Thus, Equations 12-6 and 12-7 must be used.

\[
[\text{HA}] = 3.214 \times 10^{-2} - [\text{H}_3\text{O}^+] + [\text{OH}^-] \\
[\text{A}^-] = 1.130 \times 10^{-2} + [\text{H}_2\text{O}^+] - [\text{OH}^-]
\]

Certainly, [OH\(^-\)] will be negligible since the solution is acidic.

Substituting into the dissociation-constant expression gives

\[
\frac{[\text{H}_3\text{O}^+](1.130 \times 10^{-2} + [\text{H}_2\text{O}^+])}{3.214 \times 10^{-2} - [\text{H}_3\text{O}^+]} = 1.06 \times 10^{-5}
\]

Rearranging gives

\[
[\text{H}_3\text{O}^+]^2 + 1.236 \times 10^{-2}[\text{H}_3\text{O}^+] - 3.407 \times 10^{-5} = 0
\]

\[
[\text{H}_3\text{O}^+] = 2.321 \times 10^{-3} \quad \text{and} \quad \text{pH} = 2.63
\]

(d) Here, Equation 12-10 gives \([\text{H}_3\text{P}^+] = 4.3 \times 10^{-2}\), which is clearly not \(< < c_{\text{HA}} \) or \(c_{\text{NaA}}\) and we must proceed as in part (c).

This leads to

\[
\frac{[\text{H}_3\text{O}^+](0.100 + [\text{H}_3\text{O}^+])}{0.0100 - [\text{H}_3\text{O}^+]} = 4.3 \times 10^{-1}
\]

\[
[\text{H}_3\text{O}^+]^2 + 0.53[\text{H}_3\text{O}^+] - 4.3 \times 10^{-3} = 0
\]

\[
[\text{H}_3\text{O}^+] = 7.99 \times 10^{-3} \quad \text{and} \quad \text{pH} = 2.10
\]

12-38. In each of the parts of this problem, we are dealing with a weak base B and its conjugate acid BHCl or (BH)\(_2\)SO\(_4\). The pH-determining equilibrium can then be written as

\[
\text{BH}^+ + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{B}
\]

The equilibrium concentration of BH\(^+\) and B are given by Equations 12-6 and 12-7. That is,

\[
[\text{BH}^+] = c_{\text{BHCl}} + [\text{OH}^-] - [\text{H}_3\text{O}^+] \quad (1)
\]

\[
[B] = c_B - [\text{OH}^-] + [\text{H}_3\text{O}^+] \quad (2)
\]

In many cases [OH\(^-\)] and [H\(_3\)O\(^+\)] will be much smaller than \(c_B\) and \(c_{\text{BHCl}}\) and \([\text{BH}^+] = c_{\text{BHCl}}\) and \([B] = c_B\) so that

\[
[H_3O^+] = K_\alpha \times \frac{c_{\text{BHCl}}}{c_B} \quad (3)
\]