NAMING ACIDS

Name _____

Name the following acids.

1. HNO_3 _____
2. HCl _____
3. H_2SO_4 _____
4. H_2SO_3 _____
5. $HC_2H_3O_2$ _____
6. HBr _____
7. HNO_2 _____
8. H_3PO_4 _____
9. H_2S _____
10. H_2CO_3 _____

Write the formulas of the following acids.

11. sulfuric acid _____
12. nitric acid _____
13. hydrochloric acid _____
14. acetic acid _____
15. hydrofluoric acid _____
16. phosphorous acid _____
17. carbonic acid _____
18. nitrous acid _____
19. phosphoric acid _____
20. hydrosulfuric acid _____

BRONSTED-LOWRY ACIDS AND BASES

Name _____

According to Bronsted-Lowry theory, an acid is a proton (H^+) donor, and a base is a proton acceptor.

Example: $HCl + OH^- \rightarrow Cl^- + H_2O$ (H^+ transfers from HCl to OH^-)

The HCl acts as an acid, the OH^- as a base. This reaction is reversible in that the H_2O can give back the proton to the Cl^-.

Label the Bronsted-Lowry acids and bases in the following reactions and show the direction of proton transfer.

Example: $H_2O + Cl^- \leftrightarrow OH^- + HCl$ (H^+ transfers from H_2O to Cl^- and from OH^- to HCl)

Acid Base Base Acid

1. $H_2O + H_2O \leftrightarrow H_3O^+ + OH^-$

2. $H_2SO_4 + OH^- \leftrightarrow HSO_4^- + H_2O$

3. $HSO_4^- + H_2O \leftrightarrow SO_4^{-2} + H_3O^+$

4. $OH^- + H_3O^+ \leftrightarrow H_2O + H_2O$

5. $NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$

CONJUGATE ACID-BASE PAIRS

Name _____

In the exercise, Bronsted-Lowry Acids and Bases, it was shown that after an acid has given up its proton, it is capable of getting back that proton and acting as a base. Conjugate base is what is left after an acid gives up a proton. The stronger the acid, the weaker the conjugate base. The weaker the acid, the stronger the conjugate base.

Fill in the blanks in the table below.

Conjugate Pairs

	ACID	BASE	EQUATION
1.	H_2SO_4	HSO_4^-	$H_2SO_4 \leftrightarrow H^+ + HSO_4^-$
2.	H_3PO_4		
3.		F^-	
4.		NO_3^-	
5.	$H_2PO_4^-$		
6.	H_2O		
7.		SO_4^{-2}	
8.	HPO_4^{-2}		
9.	NH_4^+		
10.		H_2O	

Which is a stronger base, HSO_4^- or $H_2PO_4^-$? _____

Which is a weaker base, Cl^- or NO_2^-? _____

pH AND pOH

Name _____

The pH of a solution indicates how acidic or basic that solution is.

pH range of 0 - 7 acidic
7 neutral
7-14 basic

Since $[H^+]\,[OH^-] = 10^{-14}$ at 25° C, if $[H^+]$ is known, the $[OH^-]$ can be calculated and vice versa.

$pH = -\log [H^+]$ So if $[H^+] = 10^{-6}$ M, pH = 6.
$pOH = -\log [OH^-]$ So if $[OH^-] = 10^{-8}$ M, pOH = 8.
Together, pH + pOH = 14.

Complete the following chart.

	$[H^+]$	pH	$[OH^-]$	pOH	Acidic or Basic
1.	10^{-5} M	5	10^{-9} M	9	Acidic
2.		7			
3.			10^{-4} M		
4.	10^{-2} M				
5.				11	
6.		12			
7.			10^{-5} M		
8.	10^{-11} M				
9.				13	
10.		6			

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 $Ca(OH)_2$

4. 0.030 M HBr

5. O.150 M KOH

6. 2.0 M $HC_2H_3O_2$ (Assume 5.0% dissociation.)

7. 3.0 M HF (Assume 10.0% dissociation.)

8. 0.50 M HNO_3

9. 2.50 M NH_4OH (Assume 5.00% dissociation.)

10. 5.0 M HNO_2 (Assume 1.0% dissociation.)

ACID-BASE TITRATION

Name _____

To determine the concentration of an acid (or base), we can react it with a base (or acid) of known concentration until it is completely neutralized. This point of exact neutralization, known as the endpoint, is noted by the change in color of the indicator.

We use the following equation:

$$N_A \times V_A = N_B \times V_B$$ where N = normality, V = volume

Solve the problems below.

1. A 25.0 mL sample of HCl was titrated to the endpoint with 15.0 mL of 2.0 N NaOH. What was the normality of the HCl? What was its molarity?

_____

_____

2. A 10.0 mL sample of H_2SO_4 was exactly neutralized by 13.5 mL of 1.0 M KOH. What is the molarity of the H_2SO_4? What is the normality?

