

## Student Learning Map

**Topic:** Chapter 7 Acids

Days: (25)

**Subject(s):**

**Grade(s):** ()

**Key Learning(s):**

Properties and Reactions of Acids

**Optional  
Instructional Tools:**

Lab 7.1, 7.2, 7.3, 7.4, 7.5  
WS 7B, 7C, and Review

**Unit Essential Questions(s):**

What are acidic properties? What types of reactions do acids undergo?

<b>Concept:</b> Reactions of Acids	<b>Concept:</b> Indicators	<b>Concept:</b> Acid Concentrations
<b>Lesson Essential Questions:</b>  How do acids react with metals? ()  How do acids react with carbonates? ()	<b>Lesson Essential Questions:</b>  How can acids be detected in a lab? ()  What are the most common indicators? ()	<b>Lesson Essential Questions:</b>  How is acid concentration controlled in a lab? ()
<b>Vocabulary:</b>  <u>carbonate</u>	<b>Vocabulary:</b>  <u>litmus</u> , <u>bromthymol blue</u> , <u>methyl orange</u>	<b>Vocabulary:</b>  <u>molarity</u>

**Additional Info:**

**Attached Document(s):**





## Part B - Hydrochloric Acid and 4 Different Metals

- \_\_\_\_ 7. Clean all 4 of the test tubes from Part A.
- \_\_\_\_ 8. Place the same amount of hydrochloric acid (HCl) in each of 4 test tubes (about 3 to 5 cm).
- \_\_\_\_ 9. Obtain one piece of zinc (Zn), copper (Cu), aluminum (Al) foil, and powdered iron (Fe).
- \_\_\_\_ 10. One at a time, place one metal in each acid test tube. Be patient. Pluck the test tubes if necessary (especially the aluminum and iron). Note your observation below.
- \_\_\_\_ 10.a. As before, if the test tubes bubble, test the gas with a burning splint.

Test Tube	Metal	Observations in HCl	Gas Test
1	Zinc (Zn)		
2	Copper (Cu)		
3	Aluminum (Al) foil		
4	Powdered iron (Fe)		

## Questions

### Part A - Magnesium with 3 Different Acids and Vinegar

- Generally, what does a metal do when placed in acid ? \_\_\_\_\_
- What might you conclude about the nature of vinegar ? \_\_\_\_\_
- What element is found in the formula of each of the acids used in lab ? \_\_\_\_\_
- The name of the test you used on the gas produced during the lab is called the **burning splint test**. What gas was produced in the bubbling test tubes ? \_\_\_\_\_
- Name one famous catastrophic incident which happened with this gas: \_\_\_\_\_

### Part B - Hydrochloric Acid and 4 Different Metals

- Do all metals react the same in acid ? \_\_\_\_\_
- Explain any differences which you observed: \_\_\_\_\_  
\_\_\_\_\_
- Indicate why copper has been used for years in supply water lines. \_\_\_\_\_  
\_\_\_\_\_

# Acid Word Equations

Name \_\_\_\_\_

## Part A - Metals and Acids

In Lab 7.1, you mixed pieces of metal with different acids. The word equation for this type of reaction is:

Metal	+	acid	----->	salt	+	hydrogen gas
(single word)	+	("acid" in name)	----->	(2 words)	+	(H <sub>2</sub> )

Ex. **magnesium + hydrochloric acid -----> magnesium chloride + H<sub>2</sub>**

You will need the sheet called Acids and the Compounds They Form to determine the name of the "salt" formed. Try the following:

