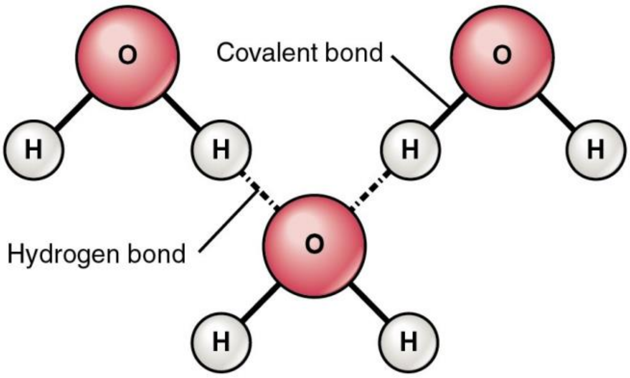

SUMMARY : *Ionization of Water, Weak Acids, and Weak Bases*

■ Pure water ionizes slightly, forming equal numbers of hydrogen ions (hydronium ions, $H3O^+$) and hydroxide ions. The extent of ionization is described by an equilibrium constant, $K_{eq} = \frac{[H^+][OH^-]}{[H_2O]}$, from which the ion product of water, Kw, is derived. At 25 °C, Kw = $[H^+][OH^-]$ = (55.5 M)(Keq) = 10^{-14} M^2.

■ The pH of an aqueous solution reflects, on a logarithmic scale, the concentration of hydrogen ions:

$$pH = \log \frac{1}{[H^+]} = -\log [H^+]$$

■ The greater the acidity of a solution, the lower its pH. Weak acids partially ionize to release a hydrogen ion, thus lowering the pH of the aqueous solution. Weak bases accept a hydrogen ion, increasing the pH.

The extent of these processes is characteristic of each particular weak acid or base and is expressed as an acid dissociation constant:

$$K_{eq} = \frac{[H^+][A^-]}{[HA]} = K_a.$$

■ The pKa expresses, on a logarithmic scale, the relative strength of a weak acid or base:

$$pK_a = \log \frac{1}{K_a} = -\log K_a.$$