The parameter pH is equal to the negative of the logarithm (base 10) of the concentration of hydrogen ions:

$$pH = -\log_{10}[H^+]$$

**NOTATION AND UNITS OF CONCENTRATION**

The notation for concentration is square brackets [ ], e.g., the concentration of sodium chloride (NaCl) is shown as [NaCl]. The units of concentration are moles per liter (moles/l).

Therefore, for water at equilibrium conditions, with the concentration of the hydrogen ion of $1 \times 10^{-7}$ gram equivalents per liter, the pH would be 7. Compounds that have hydrogen atoms form acids, and compounds that have hydroxide atoms form alkalis or bases when dissolved in water. pH measurements are not linear, meaning that a solution with a pH of 5 is ten times as acidic as a solution with a pH of 6. Similarly, a solution with a pH of 11 is ten times as alkaline as a solution with a pH of 10.

**pH PROBES ARE DELICATE!**

- The pH probe on a bench-top meter must be stored in a pH buffer; choose a buffer pH (4, 7, 10) near the pH of the typical sample.
- The average probe life is 6–12 months.
- Use a dedicated probe to measure high-purity samples like demineralized water or condensate.
- ALWAYS cool the sample prior to measuring pH.
- *NEVER store a pH probe in demineralized water and NEVER let it dry out!*

**Carbonate hardness** describes the concentration of all calcium, magnesium, barium, and strontium ions that partner with carbonate ions: $CaCO_3$, $MgCO_3$, $BaCO_3$, and $SrCO_3$. Water treatment specialists sometimes describe carbonate hardness as "**temporary hardness**" because raising the water past the boiling point converts the bicarbonate ions to carbonate ions and lowers the solubility of calcium carbonate.

**WHICH WORDS?**

Mole—Measurement of a unit of mass based on the number of molecules; 1 mole = $6 \times 10^{23}$ molecules

Logarithm—A mathematical relationship that describes exponents in a specific manner, e.g., $\log_{10}(10^4) = 4$

Carbonate hardness = Temporary hardness = Alkaline hardness

Dissolution—The process of dissolving a solid into a liquid