Practice Worksheet Naming Acids

Review:

- Binary Acids – (When the anion does NOT contain Oxygen):

Use the prefix *hydro* + **root of the anion's name** – *ic* + the word acid
Examples: HCl - *hydro***chlor***ic* acid; HBr- *hydro***brom***ic* acid

- Oxyacids – (When the anion contains Oxygen):

The name will depend on the name of the polyatomic anion. DO NOT use the prefix hydro. Examples: H_2SO_4 the anion is sulf**ate**, therefore the acid name will end in **ic – Sulfuric acid.** H_2SO_3 the anion is sulf**ite**, therefore the name of the acid will end in **ous – sulfurous acid.**

ATE → IC ITE → OUS

Complete the Following:

POLYATOMIC ION	POLYATOMIC ION NAME	ACID NAME	ACID FORMULA
		Nitric acid	
	Acetate		
			H_2SO_3
ClO_3^-			
	Chlorite		
		Phosphoric acid	
	Nitrite		
ClO^-			
ClO_4^-			
		Carbonic acid	
			$HClO_4$
	Permanganate		
			H_2SO_4
		Thiocyanic acid	
	Borate		
$C_2O_4^{2-}$			
		Bromic acid	

Acids and Bases

Naming Acids and Writing formulas of acids

Directions: Use the naming rules from your notes to name these acids.

Formula	Name	Formula	Name
1) HF		10)HClO	
2) HI		11) $HClO_2$	
3) HCl		12) $HClO_3$	
4) HBr		13) $HClO_4$	
5) H_2S		14) H_2CO_3	
6) HNO_3		15) $H_2C_2O_4$	
7) HNO_2		16) H_3PO_4	
8) H_2SO_4		17) H_3PO_3	
9) H_2SO_3		18) H_2CrO_4	

Directions: Use the rules for writing formulas to write the proper formulas for these acids.

Name	Formula	Name	Formula
19) Hydrobromic acid		28) Carbonic acid	
20) Hydroiodic acid		29) Chloric acid	
21) Hydrofluoric acid		30) Chlorous acid	
22) Hydrochloric acid		31) Perchloric acid	
23) Hydrosulfuric acid		32) Hypochlorous acid	
24) Phosphoric acid		33) Permanganic acid	
25) Phosphorous acid		34) Acetic acid	
26) Sulfuric acid		35) Nitric acid	
27) Sulfurous acid		36) Nitrous acid	

Name each of the following bases - remember to use the rules for ionic naming.

1. KOH: _____
2. LiOH: _____
3. $Ca(OH)_2$: _____
4. $Ba(OH)_2$: _____
5. $Mg(OH)_2$: _____
6. $Be(OH)_2$: _____
7. $Sr(OH)_2$: _____
8. $Fe(OH)_3$: _____
9. $Fe(OH)_2$: _____
10. $Al(OH)_3$: _____

Write formulas for each of the following bases- remember to use the rules for writing ionic formulas.

11. potassium hydroxide_____
12. aluminum hydroxide_____
13. iron (III) hydroxide_____
14. copper (I) hydroxide_____
15. copper (II) hydroxide_____
16. strontium hydroxide_____
17. lithium hydroxide_____
18. sodium hydroxide_____
19. rubidium hydroxide_____
20. calcium hydroxide_____

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			$HClO_4$
	Permanganate		
			H_2SO_4
		Thiocyanic acid	
	Borate		
$C_2O_4^{2-}$			
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	Borate		
$C_2O_4^{2-}$			
		Bromic acid	

Name: _____ PH, pOH, Weak acids wks

1) Determine the pH of a 0.0034 M HNO_3 solution.

2) Determine the pOH of a 0.0034 M HNO_3 solution.

3) Determine the pH of a 4.3×10^{-4} M NaOH solution.

4) If a solution is created by adding water to 2.3×10^{-4} moles of NaOH and 4.5×10^{-6} moles of HBr until the final volume is 1 L, what is the pH of this solution?

5) Determine the pH of a 4.5×10^{-11} M NaOH solution.

6) Why would we say that a solution with a H^+ concentration of 1.00×10^{-7} M is said to be neutral. If it contains acid, shouldn't it be acidic?

7) Find the pH of a 0.065 M solution of formic acid. The acid dissociation constant (K_a) for formic acid is 1.8×10^{-4}.

