pH AND pOH CONTINUED

Name ____________________

Calculate the pH of the solutions below.

1. 0.01 M HCl $\rightarrow H^+ + Cl^-$ $pH = -\log(0.01) = \boxed{2}$	
2. 0.0010 M NaOH $\rightarrow Na^+ + OH^-$ $pOH = -\log(0.001) = 3$ $pH = 14 - 3 = 11$	
3. 0.050 M $Ca(OH)_2$ $\rightarrow \underset{0.05}{Ca^{+2}} + \underset{0.1}{2OH^-}$ $pOH = -\log(0.1) = 1$ $pH = 14 - 1 = 13$	
4. 0.030 M HBr $\rightarrow H^+ + Br^-$ $pH = -\log(0.03) = \boxed{1.52}$	
5. 0.150 M KOH $\rightarrow K^+ + OH^-$ $pOH = -\log(0.15) = 0.82$ $pH = 14 - 0.82 = 13.12$	
6. 2.0 M $HC_2H_3O_2$ (Assume 5.0% dissociation.) $\frac{5}{100} = \frac{x}{2.0}$ $x = 0.1$ $pH = -\log 0.1 = \boxed{1}$	
7. 3.0 M HF (Assume 10.0% dissociation.) $\frac{10}{100} = \frac{x}{3.0}$ $pH = -\log 0.3 = \boxed{0.52}$	
8. 0.50 M HNO_3 $\rightarrow H^+ + NO_3^-$ $pH = -\log 0.50 = \boxed{0.30}$	
9. 2.50 M NH_4OH (Assume 5.00% dissociation.) $\frac{5}{100} = \frac{x}{2.50}$ $pOH = -\log 0.125 = 0.90$ $14 - 0.9 = 13.1$	
10. 5.0 M HNO_2 (Assume 1.0% dissociation.) $\frac{1}{100} = \frac{x}{5}$ $pH = -\log 0.05 = \boxed{1.30}$	

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1. Change to [OH-] conc and tell if it's an acid or a base. Use $\boxed{[H_3O^+] \cdot [OH^-] = 1 \times 10^{-14}} \Rightarrow [OH^-] = \frac{1 \times 10^{-14}}{[H_3O^+]}$
   a) [H+] = 1.0×10^{-2} M $[OH^-] = 1 \times 10^{-12}$ M Acid
   b) " 1.0×10^{-9} M $[OH^-] = 1 \times 10^{-5}$ M Base
   c) " 3.6×10^{-8} M $[OH^-] = 2.78 \times 10^{-7}$ M Base
   d) " 9.4×10^{-3} M $[OH^-] = 1.06 \times 10^{-12}$ M Acid
   e) " 1.4×10^{-6} M $[OH^-] = 7.1 \times 10^{-9}$ M Acid

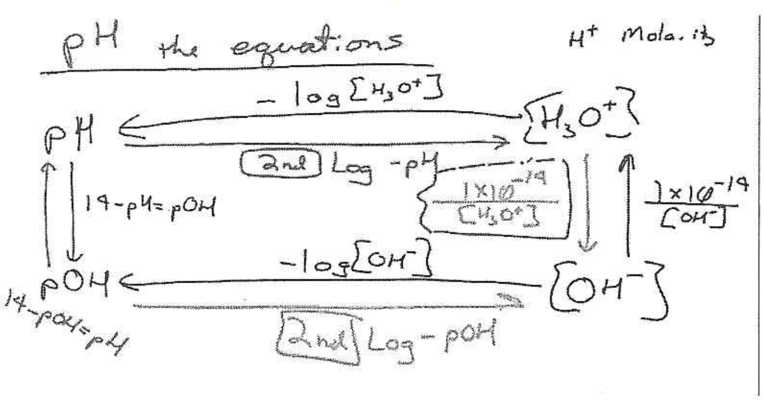
2. Change to [H+] conc and tell if it's an acid or a base.
   a) [OH-] = 1.0×10^{-6} M $[H_3O^+] = 1 \times 10^{-8}$ M Base
   b) " 1.0×10^{-9} M $[H_3O^+] = 1 \times 10^{-5}$ M acid
   c) " 1.8×10^{-7} M $[H_3O^+] = 5.6 \times 10^{-8}$ M ~~acid~~ Base
   d) " 8.9×10^{-9} M $[H_3O^+] = 1.1 \times 10^{-6}$ M Acid

3. Convert to pH and tell if it's an acid or a base.
   a) [H+] = 1.0×10^{-7} M pH = 7 neutral
   b) " 1.0×10^{-9} M pH = 9 base
   c) " 4.3×10^{-4} M pH = 3.4 acid
   d) " 5.3×10^{-9} M pH = 8.3 base

