is such an electrolyte. A 0.1 M CH_3COOH solution is only about 1.3% ionized to produce hydronium ions and acetate ions, CH_3COO^-. The ionic equilibrium is shown by the following equation.

$$CH_3COOH(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + CH_3COO^-(aq)$$

Small additions of sodium acetate, $NaCH_3COO$ (an ionic salt that is completely dissociated in water), to a solution containing acetic acid increase the acetate ion concentration. The equilibrium then shifts in the direction that uses up some of the acetate ions in accordance with Le Châtelier's principle. More molecules of acetic acid are formed, and the concentration of hydronium ions is reduced. In general, the addition of a salt with an ion common to the solution of a weak electrolyte reduces the ionization of the electrolyte. **Figure 7** shows a 0.25 M CH_3COOH solution on the left that has a pH of about 2.7. Mixing that with the 0.10 M $NaCH_3COO$ solution in the center produces the solution on the right, which has a pH of about 4.5, indicating lower $[H_3O^+]$ and thus lowered acetic acid ionization.

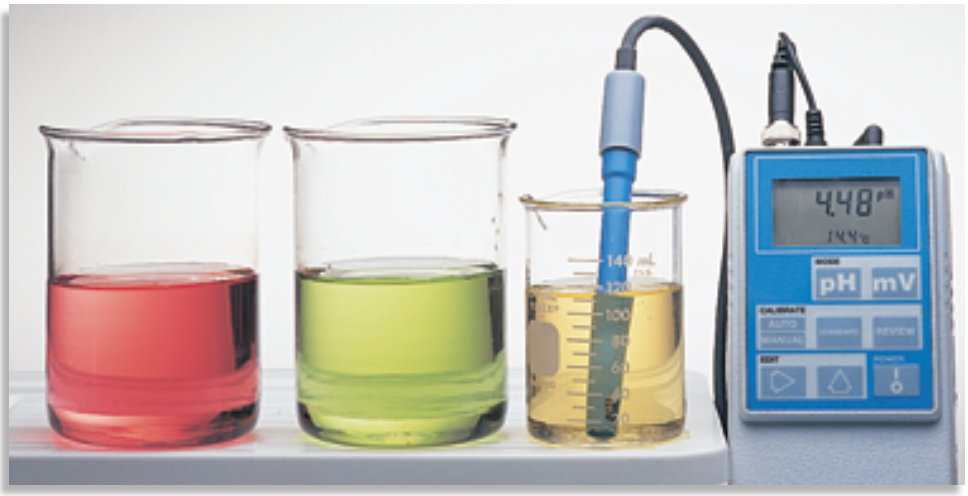

FIGURE 7 The solution of CH_3COOH on the left is combined with the solution of $NaCH_3COO$ in the center. Both contain the common ion, CH_3COO^-. They produce the solution on the right, which is only slightly acidic due to the decreased ionization of the acid. The colors of the solutions are due to the addition of an acid-base indicator.

SECTION REVIEW

1. Name three ways the chemical equilibrium can be disturbed.
2. Describe three situations in which ionic reactions go to completion.
3. Describe the common-ion effect.
4. Identify the common ion in each of the following situations.
   - **a.** 5 g of NaCl is added to a 2.0 M solution of HCl
   - **b.** 50 mL of 1.0 M $NaCH_3COO$ is added to 1.0 M CH_3COOH
   - **c.** 10 pellets of NaOH are added to 100 mL of water
5. Predict the effect that decreasing pressure would have on each of the following reaction systems at equilibrium.
   - **a.** $H_2(g) + Cl_2(g) \rightleftharpoons 2HCl(g)$
   - **b.** $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$
   - **c.** $2H_2O_2(aq) \rightleftharpoons 2H_2O(l) + O_2(g)$
   - **d.** $3O_2(g) \rightleftharpoons 2O_3(g)$

Critical Thinking

6. **PREDICTING OUTCOMES** Carbon dioxide and water react to form bicarbonate ion and hydronium ion. Hyperventilation (rapid breathing) causes more carbon dioxide to be exhaled than normal. How will hyperventilation affect the pH of blood? Explain.