Acid Base Practice Problems Set #1 ANSWERS
Read this first, then do the fill in the blanks.

1	$Acid_{(AQ)} + Base_{(AQ)} \longrightarrow Salt_{(AQ)} + Water_{(L)}$
2	$2H_3PO_{4(AQ)} + 3Ca(OH)_{2(AQ)} \longrightarrow Ca_3(PO_4)_{2(AQ)} + 6HOH_{(L)}$
3	$H_2SO_{3(AQ)} + 2NaOH_{(AQ)} \longrightarrow Na_2SO_{3(AQ)} + 2HOH_{(L)}$
4	$H_2CO_{3(AQ)} + 2RbOH \longrightarrow Rb_2CO_{3(AQ)} + 2HOH_{(L)}$
5	$HC_2H_3O_{2(AQ)} + NaOH_{(AQ)} \longrightarrow NaC_2H_3O_{2(AQ)} + HOH_{(L)}$
6	$HNO_{3(AQ)} + LiOH_{(AQ)} \longrightarrow LiNO_{3(AQ)} + HOH_{(L)}$
7	$H_2SO_{4(AQ)} + 2KOH_{(AQ)} \longrightarrow K_2SO_{4(AQ)} + HOH_{(L)}$
8	$\longrightarrow$

Acid Base Practice Problems Set #2 ANSWERS

1 When 50. mL of an HNO_3 solution is exactly neutralized by 150 mL of a 0.50 M KOH, what is the concentration of HNO_3? $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1})$

$(1)(M_A)(50.\ mL) = (0.50\ M)(150\ mL)(1)$

$M_A = 1.5\ M$ choice B

(# 71, 72, and 73 January 2003)
A titration set up was used to determine the unknown molar concentration of a solution of NaOH. A 1.20 M HCl solution was used as the titration standard. The following data were collected.

	trial 1	trial 2	trial 3	trial 4
Amount of HCl used	10.0 mL	10.0 mL	10.0 mL	10.0 mL
Initial NaOH Buret Reading	0.0 mL	12.2 mL	23.2 mL	35.2 mL
Final NaOH Buret Reading	12.2 mL	23.2 mL	35.2 mL	47.7 mL

2. Calculate the volume of NaOH solution used to neutralize 10.0 mL standard HCl solution in trial 3. Show your work. 35.2 mL - 23. 2 mL = 12.0 mL base used in trial 3

3. Calculate the AVERAGE Molarity of the unknown NaOH solution for all four trials.

Trial 1: $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (1)(1.20\ M)(10.0\ mL) = (M_B)(12.2\ mL)(1)$ $M_B = 0.984$
Trial 2: $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (1)(1.20\ M)(10.0\ mL) = (M_B)(11.0\ mL)(1)$ $M_B = 1.09$
Trial 3: $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (1)(1.20\ M)(10.0\ mL) = (M_B)(12.0mL)(1)$ $M_B = 1.00$
Trial 4: $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (1)(1.20\ M)(10.0\ mL) = (M_B)(12.5\ mL)(1)$ $M_B = 0.960$

average $M_B = 1.01$

4. According to Table M, what indicator would be appropriate in determining the end point of titration? Give a reason for choosing this indicator.
A good indicator for neutralization would be phenolphthalein since the change from neutral to base is likely a single drop, which is very close to a perfect measure of neutrality.

Acids Bases Practice Problems Set #3 ANSWERS

Fill in this chart, carefully read Table M in your reference tables. In each box, write the color that the solution would be with that indicator. The first box is an example.