4. Convert to conc of [H+] and tell if it's an acid or a base.
   a) pH = 2.4 $[H_3O^+] = 0.00398$ M acid
   b) " 8.9 $[H_3O^+] = 1 \times 10^{-9}$ M base
   c) " 3.6 $[H_3O^+] = 2.5 \times 10^{-4}$ M acid
   d) " 11.2 $[H_3O^+] = 6.3 \times 10^{-12}$ M base

5. Convert to pOH and tell if it's an acid or a base.
   a) pH = 2.4 pOH = 11.6 acid
   b) " 8.9 pOH = 5.1 base
   c) " 3.6 pOH = 10.4 acid
   d) " 11.2 pOH = 2.8 base

6. Convert to pOH and tell if it's an acid or a base
   a) [OH-] = 1.0×10^{-4} M pOH = 4 base
   b) " 1.0×10^{-8} M pOH = 8 acid
   c) " 4.3×10^{-5} M pOH = 4.37 base
   d) " 5.3×10^{-10} M pOH = 9.3 acid



pH Calculations

Equation for molarity: $\boxed{M = \frac{mol}{L}}$

Name________________Hr__

Calculation for pH from $[H_3O^+]$: $\boxed{pH = -\log[H_3O^+]}$

Calculation for $[H_3O^+]$ from pH: $\boxed{[H_3O^+] = 10^{-pH}}$

1. What is a neutral pH? 7 acidic pH range? 0 - 6.9 alkaline (basic) pH range? 7.1 - 14
2. Write out the equation for the dissociation of water: $2H_2O \rightleftharpoons H_3O^+ + OH^-$ K_w= 1×10^{-14} M
3. What is the concentration of hydronium ions (in M) in a solution of pH 7? 1×10^{-7} M
4. Are there any hydronium ions in a solution of pH 10? yes
   If so, what is the concentration of hydronium ions at pH 10? 1×10^{-10} M
5. In an acidic solution, which is higher, the hydronium or the hydroxide concentration? hydronium ion
6. What is the factor between each point of pH, for example from pH of 1 to 2. 0.1 0.01 10Xs factor
7. What is the pH of a 0.09 M solution of HBr (hydrobromic acid). $pH = -\log 0.09 = 1.05$
8. What is the pH of a 1.34×10^{-4} M solution of hydrochloric acid. $pH = -\log 1.34 \times 10^{-4} = 3.87$
9. What is the pH of a 7.98×10^{-2} M solution of HNO_3 (nitric acid). $pH = -\log 7.98 \times 10^{-2} = 1.10$
10. What is the pH of 12 L of a solution containing 1 mole of hydrochloric acid. 1.08
    $M = \frac{1m}{12L} = 0.083$ $pH = -\log 0.083$
11. What is the pH of 735 L of a solution containing 0.34 moles of nitric acid. 3.33
    $M = \frac{0.34 mol}{735 L} = 4.63 \times 10^{-4}$ $pH = -\log 4.63 \times 10^{-4}$
12. What is the pH of 2.3 L of a solution containing 4.5 grams of nitric acid. 1.51
    H 1, N 14, O 16x3 = 48, 1 + 14 + 48 = 63 g/mol $\frac{4.5 g \cdot 1 mol}{63 g} = 0.071 mol$ $\frac{0.071 mol}{2.3 L} = 0.031$ M
13. What is the pH of 792 mL of a solution containing 0.344 grams of hydrochloric acid. 1.92
    35.5 + 1 = 36.5 g/mol $\frac{0.344 g \cdot mol}{36.5 g}$ $M = \frac{0.00942 mol}{0.792 L} = 0.0119$

Find the hydronium ion concentration $[H_3O^+]$ from the pH of the following solutions:

1. pH = 7.0, $[H_3O^+]$ = 1×10^{-7}
2. pH = 4, $[H_3O^+]$ = 1×10^{-4}
3. pH= 3, $[H_3O^+]$ = 1×10^{-3}
4. pH = 2.23, $[H_3O^+]$ = 5.89×10^{-3}
5. pH = 6.26, $[H_3O^+]$ = 5.5×10^{-7}
6. pH = 7.9, $[H_3O^+]$ = 1.3×10^{-8}
7. pH = 4.91, $[H_3O^+]$ = 1.23×10^{-5}
8. pH= 9.32, $[H_3O^+]$ = 4.79×10^{-10}
9. pH = 12.23, $[H_3O^+]$ = 5.89×10^{-13}
10. pH = 7.26, $[H_3O^+]$ = 5.5×10^{-8}