

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

## Lab 7.4 - Bubblers

\*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 - 6 Chemicals

\_\_\_\_1. Rinse 6 test tubes which are approximately the same size.

\_\_\_\_2. Using a scoopula, place a scoop of each of the chemicals below into the test tubes:

Test tube # 1 - Citric acid      Appearance:\_\_\_\_\_

Test tube # 2 - Sodium hydrogen carbonate (sodium bicarbonate)

Appearance:\_\_\_\_\_

Test tube # 3 - Tartaric acid      Appearance:\_\_\_\_\_

Test tube # 4 - Starch      Appearance:\_\_\_\_\_

Test tube # 5 - Potassium carbonate  
Appearance:\_\_\_\_\_

Test tube # 6 - Calcium hydrogen phosphate (calcium acid phosphate)  
Appearance:\_\_\_\_\_

\_\_\_\_3. Fill all the test tubes to approximately the same level (about 1/2 full) with **distilled** water.

\_\_\_\_4. Pluck all the test tubes.

\_\_\_\_5. Note if any bubbled in the **Data Table A**.

\_\_\_\_6. Test each with red litmus paper and record your observations in **Data Table A**.

\_\_\_\_7. Test each with blue litmus paper and record your observations in **Data Table A**.

**Data Table A**

Test Tube #	Substance	Bubbles ?	Red Litmus	Blue Litmus
1	Citric acid			
2	Sodium hydrogen carbonate (sodium bicarbonate)			
3	Tartaric acid			
4	Starch			
5	Potassium carbonate			
6	Calcium hydrogen phosphate (calcium acid phosphate)			

**Questions Part A**

1. Which of these chemicals should bubble when distilled water is added ? \_\_\_\_\_

\_\_\_\_\_

2. In the presence of an acid, \_\_\_\_\_ litmus turns \_\_\_\_\_ color.

3. Which of these chemicals are acids according to the litmus tests ? Indicate their numbers and names please. \_\_\_\_\_

\_\_\_\_\_

**Part B - Mixing Chemicals**

**\*\*Read all of the following instructions before continuing\*\***

For **each** of the combinations of chemicals listed in **Data Table B...**

\_\_\_\_\_ 8. Mix the dry chemicals together in a big, relatively dry, test tube.

\_\_\_\_\_ 9. Add about 10 cm of water to the test tube with the 2 dry chemicals in it.

\_\_\_\_\_ 10. Note in **Data Table B** if the test tube bubbled.

\_\_\_\_\_ 11. **Only if the test tube bubbled**, place a burning splint in the test tube (please note that the test tube is upright in this lab, not upside down as in Lab 7-1). Do **not** do this test unless the test tube bubbled.

\_\_\_\_12. Indicate your observations in **Data Table B**

**Data Table B**

Test Tube #	Substance 1	Substance 2	Did it bubble ?	Results of burning splint test (if done)
1	Citric acid	Sodium hydrogen carbonate		
2	Citric acid	Tartaric acid		
3	Citric acid	Starch		
4	Citric acid	Potassium carbonate		
5	Citric acid	Calcium acid phosphate		
6	Sodium hydrogen carbonate	Tartaric acid		
7	Sodium hydrogen carbonate	Starch		
8	Sodium hydrogen carbonate	Potassium carbonate		
9	Sodium hydrogen carbonate	Calcium acid phosphate		
10	Tartaric acid	Starch		
11	Tartaric acid	Potassium carbonate		
12	Tartaric acid	Calcium acid phosphate		
13	Starch	Potassium carbonate		
14	Starch	Calcium acid phosphate		
15	Potassium carbonate	Calcium acid phosphate		

**Questions Part B**

1. What happened to the burning splint when you performed the burning splint test on these bubbling solutions ? \_\_\_\_\_
2. Which Test Tube numbers should have bubbled ? \_\_\_\_\_
3. What is the name of the gas which is present when this test result is noted ? \_\_\_\_\_
4. What is the formula of this gas ? \_\_\_\_\_
5. In this lab, what 2 kinds of substances are needed to result in bubbles ? \_\_\_\_\_  
\_\_\_\_\_
6. From what you just learned about this gas, what is a probable use for this gas ? \_\_\_\_\_

## Part C - Household Chemicals

- \_\_\_\_\_1. Rinse 2 test tubes which are approximately the same size.
- \_\_\_\_\_2. Using a scoopula, place a scoop of each of the chemicals below into the test tubes:
- Test tube # 1 - Baking powder      Appearance: \_\_\_\_\_
- Test tube # 2 - Alka Seltzer      Appearance: \_\_\_\_\_
- \_\_\_\_\_3. Fill all the test tubes to approximately the same level (about 1/2 full) with water.
- \_\_\_\_\_4. Pluck all the test tubes.
- \_\_\_\_\_5. Note in the **Data Table C** if any bubbled.
- \_\_\_\_\_6. If any bubbled, perform the burning splint test and note your observations in **Data Table C**.

