Practice G1 **Working the pH Loop** Name________________________Per___

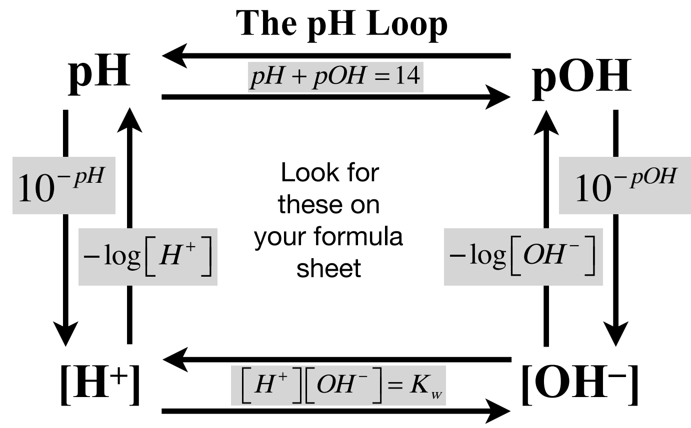
Assume all solutions are at 25ºC

1. Calculate the pH of a 0.035 M HBr solution.

2. Calculate the pH of a 0.25 M KOH solution.

3. Consider a solution with a pH of 9.45
   (a) What is the hydronium ion concentration?

   (b) What is the hydroxide ion concentration?



4. What is the pH of a solution made by dissolving 2.64 g of NaOH into a 250. ml solution?

5. Consider the neutralization reaction between a solution of NaOH and a solution of HCl.
   (a) Write the balanced net ionic equation.

   (b) What volume of 0.150 M NaOH would be required to completely neutralize 8.60 ml of 0.200 M HCl?

   (c) What is the $[H^+]$ after the reaction?

   (d) What is the $[Na^+]$ after the reaction?

6. Consider the neutralization reaction between $Sr(OH)_2$ and HCl.
   (a) Write the balanced overall equation.

   (b) What volume of 0.15 M $Sr(OH)_2$ would be required to completely neutralize 8.60 ml of 0.20 M HCl?

   (c) What is the $[Cl^-]$ after the reaction?

7. Consider a solution in which $[OH^-] = 0.0256$ M
   (a) Calculate the pOH and pH.

   (b) What is the hydronium ion concentration?

Practice G0 # Working the pH Loop

Assume all solutions are at 25ºC

1. Calculate the pH of a 0.035 M HBr solution.

pH = 1.46

$pH = -\log[H^+] \quad -\log[0.035] = 1.46$

2. Calculate the pH of a 0.25 M KOH solution.

pH = 13.40

$pOH = -\log[OH^-] \quad pH + pOH = 14$

$-\log[0.25] = 0.60 \quad 14 - 0.60 = 13.40$

3. Consider a solution withh a pH of 9.45

(a) What is the hydronium ion concentration?

$[H^+] = 3.5 \times 10^{-10}$ M

$[H^+] = 10^{-pH} \quad 10^{-9.45} = 3.5 \times 10^{-10} M$

(b) What is the hydroxide ion concentration?

$[OH^-] = 2.8 \times 10^{-5}$ M

$pH + pOH = 14 \quad [OH^-] = 10^{-pOH} \quad 10^{-4.55} = 2.8 \times 10^{-5} M$

4. What is the pH of a solution made by dissolving 2.64 g of NaOH into a 250. ml solution?

pH = 13.42

$\frac{2.64g \times \frac{1mol}{40.3g}}{0.250L} = 0.262M \quad -\log[0.262] = 0.58 \quad pH + pOH = 14 \quad 14 - 0.58 = 13.42$

5. Consider the neutralization reaction between a solution of NaOH and a solution of HCl.

(a) Write the balanced net ionic equation.

strong base and strong acid: $OH^- + H^+ \rightarrow H_2O$

(b) What volume of 0.150 M NaOH would be required to completely neutralize 8.60 ml of 0.200 M HCl?

V_b = 11.5 ml

$M_aV_a = M_bV_b \quad 0.2M \times 8.6ml = 0.15M \times V_b \quad V_b = 11.5ml$

(c) What is the $[H^+]$ after the reaction?

$[H^+] = 1.0 \times 10^{-7}$ M Since all the acid is completely reacted with hydroxide to form water, and there are only Na^+ and Cl^- ions in the water, the $[H^+]$ will be the same as in pure water.

(d) What is the $[Na^+]$ after the reaction?

$[Na^+]$ = 0.086 M Remember dilution occurs anytime we "pour together."

$M_{NaOH}V_{NaOH} = 1.725mmolNaOH \times \frac{1Na^+}{NaOH} \quad \frac{1.725mmol}{20.1mlTotalVol} = 0.086M$

6. Consider the neutralization reaction between $Sr(OH)_2$ and HCl.

(a) Write the balanced overall equation.

$Sr(OH)_2 + 2\,HCl \rightarrow 2\,H_2O + SrCl_2$

(b) What volume of 0.15 M $Sr(OH)_2$ would be required to completely neutralize 8.60 ml of 0.20 M HCl?

V_b = 5.73 ml

$M_aV_a = M_bV_b \times \text{"buy1get2"} \quad 0.2M \times 8.6ml = 0.15M \times V_b \times 2molOH^- \quad V_b = 5.73ml$

$OR \quad 0.2MH^+ \times 8.6ml \times \frac{1OH^-}{2H^+} = 0.86mmolOH^- \quad 0.86mmolOH^- \times \frac{1ml}{0.15mmol} = 5.73ml$

(c) What is the $[Cl^-]$ after the reaction?

$[Cl^-]$ = 0.12 M Remember dilution occurs anytime we "pour together."

$M_{HCl}V_{HCl} = 1.725mmolHCl \times \frac{1Cl^-}{1HCl} \quad \frac{1.725mmol}{14.33ml} = 0.12M$

7. Consider a solution in which $[OH^-]$ = 0.0256 M

(a) Calculate the pOH and pH.

pOH = 1.59
pH = 12.41

$pOH = -\log[OH^-] \quad pH + pOH = 14$

$-\log[0.0256] = 1.59 \quad 14 - 1.59 = 12.41$

(b) What is the hydronium ion concentration?

hydronium, $[H_3O^+] = [H^+]$

$[H^+] = 10^{-pH} \quad 10^{-12.41} = 3.89 \times 10^{-13} M$