

# Acid Base HW #1

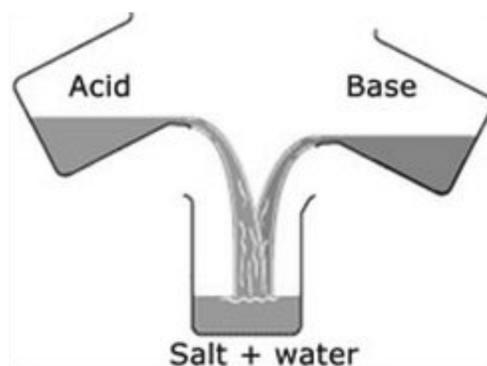
name: \_\_\_\_\_

Read this first, then do the fill in the blanks.

Svante Arrhenius explained how acids and bases might exist in 1887 with his theory. His idea was that when there is an excess of  $H^{+1}$  ions in solution, the solution is an acid. He said that when there is an excess of  $OH^{-1}$  ions in solution that solution is a base.

Further, he stated that when an acid is combined to a base (in proper ratio) that a special kind reaction, called an acid base neutralization reaction occurs, which ALWAYS forms a salt plus water. These ARE NOT double replacement reactions.

Salt, in chemistry, as you remember surely, is any ionic compound (a metallic cation plus a nonmetal anion). Water is always a liquid, it's NOT dissolved in water (AQ)



Using this table, fill in all the blanks. BALANCE THE EQUATIONS

ex	Acid <sub>(AQ)</sub> + Base <sub>(AQ)</sub> → Water <sub>(L)</sub> + Salt <sub>(AQ)</sub>
1	___ $H_3PO_{4(AQ)}$ + ___ $Ca(OH)_{2(AQ)}$ → ___ $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
2	___ $H_2SO_{3(AQ)}$ + ___ $NaOH_{(AQ)}$ → ___ $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
3	___ $H_2CO_{3(AQ)}$ + _____ <sub>(AQ)</sub> → _____ + $Rb_2CO_{3(AQ)}$
4	___ $HC_2H_3O_{2(AQ)}$ + ___ $NaOH_{(AQ)}$ → ___ $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
5	___ $HNO_{3(AQ)}$ + ___ $LiOH_{(AQ)}$ → $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
6	___ $H_2SO_{4(AQ)}$ + ___ $KOH_{(AQ)}$ → $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
7	___ $H_3PO_{4(AQ)}$ + ___ $Sr(OH)_{2(AQ)}$ → $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
8	___ $HNO_{2(AQ)}$ + ___ $NH_4OH_{(AQ)}$ → $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
9	___ $H_2CO_{3(AQ)}$ + ___ $KOH_{(AQ)}$ → $HOH_{(L)}$ + _____ <sub>(AQ)</sub>
10	___ $HCl_{(AQ)}$ + ___ $NaOH_{(AQ)}$ → $HOH_{(L)}$ + _____ <sub>(AQ)</sub>

These four questions are from the 2002 and 2003 NYS Chemistry Regents Exam. SHOW ALL WORK

1. (Aug 2002) When 50. milliliters of an  $\text{HNO}_3$  solution is exactly neutralized by 150 milliliters of a 0.50 M solution of  $\text{KOH}$ , what is the concentration of  $\text{HNO}_3$ ? Show all work.  
 A. 1.0 M      B. 1.5 M      C. 3.0 M      D. 0.50 M

(Jan 2003) A titration set up was used to determine the unknown molar concentration of a solution of  $\text{NaOH}$ . The acid is a 1.20 M  $\text{HCl}$  solution was used as the titration standard. The following data were collected..

	trial 1	trial 2	trial 3	trial 4
Amount of $\text{HCl}$ used	10.0 mL	10.0 mL	10.0 mL	10.0 mL
Initial $\text{NaOH}$ Buret Reading	10.0 mL	22.2 mL	33.2 mL	45.2 mL
Final $\text{NaOH}$ Buret Reading	22.2 mL	33.2 mL	45.2 mL	57.7 mL

2. Calculate the AVERAGE Molarity of the unknown  $\text{NaOH}$  solution for all 4 trials. Your answer must have proper SF, and units.

Trial 1	Trial 2
Trial 3	Trial 4

Answer for 2: Average Molarity of the Base \_\_\_\_\_

3. If the actual molarity is 1.05 M, calculate your % error. (show formula and math for full credit). SF count

## Acids Bases HW #3

name \_\_\_\_\_

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			
2	3.1				
3	6.0				
4	9.4				
5	12.1				

6. At what pH would methyl orange, bromthymol blue AND thymol blue all appear YELLOW?  
 A. 1.9                      B. 2.9                      C. 4.7                      D. 8.7
7. Which of these solutions could have a pH of 5.0?  
 A.  $\text{KOH}_{(\text{AQ})}$                       B.  $\text{CH}_3\text{COOH}_{(\text{AQ})}$                       C.  $\text{Ca}(\text{OH})_{2(\text{AQ})}$                       D.  $\text{NH}_3_{(\text{AQ})}$
8. A student finds that an unknown solution conducts electricity and turns litmus RED. It could be  
 A.  $\text{HNO}_3_{(\text{AQ})}$                       B.  $\text{NaOH}_{(\text{AQ})}$                       C.  $\text{Ca}(\text{OH})_{2(\text{AQ})}$                       D.  $\text{NH}_3_{(\text{AQ})}$
9. How many liters of 2.47 M HCl will neutralize 1.24 Liters of 3.33 M  $\text{Mg}(\text{OH})_{2(\text{AQ})}$ ?
10. If 3.66 mL of  $\text{H}_2\text{SO}_4$  neutralizes 2.11 mL of 0.95 M NaOH, what is molarity of the acid?
11. 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?

1. Explain what an Arrhenius acid and Arrhenius Base is.
2. Write the chemical equation that explains why ammonia is a base, including the “arrows” explaining what happens to each species.
3. What is  $\text{CH}_3\text{COOH}_{(\text{AQ})}$  ?
4. What is  $\text{HC}_2\text{H}_3\text{O}_2_{(\text{AQ})}$  ?
5. What is the difference between the compounds in 3 and 4 above?
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 letter choices in the boxes. There are too many boxes, don't fill them all!

- 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


7. What are the four ways to describe an acid?