**Data Table C**

Test Tube #	Substance	Did it bubble ?	Results of the burning splint test
1	Baking powder		
2	Alka Seltzer		

### Questions Part C

1. What is probably in baking powder and alka seltzer since they bubbled ? \_\_\_\_\_
- \_\_\_\_\_
2. Why should a can of baking powder be kept tightly closed unless you are taking some from the container ? \_\_\_\_\_
3. Explain why sour milk (which is acidic) and baking soda (which is like baking powder) are used in making some cakes ? \_\_\_\_\_

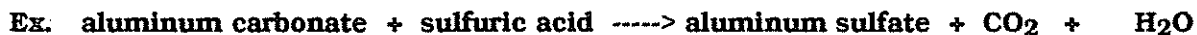
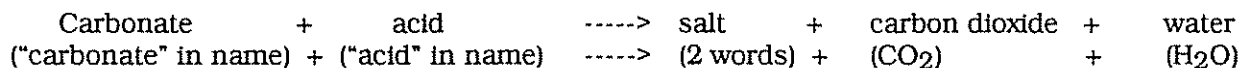
### Review Questions

1. What gas is lighter than air, explosive, and can be produced by putting a metal in acid ? \_\_\_\_\_
2. When methyl orange indicator is placed in an acid, it turns \_\_\_\_\_ color.
3. What pH numbers represent acids ? \_\_\_\_\_
4. Which is the more concentrated acid, 3.0 M, or 0.5 M ? \_\_\_\_\_
5. Which is a more acidic, pH = 2, or pH = 6 ? \_\_\_\_\_

Name: \_\_\_\_\_

## Exercise 7-B: Carbonate and Acids

In Lab 7.4 - Bubblers, you mixed a few carbonates with a few acids. They produced a salt, carbon dioxide, and water. The reaction can be summarized by the following:



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

1. sodium bicarbonate + citric acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
2. barium carbonate + hydrochloric acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
3. potassium carbonate + hydrobromic acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
4. calcium hydrogen carbonate + sulfuric acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
5. iron (II) carbonate + nitric acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
6. magnesium carbonate + chloric acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
7. sodium hydrogen carbonate + acetic acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
8. zinc carbonate + phosphoric acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_
9. barium carbonate + sulfurous acid --> \_\_\_\_\_ +  
\_\_\_\_\_ + \_\_\_\_\_

10. magnesium hydrogen carbonate + perchloric acid  $\rightarrow$  \_\_\_\_\_ +

\_\_\_\_\_ + \_\_\_\_\_

Name:	Partner's Name:
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## Lab 7.5 - Acids and Calcium Carbonate, $\text{CaCO}_3$

\*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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- \_\_\_\_ 1. In a small beaker, obtain about 15 mL of 6.0 M hydrochloric acid (HCl) from your teacher.  
 Appearance: \_\_\_\_\_
- \_\_\_\_ 2. Obtain 3 clean, same size test tubes.
- \_\_\_\_ 3. In the first test tube, place exactly 10.0 mL of the 6.0 M HCl from the small beaker.
- \_\_\_\_ 4. In the second test tube, place exactly 2.0 mL of 6.0 M HCl from the small beaker.
- \_\_\_\_ 5. To the same second test tube, add **exactly** 10.0 mL of distilled water.
- \_\_\_\_ 6. Using a graduated dropper, take **exactly** 1.0 mL from the second test tube, and place it in the third test tube.
- \_\_\_\_ 7. To the same third test tube, add **exactly** 9.0 mL of distilled water.
- \_\_\_\_ 8. You should now have 3 test tubes: the first test tube has 10.0 mL of 6.0 M HCl, the second test tube has 11.0 mL of 1.0 M HCl, and the third test tube has 10.0 mL of 0.1 M HCl.
- \_\_\_\_ 9. Obtain 3 small calcium carbonate chips,  $\text{CaCO}_3$ , from your teacher.  
 Appearance: \_\_\_\_\_
- \_\_\_\_ 10. At the same time place one chip in each of your 3 test tubes.
- \_\_\_\_ 11. Observe for 2 minutes:  
 Test tube #1 (6.0 M HCl): \_\_\_\_\_  
 Test tube #2 (1.0 M HCl): \_\_\_\_\_  
 Test tube #3 (0.1 M HCl): \_\_\_\_\_
- \_\_\_\_ 12. Pour the contents in the sink without the chips going down the drain. Rinse your test tubes well.
- \_\_\_\_ 13. Wipe down your counter area, wash your hands, then take off your goggles and have a seat.

