General Chemistry Name:_____

☺ Practice With pH! ☺

Directions:

Place a rank of 1(I don't know what I am doing), 2(could do it from help of others), or 3(I got this!) about calculations involving pH in the box at the top of this sheet.

1. Write all the different pH, pOH, and concentration formulas.

   _____ _____ _____

   _____ _____ _____

2. A certain solution has a pH of 3.25.
   a) Find the pOH of the solution.

   b) Find the $[H^+]$ of the solution.

   c) Find the $[OH^-]$ of the solution. Trick is you HAVE to use the K_w and not the pOH.

3. Find the pH of a 0.035 M solution of HNO_3. (Hint: First find the $[H^+]$ by realizing that nitric acid dissociates according to this balanced equation: $HNO_3 \rightarrow H^+ + NO_3^-$.

4. Find the pH of a 0.045 M solution of $Ca(OH)_2$. ($Ca(OH)_2 \rightarrow Ca^{+2} + 2OH^-$)

5. If 14.5 g of H_2SO_4 is dissolved in 720 mL of water, what is the pH? What about the $[OH^-]$?

6. A certain solution contains 0.35 mol of HCl in 1200 mL of water.
   a) Find the pH and pOH of the solution.

   b) Find the $[H^+]$ and the $[OH^-]$ in the solution.

General Chemistry Name:_____

Dilutions and pH

Dilutions are simple to calculate. If a student takes a sample of a certain concentration, there is a certain numbers of moles present.

1. A student takes 250mL of a 3.4M solution of NaOH. How many moles are present in the solution that the student took?

2. Rewrite the molarity formula to solve for moles.

3. The student then decides to take that amount in #1 and dilute it to a total volume of 1L. What is the new concentration of the solution that the student made?

Information:

You can calculate dilutions using a simple formula... which states $M_1V_1 = M_2V_2$ where M_1 is the initial molarity, V_1 is the volume of the sample that was taken. M_2 is the concentration of the diluted solution and V_2 is the final volume of the diluted solution.

Using the dilution formula, answer the following:

4. A student takes 250mL of a 3.4M solution of NaOH. What is the new concentration when the final volume is 1L? How does this relate to your answer to #3?

5. A student takes 15mL of a 3M HCl solution. What does the student have to dilute it to in order to obtain a final concentration of 0.75M?

6. What is the pH of the final (diluted) solution in #4?

7. What is the pH of the final (diluted) solution in #5?

General Chemistry Name:_____

pH Calculations
(this is the homework)

1) Determine the following in each solution:

a) A 4.5×10^{-3} M HBr solution.
pH:_____ $[H^+]$=_____
pOH:_____ $[OH^-]$=_____

b) A 3.67×10^{-5} M KOH solution.
pH:_____ $[H^+]$=_____
pOH:_____ $[OH^-]$=_____

c) 0.964 grams of $Ca(OH)_2$ in 0.150 L solution (hint-fin M first).
pH:_____ $[H^+]$=_____
pOH:_____ $[OH^-]$=_____

d) 10mL of a 6M stock solution of H_3PO_4 is taken and diluted to 1.5L. Determine the following of the diluted solution.
pH:_____ $[H^+]$=_____
pOH:_____ $[OH^-]$=_____

e) 15mL of a 2.5M stock solution of $Ca(OH)_2$ is taken and diluted to 750mL. Determine the following of the diluted solution.
pH:_____ $[H^+]$=_____
pOH:_____ $[OH^-]$=_____

General Chemistry Name: KEY

☺ Practice With pH! ☺

Directions:

Place a rank of 1(I don't know what I am doing), 2(could do it from help of others), or 3(I got this!) about calculations involving pH in the box at the top of this sheet.

1. Write all the different pH, pOH, and concentration formulas.

$pH = -\log[H^+]$ $[H^+] = 1.0\times10^{-pH}$ $pH + pOH = 14$

$pOH = -\log[OH^-]$ $[OH^-] = 1.0\times10^{-pOH}$ $K_w = [H^+][OH^-] = 1.0\times10^{-14}$

2. A certain solution has a pH of 3.25.
   a) Find the pOH of the solution.

$pH + pOH = 14$

$3.25 + pOH = 14$

$pOH = 10.75$

   b) Find the $[H^+]$ of the solution.

$[H^+] = 1.0\times10^{-3.25}$

$[H^+] = 0.000562\ M$ or $5.62\times10^{-4}\ M$

   c) Find the $[OH^-]$ of the solution. Trick is you HAVE to use the K_w and not the pOH.

$K_w = [H^+][OH^-] = 1.0\times10^{-14}$

$(0.000562)[OH^-] = 1.0\times10^{-14}$

$[OH^-] = 1.78\times10^{-11}\ M$

3. Find the pH of a 0.035 M solution of HNO_3. (Hint: First find the $[H^+]$ by realizing that nitric acid dissociates according to this balanced equation: $HNO_3 \rightarrow H^+ + NO_3^-$.

