

TABLE 1-1

EQUILIBRIUM CONSTANT FOR THE DISSOCIATION OF ACETIC ACID (All concentrations moles per liter)

Acetic acid in water:

Analytical concentration*	[HAc]	[Ac ⁻]	[H ⁺]	K _a
1.00×10^{-5}	2.9×10^{-6}	7.1×10^{-6}	7.1×10^{-6}	1.74×10^{-5}
1.00×10^{-4}	6.6×10^{-5}	3.4×10^{-5}	3.4×10^{-5}	1.75×10^{-5}
1.00×10^{-3}	8.73×10^{-4}	1.27×10^{-4}	1.27×10^{-4}	1.85×10^{-5}
1.00×10^{-2}	9.65×10^{-3}	4.5×10^{-4}	4.5×10^{-4}	2.10×10^{-5}

Acetic acid-sodium acetate mixtures (total concentration 1.00×10^{-3}):

[HAc]	[Ac ⁻]	[H ⁺]	K _a
9.0×10^{-4}	1.0×10^{-4}	1.7×10^{-4}	1.89×10^{-5}
7.0×10^{-4}	3.0×10^{-4}	4.4×10^{-5}	1.89×10^{-5}
5.0×10^{-4}	5.0×10^{-4}	1.8×10^{-5}	1.80×10^{-5}
4.0×10^{-4}	6.0×10^{-4}	1.3×10^{-5}	1.95×10^{-5}

Acetic acid-hydrochloric acid mixtures (total concentration 1.00×10^{-3}):

[HAc]	[Ac ⁻]	[H ⁺]	K _a
9.0×10^{-4}	1.7×10^{-4}	1.0×10^{-4}	1.89×10^{-5}
7.0×10^{-4}	4.4×10^{-5}	3.0×10^{-4}	1.89×10^{-5}
5.0×10^{-4}	1.8×10^{-5}	5.0×10^{-4}	1.80×10^{-5}
3.0×10^{-4}	8.0×10^{-6}	7.0×10^{-4}	1.86×10^{-5}
1.0×10^{-4}	2.0×10^{-6}	9.0×10^{-4}	1.80×10^{-5}

Note: Direct measurement of all the concentrations is not experimentally feasible. In practice the hydrogen ion concentration is measured potentiometrically, and the concentrations of the other ions are calculated from the known amounts of material put in. These data were adapted from the experimental results of Harned and Murphy, *J. Am. Chem. Soc.* **53**, 8 (1931), but have been greatly simplified. See Section 2-2.

* The analytical concentration is the total number of moles of a substance dissolved in a liter of solution. In 10^{-4} molar acetic acid, the analytical concentration C_{HA} of acetic acid is 1.00×10^{-4} mole/liter, whereas the actual concentration [HAc] is only 0.67×10^{-4} mole/liter, the rest being present as acetate and hydrogen ions. See Fig. 1-1.