Summary: Calculating the pH of a Solution of a Weak

Monoprotic Acid, HA(aq), Given the Value of *K*a

**Step 1** List the major entities in solution.

**Step 2** Write balanced equations for all entities that may produce H+(aq).

**Step 3** Identify the dominant equilibrium, and write the equilibrium constant equation for the dominant equilibrium.

**Step 4** Use the coefficients in the balanced equation of the dominant equilibrium to determine the changes in initial concentrations that will occur as the dominant reaction proceeds to equilibrium. Record all values in an ICE table.

**Step 5** Substitute the equilibrium concentrations of all entities (from the “Equilibrium” line in the ICE table) into the acid ionization constant equation.

**Step 6** Assume that .

**Step 7** Solve for *x* (which, for a monoprotic acid, equals [H+(aq)]).

**Step 8** Use the 5% rule to validate any assumption made in Step 6.

**Step 9** Calculate pH from [H+(aq)] (the value of *x*).

Summary: Calculating the pH of a Solution of a

Weak Base, HB(aq), Given the Value of *K*b

**Step 1** List the major entities in solution.

**Step 2** Write balanced equations for all entities that may produce OH−(aq).

**Step 3** Identify the dominant equilibrium, and write the equilibrium constant equation for the dominant equilibrium.

**Step 4** Use the coefficients in the balanced equation of the dominant equilibrium to determine the changes in initial concentrations that will occur as the dominant reaction proceeds to equilibrium. Record all values in an ICE table.

**Step 5** Substitute the equilibrium concentrations of all entities (from the “Equilibrium” line in the ICE table) into the base ionization constant equation.

**Step 6** Assume that 

represents the concentration of the base before the ionization process begins.

**Step 7** Solve for *x* (which equals [OH−(aq)]).

**Step 8**  Use the 5% rule to validate assumptions made in Step 6.

**Step 9** Calculate pOH from [OH−(aq)] (the value of *x*).

**Step 10** Calculate the pH by substituting the value of pOH into the equation pH + pOH = 14.