$\frac{1\ mol\ HNO_3}{0.035\ M} = \frac{1\ mole\ H^+}{0.035}$

$pH = -\log(0.035)$

$pH = 1.46$

4. Find the pH of a 0.045 M solution of $Ca(OH)_2$. ($Ca(OH)_2 \rightarrow Ca^{+2} + 2OH^-$)

$pOH = -\log(0.045)$

$pOH = 1.35$

$pH + 1.35 = 14$

$pH = 12.65$

5. If 14.5 g of H_2SO_4 is dissolved in 720 mL of water, what is the pH? What about the $[OH^-]$?

(*Find Molarity first!)

$1\ mol\ H_2SO_4 = 98.07\ g$ so $\frac{14.5}{98.07} = 0.15\ moles\ H_2SO_4$

$\frac{0.15\ mol}{.7245\ L} = 0.2041\ M$

$pH = -\log(0.204) = 0.69$

$14 - 0.69 = 13.3\ pOH$

6. A certain solution contains 0.35 mol of HCl in 1200 mL of water.
   a) Find the pH and pOH of the solution.

$M = \frac{0.35\ mol}{1.212\ L} = 0.289\ M$

$pH = -\log(.289) = 0.54$

$pOH = 14 - 0.54 = 13.46$

   b) Find the $[H^+]$ and the $[OH^-]$ in the solution.

$[H^+] = 1.0\times10^{-0.54} = 0.289\ M$

$[OH^-] = 1.0\times10^{-13.46} = 3.47\times10^{-14}\ M$

General Chemistry Name:_____

Dilutions and pH

Dilutions are simple to calculate. If a student takes a sample of a certain concentration, there is a certain numbers of moles present.

1. A student takes 250mL of a 3.4M solution of NaOH. How many moles are present in the solution that the student took?

$M = \frac{mol}{L}$ $3.4 = \frac{x}{.250}$ $x = 0.85 moles$

2. Rewrite the molarity formula to solve for moles.

$M = \frac{moles\ solute}{L\ solution}$ $moles_{solute} = M \cdot L_{solution}$

3. The student then decides to take that amount in #1 and dilute it to a total volume of 1L. What is the new concentration of the solution that the student made?

Information:

You can calculate dilutions using a simple formula... which states $M_1V_1 = M_2V_2$ where M_1 is the initial molarity, V_1 is the volume of the sample that was taken. M_2 is the concentration of the diluted solution and V_2 is the final volume of the diluted solution.

Using the dilution formula, answer the following:

4. A student takes 250mL of a 3.4M solution of NaOH. What is the new concentration when the final volume is 1L? How does this relate to your answer to #3?

$M_1V_1 = M_2V_2$

$(3.4)(250) = x(1)$ $M_2 = 0.85M$

5. A student takes 15mL of a 3M HCl solution. What does the student have to dilute it to in order to obtain a final concentration of 0.75M?

$(3)(0.015) = (0.75)V_2$

$V_2 = 0.06\ L$ or $60\ mL$

6. What is the pH of the final (diluted) solution in #4?

$pOH = -\log(0.85) = 0.071$ pOH

$pH = 13.9$

7. What is the pH of the final (diluted) solution in #5?

$pH = -\log(0.75)$ $pH = 0.12$

General Chemistry Name:_____

pH Calculations
(this is the homework)

1) Determine the following in each solution:

a) A 4.5×10^{-3} M HBr solution.
pH: 2.35 [H^+]= 4.47×10^{-3}
pOH: 11.65 [OH^-]= 2.23×10^{-12}

$pH = -\log(4.5 \times 10^{-3})$ $[H^+] = 1.0 \times 10^{-2.35} = 4.47 \times 10^{-3}$

$pH + pOH = 14$ $[H^+][OH^-] = 1.0 \times 10^{-14}$

b) A 3.67×10^{-5} M KOH solution.
pH: 9.56 [H^+]= 2.75×10^{-10}
pOH: 4.44 [OH^-]= 1.32×10^{-5}

$pOH = -\log(3.67 \times 10^{-5})$ $[H^+] = 1.0 \times 10^{-9.56}$

$pH + pOH = 14$

c) 0.964 grams of $Ca(OH)_2$ in 0.150 L solution (hint-fin M first). (74.08)
pH: 12.94 [H^+]= 1.15×10^{-13}
pOH: 1.06 [OH^-]= 8.69×10^{-2}

$\frac{0.013 \text{ moles}}{.150 \text{ L}} = 0.087 \text{ M}$ $[H^+] = 1.0 \times 10^{-12.94}$

$pOH = -\log(0.087)$

d) 10mL of a 6M stock solution of H_3PO_4 is taken and diluted to 1.5L. Determine the following of the diluted solution.
pH: 1.40 [H^+]= 3.98×10^{-2}
pOH: 12.6 [OH^-]= 2.51×10^{-13}

$6(0.010) = M(1.5)$ $pH = -\log(0.04)$

$M_2 = 0.04 \text{ M}$ $[H^+] = 1 \times 10^{-1.4}$

e) 15mL of a 2.5M stock solution of $Ca(OH)_2$ is taken and diluted to 750mL. Determine the following of the diluted solution.
pH: 12.70 [H^+]= 2×10^{-13}
pOH: 1.30 [OH^-]= 5×10^{-2}

$[H^+] = 1.0 \times 10^{-12.7}$

$(2.5)(.015) = M_2(.750)$

$M_2 = 0.05$ $pOH = -\log(0.05)$