1. magnesium + hydrofluoric acid-->\_\_\_\_\_ + \_\_\_\_\_

2. zinc + sulfuric acid-->\_\_\_\_\_ + \_\_\_\_\_

3. aluminum + acetic acid-->\_\_\_\_\_ + \_\_\_\_\_

4. barium + nitric acid-->\_\_\_\_\_ + \_\_\_\_\_

5. magnesium + phosphoric acid-->\_\_\_\_\_ + \_\_\_\_\_

6. aluminum + sulfurous acid-->\_\_\_\_\_ + \_\_\_\_\_

7. iron + hydrobromic acid-->\_\_\_\_\_ + \_\_\_\_\_

8. aluminum + carbonic acid-->\_\_\_\_\_ + \_\_\_\_\_

9. zinc + chloric acid-->\_\_\_\_\_ + \_\_\_\_\_

10. calcium + hydroiodic acid-->\_\_\_\_\_ + \_\_\_\_\_

## Part B - Salt and Acids

If you mix a salt with an acid, you get a new salt and a new acid. It can be summarized by the following:

Salt	+	acid	----->	new salt	+	new acid
(2 words)	+	("acid" in name)	----->	(2 words)	+	("acid" in name)

**Ex sodium chloride + phosphoric acid -----> sodium phosphate + hydrochloric acid**

Again, you will need the sheet **Acids and the Compounds They Form** to determine the new salt and new acid. Try the following:

11. sodium nitrate + sulfuric acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
12. potassium chloride + nitric acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
13. sodium phosphate + sulfurous acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
14. sodium sulfate + acetic acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
15. calcium acetate + hydrochloric acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
16. barium chloride + hydrofluoric acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
17. aluminum phosphate + perchloric acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
18. silver nitrate + chloric acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
19. sodium sulfide + hydrobromic acid ----> \_\_\_\_\_ +  
\_\_\_\_\_
20. sodium nitrate + chlorous acid ----> \_\_\_\_\_ +  
\_\_\_\_\_

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

## Lab 7.2 - Acids and Indicators

\*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.\*

Procedure	Observations
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### Part A - 3 Acids

\_\_\_\_1. In each of 2 small beakers (50 mL), place about 10 mL of 1.0 M hydrochloric acid (HCl).

Observe HCl: \_\_\_\_\_

\_\_\_\_2. Obtain red and blue litmus paper from your teacher.

\_\_\_\_3. Dip the red litmus paper in the first beaker. Note your observations in the data table below.

\_\_\_\_4. Dip the blue litmus paper in the first beaker. Note your observations in the data table below.

\_\_\_\_5. Add 2 or 3 drops of bromthymol blue indicator to the first beaker. Note your observations in the data table below.

\_\_\_\_6. Add 2 or 3 drops of methyl orange indicator to the **second** beaker. Note your observations in the data table below.

\_\_\_\_7. Rinse both beakers well.

\_\_\_\_8. Repeat steps 1-7 using 1.0 M sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) instead of hydrochloric acid. Note all of your observations in the data table below.

\_\_\_\_9. Repeat steps 1-7 using 1.0 M acetic acid (CH<sub>3</sub>COOH) instead of hydrochloric acid. Note all of your observations in the data table below.

**Data Table A**

Indicator	Hydrochloric acid	Sulfuric acid	Acetic acid
Red litmus			
Blue litmus			
Bromthymol blue			
Methyl orange			

## Part B - Unknown Acids and Indicators

\_\_\_\_10. Using the same procedure as in **Part A**, test the 4 unknown solutions using the same indicators as above. For each unknown, put it in both beakers and test it with all 4 indicators. Complete the data table below.

**Data Table B**

Indicator	Unknown # 1	Unknown # 2	Unknown # 3	Unknown # 4
Red litmus				
Blue litmus				
Bromthymol blue				
Methyl orange				

### Questions

1. What happens when an acid is tested with red litmus indicator paper ? \_\_\_\_\_
2. What happens when an acid is tested with blue litmus indicator paper ? \_\_\_\_\_
3. What happens when an acid is tested with bromthymol blue indicator ? \_\_\_\_\_
4. What happens when an acid is tested with methyl orange indicator ? \_\_\_\_\_
5. Which of the unknown solutions were acids ? \_\_\_\_\_