## Questions

1. What do the "M" designations represent ? \_\_\_\_\_
2. Which test tube was the most concentrated ? \_\_\_\_\_
3. Which test tube bubbled the most ? \_\_\_\_\_
4. Which test tube was the least concentrated ? \_\_\_\_\_
5. Which test tube bubbled the least ? \_\_\_\_\_
6. What can you conclude about the concentration of the acid and the degree of bubbling in this lab ?  
\_\_\_\_\_

7. Write the **complete word equation** for the reaction which occurred in the test tubes (hint, write the carbonate first):  
\_\_\_\_\_

8. What would acid rain do to marble statues, buildings, etc. over a long period of time ? \_\_\_\_\_  
\_\_\_\_\_

## Review Questions

1. How can you make a solution less concentrated (which means more dilute) ?  
\_\_\_\_\_
2. Name 2 metals which bubble when placed in acid: \_\_\_\_\_
3. Name 3 metals which would **not** bubble when placed in acid.  
\_\_\_\_\_
4. What is the name of the acid in vinegar ? \_\_\_\_\_
4. If the burning splint test "pops", what gas is present ? \_\_\_\_\_
5. If the burning splint test goes out, what gas is present ? \_\_\_\_\_
6. What color does bromthymol blue turn when added to acid ? \_\_\_\_\_
7. What color does methyl orange turn when added to acid ? \_\_\_\_\_
8. The more concentrated the acid, the (lower / higher) the pH number.
9. When reacting \_\_\_\_\_ and an \_\_\_\_\_, you produce carbon dioxide gas, CO<sub>2</sub>.



Name: \_\_\_\_\_

## Exercise 7-C: Review of Word Equations

The following equations represent all the different types of word equations so far. Use the handout, *Types of Reactions Summary Sheet*, to determine the type of reaction. You will also need the handout, *Acids and the Compounds They Form*, for some of the reactions. Good luck !