_____

_____

3. How much 1.5 M NaOH is necessary to exactly neutralize 20.0 mL of 2.5 M H_3PO_4?

_____

4. How much of 0.5 M HNO_3 is necessary to titrate 25.0 mL of 0.05 M $Ca(OH)_2$ solution to the endpoint?

_____

5. What is the molarity of a NaOH solution if 15.0 mL is exactly neutralized by 7.5 mL of a 0.02 M $HC_2H_3O_2$ solution?

_____

HYDROLYSIS OF SALTS

Name _____

Salt solutions may be acidic, basic or neutral, depending on the original acid and base that formed the salt.

Strong Acid + Strong Base → Neutral Salt

Strong Acid + Weak Base → Acidic Salt

Weak Acid + Strong Base → Basic Salt

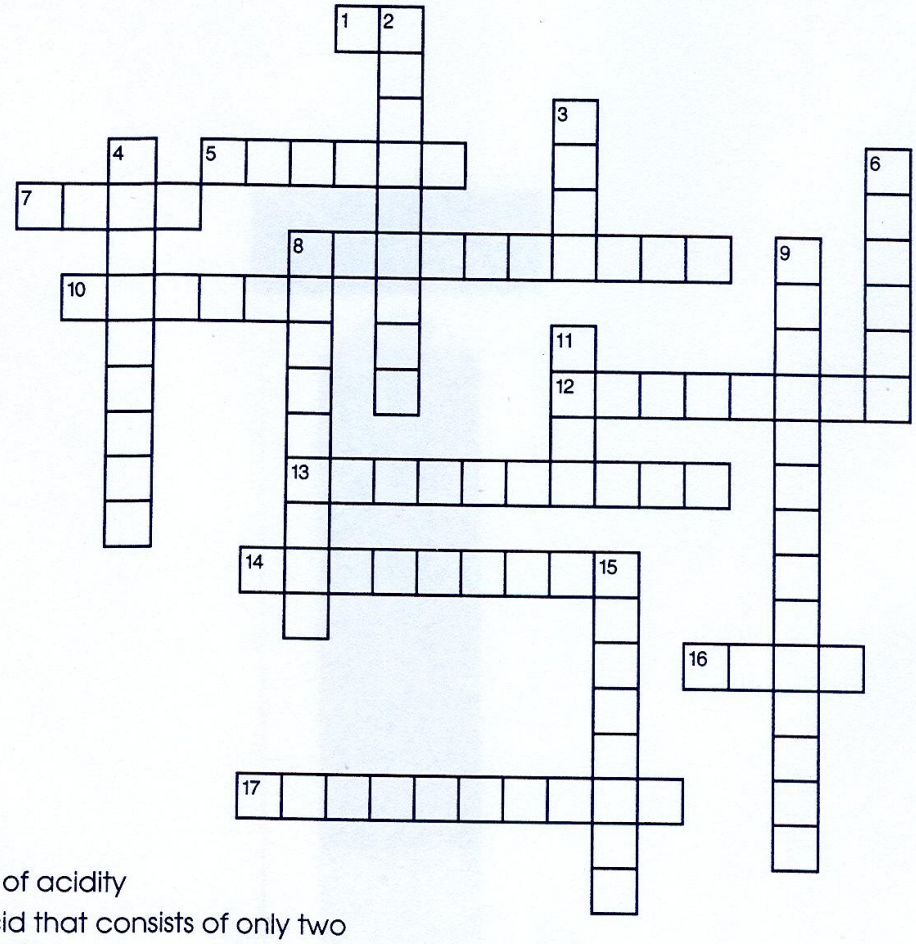
A weak acid and a weak base will produce any type of solution depending on the relative strengths of the acid and base involved.

Complete the table below for each of the following salts.

Salt	Parent Acid	Parent Base	Type of Solution
1. KCl			
2. NH_4NO_3			
3. Na_3PO_4			
4. $CaSO_4$			
5. $AlBr_3$			
6. CuI_2			
7. MgF_2			
8. $NaNO_3$			
9. $LiC_2H_3O_2$			
10. $ZnCl_2$			
11. $SrSO_4$			
12. $Ba_3(PO_4)_2$			

ACIDS AND BASES CROSSWORD

Name _____



Across

1. Scale of acidity
5. An acid that consists of only two elements
7. Substance that forms hydronium ions in water (Arrhenius)
8. This happens when an acid dissolves in water.
10. According to Bronsted-Lowry, an acid is a _____ donor.
12. According to Bronsted-Lowry, a base is a proton _____ .
13. Can act as either an acid or a base
14. These pairs differ only by a proton.
16. An acid with a small K_a value would be a _____ acid.
17. Reaction of an ion with H_2O to produce $H^+(aq) + OH^-(aq)$

Down

2. H_3O^+
3. Formed from the reaction of an acid and a base
4. Procedure to determine the concentration of an acid or base
6. A solution that will resist changes in pH.
8. Changes color at the endpoint of a titration
9. The reaction of an acid with a base
11. Substance that produces hydroxide ions in aqueous solution (Arrhenius)
15. When equivalent amounts of H^+ and OH^- have reacted in a titration