8) Find the pH of a 0.325 M acetic acid solution. $K_a = 1.8 \times 10^{-5}$.

9) Find the pH of a solution that contains 0.0034 M lactic acid ($K_a = 1.4 \times 10^{-4}$) and 0.056 M propionic acid ($K_a = 1.4 \times 10^{-5}$).

10) What is the pH of a 0.00056 M butyric acid solution. $pK_a = 4.82$.

Name:_____ Class:_____

Write the equilibrium expression for each reaction below.

1. $HF_{(g)} + H_2O_{(g)} \leftrightarrow H_3O^+_{(g)} + F^-_{(g)}$

2. $NO_{(g)} + O_{2(g)} \leftrightarrow NO_{2(g)}$

3. $CH_3COOH_{(g)} + C_2H_5OH_{(g)} \leftrightarrow CH_3COOC_2H_{5(g)} + H_2O_{(l)}$

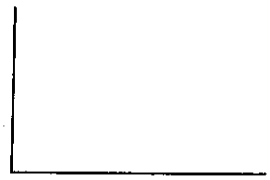
4. $(NH_4)_2Se_{(s)} \leftrightarrow NH_{3(g)} + H_2Se_{(g)}$

5. Write the equilibrium expression and then solve for the equilibrium constant, K for the following reaction if there are 0.249 moles of nitrogen gas, 3.21×10^{-2} moles of hydrogen gas and 6.42×10^{-4} moles of ammonia gas in a reaction volume of 3.0 L. Then report the value of K and Graph it. Circle which side of the reaction equilibrium will reside on.

$N_{2(g)}\ 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$

Equilibrium Expression	K Value

Graph of K



6) For the following reaction predict what direction the equilibrium will shift in response to the changes below.

$$H_{2\,(g)} + Cl_{2\,(g)} \leftrightarrows 2HCl_{(aq)} \quad H = -495\ KJ$$

Equilibrium Expression

a) HCl is removed _____

b) Bromine gas is added _____

c) Hydrogen gas is added _____

d) NaCl is added _____

e) Chlorine is removed _____

f) The solution is boiled _____

Write a sentence on how letter F will effect K and the equilibrium of the reaction.

Conjugate Acids and Bases

Name:_____ **Class**_____

The **Brønsted-Lowry** definition of an acid is a substance capable of **donating** a **proton** (H^+), and **a base** is a substance capable of **accepting** a **proton**. For example, the weak acid, **HF**, can be dissolved in water, giving the reaction:

$$HF\ (aq) + H_2O\ (l) \leftrightarrows H_3O^+\ (aq) + F^-\ (aq)$$

_____ _____ _____ _____

The **acid** is the species losing the proton (H^+)

The **Base** is the species accepting the proton (H^+)

The **conjugate base** gains a proton in the reverse reaction

The **conjugate acid** lose a proton in the reverse reaction

Determine the conjugate acid for each:

H_2O		F^-	
HCO_3^-		SO_4^{2-}	
OH^-		PO_4^{3-}	
$H_2PO_4^-$		Cl^-	
ClO_4^-		CH_3COO^-	
SH^-		CN^-	
HSO_4^-		NH_3	

Determine the conjugate base for each:

H_2O		HF	
HCO_3^-		HSO_4^-	
OH^-		HPO_4^{2-}	
H_3PO_4		HCl	
$HBrO_2$		CH_3COOH	
H_2S		$HOCN$	
HSO_4^-		NH_3	

K_a Problems Worksheet

Name:_____ Class: _____

Attacking the Problem!!!!
Write ionization equation for the reaction
Write equilibrium expression
Use pH to solve for [H+] (If given pH)
ICE Box
Plug values into equilibrium expression and solve
NOTE: X = [ ] CONCENTRATION!!!!

Solve:

1) Find the pH of a 0.065 M solution of formic acid (HCOOH). The acid dissociation constant (K_a) for formic acid is 1.8×10^{-4}.

2) Find the pH of a 0.325 M acetic acid solution. $K_a = 1.8 \times 10^{-5}$.

3) Find the pH of a solution that contains 0.0034 M lactic acid ($K_a = 1.4 \times 10^{-4}$) and 0.056 M propionic acid ($K_a = 1.4 \times 10^{-5}$).

