

Name \_\_\_\_\_ Date \_\_\_\_\_ Block \_\_\_\_\_

### Acid and Base Concepts

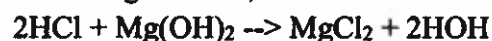
1. Which of the following is a weak base in aqueous solution

- a)  $\text{NH}_3$       b)  $\text{HCl}$       c)  $\text{KOH}$       d)  $\text{NaOH}$       e)  $\text{Ca}(\text{OH})_2$

2. Which of the following statements is not a characteristic of acids?

- a) They are proton donors.  
b) They neutralize bases.  
c) They react with nonmetals to give a salt and oxygen.  
d) They react with bases to give a salt and water.  
e) They taste sour.

3. For the following reaction, which substance is the base?



4. What is the difference between the Bronsted-Lowry and Arrhenius definitions of acids and bases?

- a) Bronsted-Lowry definition explains acids and bases in terms of electron pairs.  
b) Arrhenius defined bases as containing  $\text{OH}^-$  and Bronsted-Lowry said that bases have  $\text{H}^+$ .  
c) Arrhenius defined bases as containing  $\text{OH}^-$  and Bronsted-Lowry said that bases are proton acceptors.  
d) They are the same definition, just different names.

5. Which of the following is the most concentrated acid?

0.5 M  $\text{HCl}$ , 1.0 M  $\text{HI}$ , 2.0 M  $\text{HBr}$

6. What are the reaction products for a neutralization reaction between  $\text{H}_2\text{SO}_4$  and  $\text{KOH}$ ?

7.  $\text{BaCl}_2$  is a salt that must have been formed from the acid \_\_\_\_\_ and the base \_\_\_\_\_.

Unit 9 Solutions, Acids and Bases HW Packet

Name \_\_\_\_\_ Date \_\_\_\_\_

**pH and pOH Calculations**

Directions: Fill in the table below. You do not need to show your work.

pH	[H <sup>+</sup> ]	pOH	[OH <sup>-</sup> ]	ACID or BASE?
3.78				
	3.89 x 10 <sup>-4</sup> M			
		5.19		
			4.88 x 10 <sup>-6</sup> M	
8.46				
	8.45 x 10 <sup>-13</sup> M			
		2.00		
			2.31 x 10 <sup>-11</sup> M	
10.91				
	7.49 x 10 <sup>-6</sup> M			

Directions: Calculate the following problems.

Calculate the pH for the following solutions:

- 1) [H<sup>+</sup>] = 0.000010M
- 2) [H<sup>+</sup>] = 1.0 x 10<sup>-11</sup>
- 3) [OH<sup>-</sup>] = 1.0 x 10<sup>-4</sup>
- 4) pOH = 5.75

Calculate the [H<sup>+</sup>] for the following solutions:

- 1) pH = 4
- 2) pOH = 8
- 3) pH = 3.75
- 4) [OH<sup>-</sup>] = 6.53 x 10<sup>-4</sup>

# pH AND pOH CONTINUED

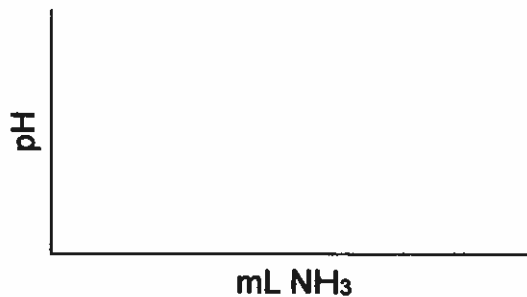
Name \_\_\_\_\_

Calculate the pH of the solutions below.

1. 0.01 M HCl
2. 0.0010 M NaOH
3. 0.050 M Ca(OH) <sub>2</sub>
4. 0.030 M HBr
5. 0.150 M KOH
6. 2.0 M HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> (Assume 5.0% dissociation.)
7. 3.0 M HF (Assume 10.0% dissociation.)
8. 0.50 M HNO <sub>3</sub>
9. 2.50 M NH <sub>4</sub> OH (Assume 5.00% dissociation.)
10. 5.0 M HNO <sub>2</sub> (Assume 1.0% dissociation.)

## Titration Practice

1. A strong acid, HCl, is titrated with a weak base,  $\text{NH}_3$ . Sketch a possible titration curve and label the approximate equivalence point. Is the solution at the equivalence point acidic or basic?



2. 25.0 mL of 1.50M LiOH are neutralized by 15.0 mL of nitric acid. What is the molarity of  $\text{HNO}_3$ ?
3. 50.0 mL of an unknown solution of  $\text{Ca}(\text{OH})_2$  are titrated with 0.15M HCl. Find the molarity of the  $\text{Ca}(\text{OH})_2$  solution if 83 mL of acid are required to reach the equivalence point.
4. What volume of 0.75M  $\text{H}_2\text{SO}_4$  is required to neutralize 25.0 mL of 0.427M KOH?
5. What volume of 0.083M  $\text{H}_3\text{PO}_4$  is required to neutralize 30.0 cm<sup>3</sup> of 0.025M  $\text{Ba}(\text{OH})_2$ ?

### Conjugate Acids and Bases

1. Write an equation that shows the reaction of ammonia,  $\text{NH}_3$  with hydrobromic acid,  $\text{HBr}$ . Label the acid, the base, the conjugate acid, and the conjugate base.
  
2. Write an equation that shows the reaction of phosphate ion,  $\text{PO}_4^{3-}$ , reacting with hydronium ion,  $\text{H}_3\text{O}^+$ . Label the acid, the base, the conjugate acid, and the conjugate base.
  
3. Write an equation that shows the reaction of hydrogen sulfide,  $\text{HS}^-$  with hydroxide ion,  $\text{OH}^-$ . Label the acid, the base, the conjugate acid, and the conjugate base.

4. Fill in the following table completely:

	Acid	Base	Conjugate Acid	Conjugate Base	Equation
9	$\text{HNO}_2$	$\text{H}_2\text{O}$			$\text{HNO}_2 + \text{H}_2\text{O} \rightarrow \text{NO}_2^- + \text{H}_3\text{O}^+$
10	$\text{H}_2\text{O}$	$\text{F}^-$	$\text{HF}$	$\text{OH}^-$	
11					$\text{NH}_3 + \text{HCN} \rightarrow \text{NH}_4^+ + \text{CN}^-$
12			$\text{H}_2\text{O}$	$\text{ClO}_3^-$	
13	$\text{HSO}_4^-$	$\text{PO}_4^{3-}$			
14					$\text{S}^{2-} + \text{H}_2\text{O} \rightarrow \text{OH}^- + \text{HS}^-$
15	$\text{HCO}_2\text{H}$	$\text{OH}^-$			