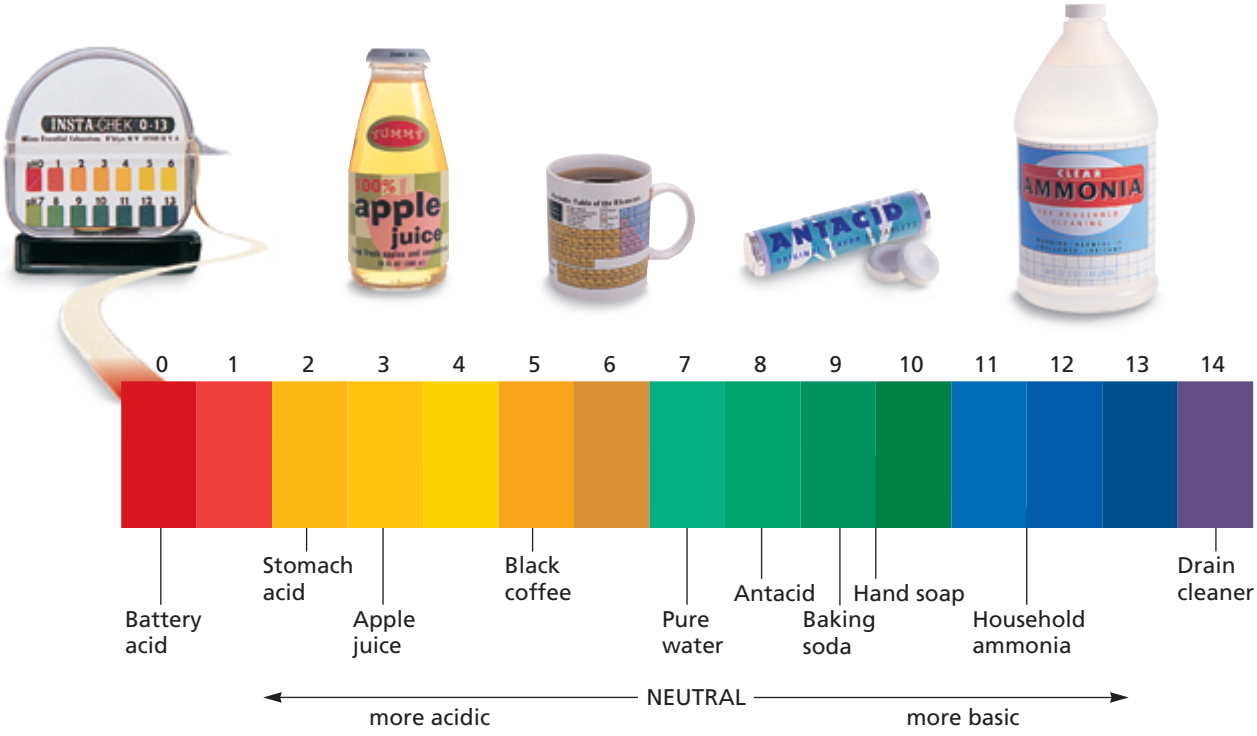

FIGURE 5 The pH of a solution can be determined by comparing the color it turns pH paper with the scale of the paper. The colors of pH paper at various pH values are shown, as are the pH values for some common materials.

Indicators come in many different colors. The exact pH range over which an indicator changes color also varies. *The pH range over which an indicator changes color is called its* **transition interval. Table 6** gives the color changes and transition intervals for a number of common acid-base indicators.

Indicators that change color at pH lower than 7, such as methyl orange, are simply stronger acids than the other types of indicators. They tend to ionize more than the others. The In^- anions that these indicators produce are weaker Brønsted bases and have less tendency to accept protons from any acid being tested. These indicators therefore do not shift to their nonionized (H*In*) form unless the concentration of H^+ is fairly high. The color transition of these indicators occurs at rather low pH. In contrast, indicators that undergo transition in the higher pH range, such as phenolphthalein, are weaker acids.

Universal indicators are made by mixing several different indicators. Paper soaked in universal indicator solution is called pH paper. This paper can turn almost any color of the rainbow and provides a fairly accurate way of distinguishing the pH of solutions, as shown in **Figure 5.**

If a more precise value for the pH of a solution is needed, a pH meter, shown in **Figure 6,** should be used. *A* **pH meter** *determines the pH of a solution by measuring the voltage between the two electrodes that are placed in the solution.* The voltage changes as the hydronium ion concentration in the solution changes.

FIGURE 6 A pH meter precisely measures the pH of a solution.