4) Find the K_a of a 0.065 M solution of formic acid. The pH of the solution is 4.56.

5) Find the K_a of a 0.325 M acetic acid solution if the pH of the solution is 3.24.

Name_____

Lewis Acid-Base Worksheet

Part 1

A. Classify each of the following as either a Brønsted Acid-Base reaction or as a Lewis Acid-Base Reaction. If it is better classified as a Brønsted reaction, write Brønsted. If it is better classified as a Lewis reaction, write Lewis.

B. Identify which reactant is the acid and which is the base. Circle the Acid and box the base.

a. $Zn(H_2O)_4^{2+} + H_2O \rightarrow Zn(H_2O)_3OH^+ + H_3O^+$

b. $SO_2 + OH^- \rightarrow HSO_3^-$

c. $HClO_4 + H_2O \rightarrow ClO_4^- + H_3O^+$

2. Circle any of the following compounds that are capable of acting as **Lewis acids.** (Draw the Lewis structure it may help)

F^- H_3O^+ PF_3^{2+} BF_3

S^{2-} NH_3 SO_2

Part 2

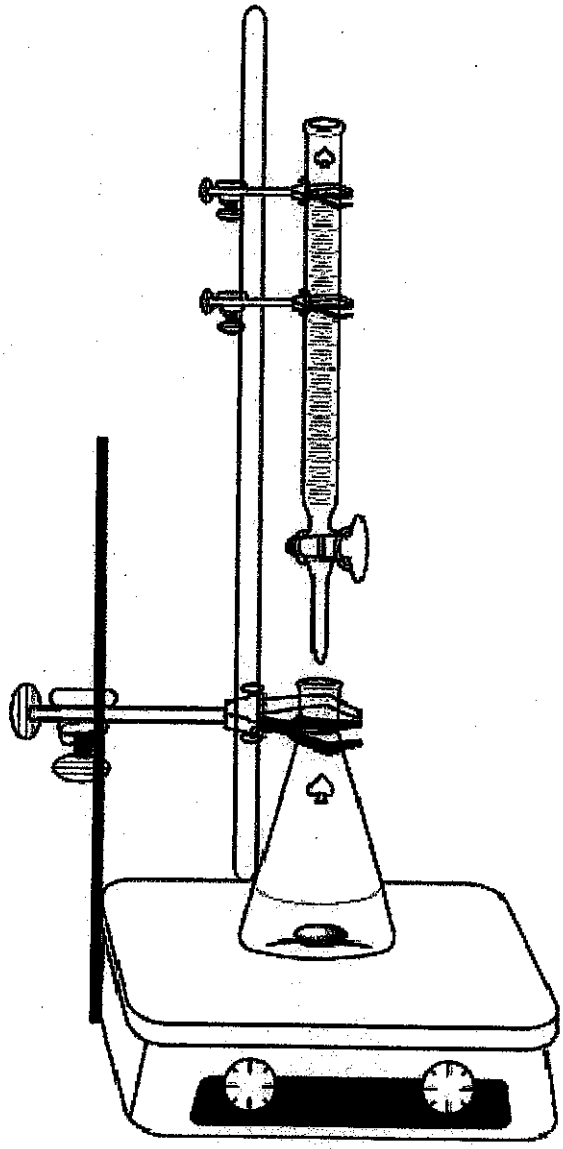
Circle the equations which represents Lewis acid-base reactions which are NOT Brønsted reactions. Box the equations which represent Brønsted acid-base reactions.

