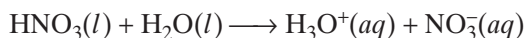
Arrhenius Acids and Bases

Svante Arrhenius, a Swedish chemist who lived from 1859 to 1927, understood that aqueous solutions of acids and bases conducted electric current. Arrhenius therefore theorized that acids and bases must produce ions in solution. An **Arrhenius acid** is a chemical compound that increases the concentration of hydrogen ions, H^+ , in aqueous solution. In other words, an acid will ionize in solution, increasing the number of hydrogen ions present. An **Arrhenius base** is a substance that increases the concentration of hydroxide ions, OH^- , in aqueous solution. Some bases are ionic hydroxides. These bases dissociate in solution to release hydroxide ions into the solution. Other bases are substances that react with water to remove a hydrogen ion, leaving hydroxide ions in the solution.

Aqueous Solutions of Acids

The acids described by Arrhenius are molecular compounds with ionizable hydrogen atoms. Their water solutions are known as *aqueous acids*. All aqueous acids are electrolytes.

Because acid molecules are sufficiently polar, water molecules attract one or more of their hydrogen ions. Negatively charged anions are left behind. As explained in Chapter 13, the hydrogen ion in aqueous solution is best represented as H_3O^+ , the hydronium ion. The ionization of an HNO_3 molecule is shown by the following equation. **Figure 6** also shows how the hydronium ion forms when nitric acid reacts with water.



Similarly, ionization of a hydrogen chloride molecule in hydrochloric acid can be represented in the following way.

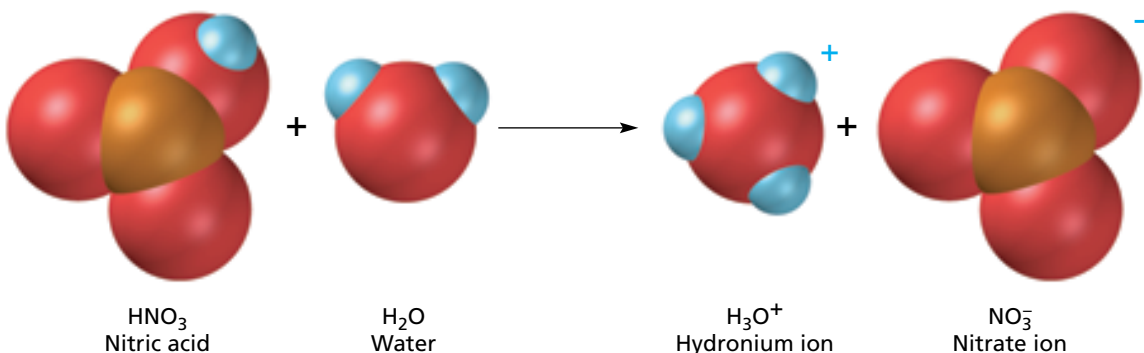
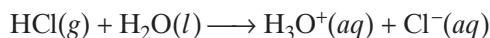


FIGURE 6 Arrhenius's observations form the basis of a definition of acids. Arrhenius acids, such as the nitric acid shown here, produce hydronium ions in aqueous solution.