### Review Questions

6. What happens when certain metals, like zinc, are placed into acids ? \_\_\_\_\_
7. What gas is produced ? \_\_\_\_\_
8. What element is found in the formula of all acids ? \_\_\_\_\_



Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

## Lab 7.3 - Making 3 Concentrations of Acidic Solutions

\*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.\*

Procedure	Observations
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### Part A - Making a 0.01 M Concentration Solution

- \_\_\_\_ 1. Put exactly 99.0 mL of water into a 100 mL graduated cylinder. Use a dropper to make it exact.
- \_\_\_\_ 2. Pour this 99.0 mL of water into a 250 mL erylenmeyer flask.
- \_\_\_\_ 3. Obtain a very small amount of 1.0 M acid in a small beaker from your teacher.
- \_\_\_\_ 4. Using a graduated dropper, take exactly 1.0 mL of this acid out of the small beaker.
- \_\_\_\_ 5. Put this 1.0 mL of acid into the 99.0 mL of water in the flask.
- \_\_\_\_ 6. Swirl the flask. This flask is now 0.01 M concentration.

### Part B - Making a 0.0001 M Concentration Solution

- \_\_\_\_ 7. Put exactly 99.0 mL of water into a 100 mL graduated cylinder. Use a dropper to make it exact.
- \_\_\_\_ 8. Pour this 99.0 mL of water into a 125 mL erylenmeyer flask.
- \_\_\_\_ 9. Using a graduated dropper, take exactly 1.0 mL of the 0.01 M acid you made in Part A out of the 250 mL flask.
- \_\_\_\_ 10. Put this 1.0 mL of acid into the 99.0 mL of water in the 125 mL flask.
- \_\_\_\_ 11. Swirl the flask. This flask is now 0.0001 M concentration.

### Part C - Testing Your Solutions

- \_\_\_\_ 12. Fill a test tube about 1/2 full of the 1.0 M acid solution obtained from your teacher.
- \_\_\_\_ 13. Fill a second test tube to the same height as the first test tube with the 0.01 M acid solution that you made in Part A.
- \_\_\_\_ 14. Fill a third test tube to the same height as the first test tube with the 0.0001 M acid solution that you made in Part B.

\_\_\_\_15. Dip a small piece of pH paper into each test tube. Complete the data table below with both the color that the paper changed to and the relative pH value from the pH paper wheel.

**Data Table**

Acid Concentration	pH Paper Color	pH #	Color with Methyl Orange
1.0 M			
0.01 M			
0.0001 M			

\_\_\_\_16. Add 3 drops of methyl orange indicator solution to each test tube.

\_\_\_\_17. Note the color each turned in the data table above.

### Questions

1. What does "M" stand for in the different solutions ? \_\_\_\_\_
2. Which is the most concentrated, the 1.0 M, the 0.01 M, or the 0.0001 M solution ? \_\_\_\_\_
3. What is the range of the common pH scale ? \_\_\_\_\_
  - 3.a. Draw the pH scale. Label the acid end, and neutral point with numbers.
4. Which pH numbers represent acids ? \_\_\_\_\_
5. What pH number represents a neutral solution ? \_\_\_\_\_
6. Which pH numbers represent strongly acidic solutions ? \_\_\_\_\_
7. Which pH numbers represent weakly acidic solutions ? \_\_\_\_\_
8. Methyl orange turns \_\_\_\_\_ color with in a strongly acidic solution.
9. Methyl orange turns \_\_\_\_\_ color with in a weakly acidic solution.
10. Which appears to be more accurate when trying to determine the pH of solutions, methyl orange indicator or pH paper ? \_\_\_\_\_
11. What should you do if you want to make an acid solution weaker ? \_\_\_\_\_

### Review Questions

12. What happens when copper is dropped into hydrochloric acid solution ? \_\_\_\_\_
13. What element is present in all acids ? \_\_\_\_\_
14. \_\_\_\_\_ litmus paper turns \_\_\_\_\_ color when dipped in acid.