FIGURE 9 Hydrogen chloride gas escapes from a hydrochloric acid solution and combines with ammonia gas that has escaped from an aqueous ammonia solution. The resulting cloud is solid ammonium chloride that is dispersed in air.

A **Brønsted-Lowry base** *is a molecule or ion that is a proton acceptor.* In the reaction between hydrochloric acid and ammonia, ammonia accepts a proton from the hydrochloric acid. It is a Brønsted-Lowry base. The Arrhenius hydroxide bases, such as NaOH, are not, strictly speaking, Brønsted-Lowry bases. Instead, it is the OH^- ion produced in solution that is the Brønsted-Lowry base. It is the species that can accept a proton.

In a **Brønsted-Lowry acid-base reaction,** *protons are transferred from one reactant (the acid) to another (the base).* **Figure 9** shows the reaction between the Brønsted-Lowry acid HCl and the Brønsted-Lowry base NH_3.

Monoprotic and Polyprotic Acids

An acid that can donate only one proton (hydrogen ion) per molecule is known as a **monoprotic acid.** Perchloric acid, $HClO_4$, hydrochloric acid, HCl, and nitric acid, HNO_3, are all monoprotic. The following equation shows how a molecule of the monoprotic acid HCl donates a proton to a water molecule. The HCl ionizes to form H_3O^+ ions and Cl^- ions. The Cl^- has no hydrogens to lose, so HCl has only one ionization step.

$$HCl(g) + H_2O(l) \longrightarrow H_3O^+(aq) + Cl^-(aq)$$

A **polyprotic acid** *is an acid that can donate more than one proton per molecule.* Sulfuric acid, H_2SO_4, and phosphoric acid, H_3PO_4, are examples of polyprotic acids. The ionization of a polyprotic acid occurs in stages. The acid loses its hydrogen ions one at a time. Sulfuric acid