$PF_3^{2+} + F^- \rightarrow PF_4^-$ $BF_3 + NH_3 \rightarrow F_3B{-}NH_3$

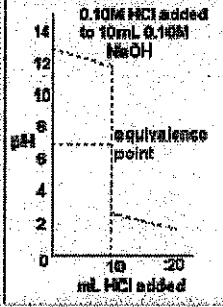
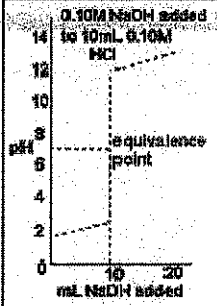
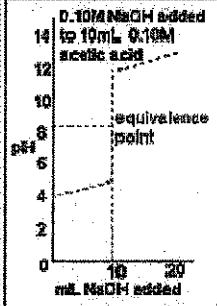
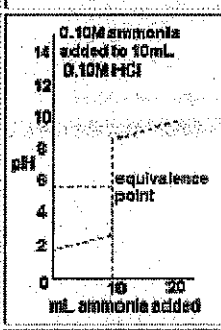
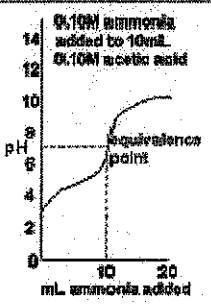
$H_3O^+ + F^- \rightarrow HF + H_2O$ $H_3O^+ + NH_3 \rightarrow NH_4^+ + H_2O$

Titration

Label the diagram below



Titration Curves

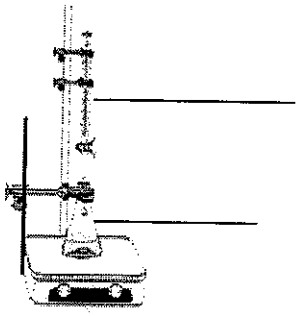
General Type	Example	Typical Titration Curve	Features of Curve
Strong Acid and Strong Base	HCl added to NaOH		Curve begins at high pH typical of strong base and ends at low pH typical of strong acid. There is a large rapid change in pH near the equivalence point (pH =7).
Strong Base and strong Acid	NaOH added to HCl		Curve begins at low pH typical of strong acid, and ends at high pH typical of strong base. There is a large rapid change in pH near the equivalence point (pH=7).
Weak Acid and Strong Base	NaOH added to acetic acid (CH_3COOH)		Curve begins at a higher acidic pH and ends at high basic pH. The pH change at the equivalence point (pH > 7)is not so great.
Strong Acid and Weak Base	Ammonia (NH_3) added to HCl		Curve begins at low pH and ends at a less high basic pH. The pH change at the equivalence point (pH < 7) is similar to that for Strong Base and Weak Acid.
Weak Acid and Weak Base	Ammonia (NH_3) added to Acetic acid (CH_3COOH)		Curve begins at higher acidic pH and ends at low basic pH. There is not a great pH change at the equivalence point (pH ~ 7) making this a very difficult titration to perform.

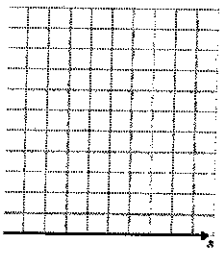
Name:_____ Class:_____

Titration Practice Worksheet

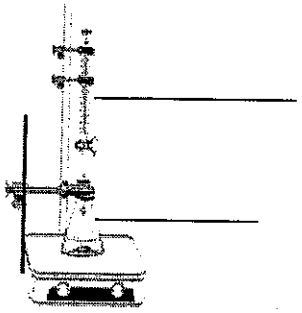
For each problem label the experimental set up and sketch an approximate graph. Then solve.

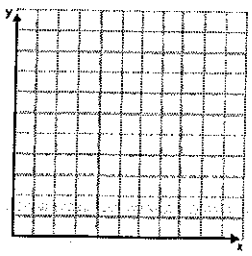
1. What is the M of NaOH if it takes 40 ml of NaOH to reach the equivalence point in a titration with 50 ml of 0.2 M HCl?



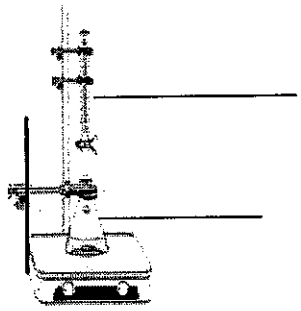


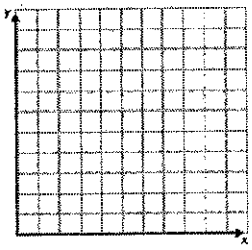
2. 50 ml of 0.3 M KOH are required to titrate 60 ml of H_2SO_4. What is the M of the H_2SO_4?





3. 60 ml of 1.2 M NaOH are required to titrate 40 ml of HF. What is the M of the HF?





5. 55 ml of 1.2 M H $C_2H_3CO_2$ are used to titrate a sample of 0.67 M $Ba(OH)_2$. What is volume of the $Ba(OH)_2$ used?