#	Solution pH	thymol blue	litmus	phenolphthalein	methyl orange
1	1.5	yellow	red	colorless	red
2	3.1	yellow	red	colorless	red
3	6.0	yellow	purple (red/blue)	colorless	yellow
4	9.4	green (yellow/blue)	blue	pink	yellow
5	12.1	blue	blue	pink	yellow

6. At what pH would methyl orange (over 4.4), bromthymol blue (under 6.0) AND thymol blue (under 8.0) all appear YELLOW? C. 4.7

7. Which of these solutions could have a pH of 5.0? (this is an ACID)
   B. $CH_3COOH_{(AQ)}$ This is on Table K, it is ethanoic acid (AKA vinegar or acetic acid)

8. A student finds that an unknown solution conducts electricity and turns litmus RED. It could be
   Red means acid, electrolyte means acid or base, it has to be the acid: A. $HNO_{3(AQ)}$

9. How many liters of 2.47 M HCl will neutralize 1.24 Liters of 3.33 M $Mg(OH)_{2(AQ)}$?
   $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (1)(2.47\ M)(V_A) = (3.33\ M)(1.24\ L)(2)$ $V_A = 3.34$ L

10. How many liters of 1.22 M $H_3PO_{4(AQ)}$ will neutralize 0.650 Liters 2.23 M $KOH_{(AQ)}$?
    $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (3)(1.22\ M)(V_A) = (2.23\ M)(0.650\ L)(1)$ $V_A = 0.396$ Liters

11. If 3.66 mL of H_2SO_4 neutralizes 2.11 mL of 0.95 M NaOH, what is molarity of the acid?
    $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (2)(M_A)(3.66\ mL) = (0.95\ M)(2.11\ mL)(1)$ $M_A = 0.274$ M

12. When you neutralize 1.95 L of 1.00 M nitric acid with 3.56 L of calcium hydroxide solution, what is the molarity of the base?
    $(\#\ H^{+1})(M_AV_A) = (M_BV_B)(\#OH^{-1}) \rightarrow (1)(1.00\ M)(1.95\ L) = (M_B)(3.65\ L)(2)$ $M_B = 0.267$ M

Acids Bases Practice Problems Set #4

1. Explain the difference between an Arrhenius acid and a Brønsted-Lowry acid.
   Arrhenius acids have H^{+1} as the only positive ion in solution, the more hydrogen ions in solution, the stronger the acid. A Bronsted-Lowry acid is a substance that will donate a H^{+1} ion to another substance in solution. (water donates a hydrogen ion to ammonia in solution, ammonia accepts this ion making it a base, since water donated this hydrogen ion, water is an acid in this example. (crazy making really)

2. Explain the difference between an Arrhenius base and a BrØnsted-Lowry base.
   An Arrhenius base has OH^{-1} ions in solution, the more hydroxide ions in solution, the stronger the base is. A Bronsted-Lowry base is a substance that will accept a H^{+1} ion from another substance in solution. (ammonia accepts this ion making it a base, and since water donated this hydrogen ion, water is an acid in this example. (crazy making really)

3. What is $CH_3COOH_{(AQ)}$? An organic chem style of writing the formula for ethanoic acid which is the same thing as acetic acid (vinegar too).

4. What is $HC_2H_3O_{2(AQ)}$? An inorganic chem style of writing the formula for acetic acid which is the same thing as ethanoic acid (vinegar too).

5. What is the difference between the compounds in 3 and 4 above?
   Just the order of the symbols, it's the exact same compound.

6. You have a solution that has a pH of 12.0 and you have some indicators to measure it. Which of these (A to K) would be TRUE? List the correct choices.

   A. litmus is blue
   B. phenolphthalein is colorless
   C. methyl orange is red
   D. bromcresol green is yellow
   E. thymol blue is blue
   F. litmus is blue
   G. methyl orange is blue
   H. methyl orange is yellow
   I. bromcresol green is blue
   J. phenolphthalein is pink
   K. bromthymol blue is blue

   These are TRUE

   A, E, H, I, J, K

7. What are the similarities between H^{+1}, H_3O^{+1} ,H^{+1} donors, and protons?
   All four of these symbols can be used to represent acids. The first is the hydrogen ion that Arrhenius showed as the real acid ion. The second is the hydronium ion (which is dumb but correct for the regents), third is the Bronsted Lowry theory, and a hydrogen ion is really just a proton minus an electron, so a single proton could be a stand in for the H^{+1} , in a way.