1. aluminum carbonate + sulfuric acid ----> \_\_\_\_\_

\_\_\_\_\_

2. sodium bromide + hydrochloric acid ----> \_\_\_\_\_

\_\_\_\_\_

3. lead (II) nitrate + sulfurous acid ----> \_\_\_\_\_

\_\_\_\_\_

4. aluminum + hydrofluoric acid ----> \_\_\_\_\_

\_\_\_\_\_

5. potassium acetate + chloric acid ----> \_\_\_\_\_

\_\_\_\_\_

6. calcium + acetic acid ----> \_\_\_\_\_

\_\_\_\_\_

7. sodium acetate + phosphoric acid ----> \_\_\_\_\_

\_\_\_\_\_

8. copper + sulfur ----> \_\_\_\_\_

9. magnesium carbonate + citric acid ----> \_\_\_\_\_

\_\_\_\_\_

10. silver + iodine ----> \_\_\_\_\_

11. silver nitrate + iron (III) chloride ----> \_\_\_\_\_

\_\_\_\_\_

12. ammonium carbonate + sodium nitrate----> \_\_\_\_\_  
\_\_\_\_\_

13. aluminum chloride + barium hydroxide ----> \_\_\_\_\_  
\_\_\_\_\_

14. magnesium + acetic acid ----> \_\_\_\_\_  
\_\_\_\_\_

15. calcium + oxygen ----> \_\_\_\_\_

16. aluminum bromide ----> \_\_\_\_\_

17. magnesium oxide ----> \_\_\_\_\_

18. hydrogen + fluorine ----> \_\_\_\_\_

19. magnesium perchlorate + sulfuric acid ----> \_\_\_\_\_  
\_\_\_\_\_

20. sodium carbonate + hydrochloric acid ----> \_\_\_\_\_  
\_\_\_\_\_

21. potassium carbonate + nitric acid ----> \_\_\_\_\_  
\_\_\_\_\_

22. calcium + phosphoric acid ----> \_\_\_\_\_  
\_\_\_\_\_

23. aluminum + oxygen ----> \_\_\_\_\_

24. sodium bicarbonate + sulfurous acid ----> \_\_\_\_\_  
\_\_\_\_\_

Name: \_\_\_\_\_

## Exercise 7-D: Chapter 7 Review

1. Most metals react with acids to form \_\_\_\_\_ gas.
2. What type of acid is vinegar ? \_\_\_\_\_
3. \_\_\_\_\_ metal when dropped in acid will **not** bubble.
4. What element is found in all acids ? \_\_\_\_\_
5. When the burning splint test "chirps", what gas is present ? \_\_\_\_\_
6. A compound which shows a definite color change in the presence of an acid is called an  
\_\_\_\_\_.
7. Red litmus paper turns \_\_\_\_\_ color in the presence of an acid.
8. Blue litmus paper turns \_\_\_\_\_ color in the presence of an acid.
9. Methyl orange turns \_\_\_\_\_ color in the presence of an acid.
10. Bromthymol blue turns \_\_\_\_\_ color in the presence of an acid.
11. Which is more concentrated, a 0.5 M  $\text{H}_2\text{SO}_4$  solution or a 1.0 M solution ? \_\_\_\_\_
12. How does a person make a solution more dilute ? \_\_\_\_\_
13. What is the range of the common pH scale ? \_\_\_\_\_
14. What pH numbers represent acids ? \_\_\_\_\_
15. Which is more acidic, a pH = 6, or a pH = 4 ? \_\_\_\_\_
16. Magnesium + sulfurous acid -----> \_\_\_\_\_
17. Aluminum + hydrochloric acid -----> \_\_\_\_\_
18. Zinc + sulfuric acid -----> \_\_\_\_\_
19. Calcium + acetic acid -----> \_\_\_\_\_
20. Barium + phosphoric acid -----> \_\_\_\_\_
21. Potassium sulfate + nitric acid -----> \_\_\_\_\_
22. Silver nitrate + chloric acid -----> \_\_\_\_\_
23. sodium chloride + hydrobromic acid -----> \_\_\_\_\_

24. \_\_\_\_\_ combines with \_\_\_\_\_ to yield carbon dioxide gas, water, and a salt.

25. Carbon dioxide gas will \_\_\_\_\_ a burning splint.

26. What is the formula of carbon dioxide gas ? \_\_\_\_\_

27. Magnesium carbonate + nitric acid ----->

\_\_\_\_\_

28. Potassium carbonate + acetic acid ----->

\_\_\_\_\_

29. Zinc carbonate + phosphoric acid ----->

\_\_\_\_\_

30. Hydrogen + chlorine -----> \_\_\_\_\_

31. Zinc + sulfur -----> \_\_\_\_\_

32. Silver nitrate + potassium bromide ----->

\_\_\_\_\_

33. Iron (II) chloride + lead (II) nitrate ----->

\_\_\_\_\_

34. Sodium chloride -----> \_\_\_\_\_

35. Which solution will bubble more rapidly when chips of calcium carbonate are added; a 2.0 M HCl solution, or a 5.0 M HCl solution ? \_\_\_\_\_

36. What will happen to the pH number of a solution as you add water to it ?

\_\_\_\_\_

NAME \_\_\_\_\_ DATE \_\_\_\_\_

## 12. ACIDS

## DOWN

1. A noble gas (chemical symbol)
2. This element was named after the man who first thought up the periodic table (chemical symbol)
3. A term relating to the ability of acids to "dissolve" different materials by chemical action
5. An acid found in lemons
6. Containing a relatively large amount of solute
8. Atomic number 21 (chemical symbol)
9. A substance that gives up protons to other substances
12. Atomic number 1
13. Atoms of this element have 94 protons (chemical symbol).
16. Chemical symbol for osmium
17. Chemical symbol for europium
20. The removal of hydrogen and oxygen atoms in the form of water
21. Atomic number 70 (chemical symbol)
22. The result when most nonmetallic oxides react with water
24. Chemical symbol for titanium
25. An element named after Einstein (chemical symbol)
26. Atoms of this element have 76 protons (chemical symbol).
28. Acids have this taste.
29. An important component of nitric acid
30. A noble gas (chemical symbol)
32. Atoms of this element have 95 protons (chemical symbol).
35. A strong acid composed of three gaseous elements
38. Stable atoms of this element have 30 electrons (chemical symbol).
39. Atomic number 102 (chemical symbol)
41. Atomic weight = 79.904 (chemical symbol)
42. Atoms of this metal have 13 protons (chemical symbol).
43. Atomic weight = 6.941 (chemical symbol)

## 12. ACIDS

Acetic  
Donor  
Indicators  
Dilute  
Bronsted  
Litmus  
Yellow  
Neutralize

## ACROSS

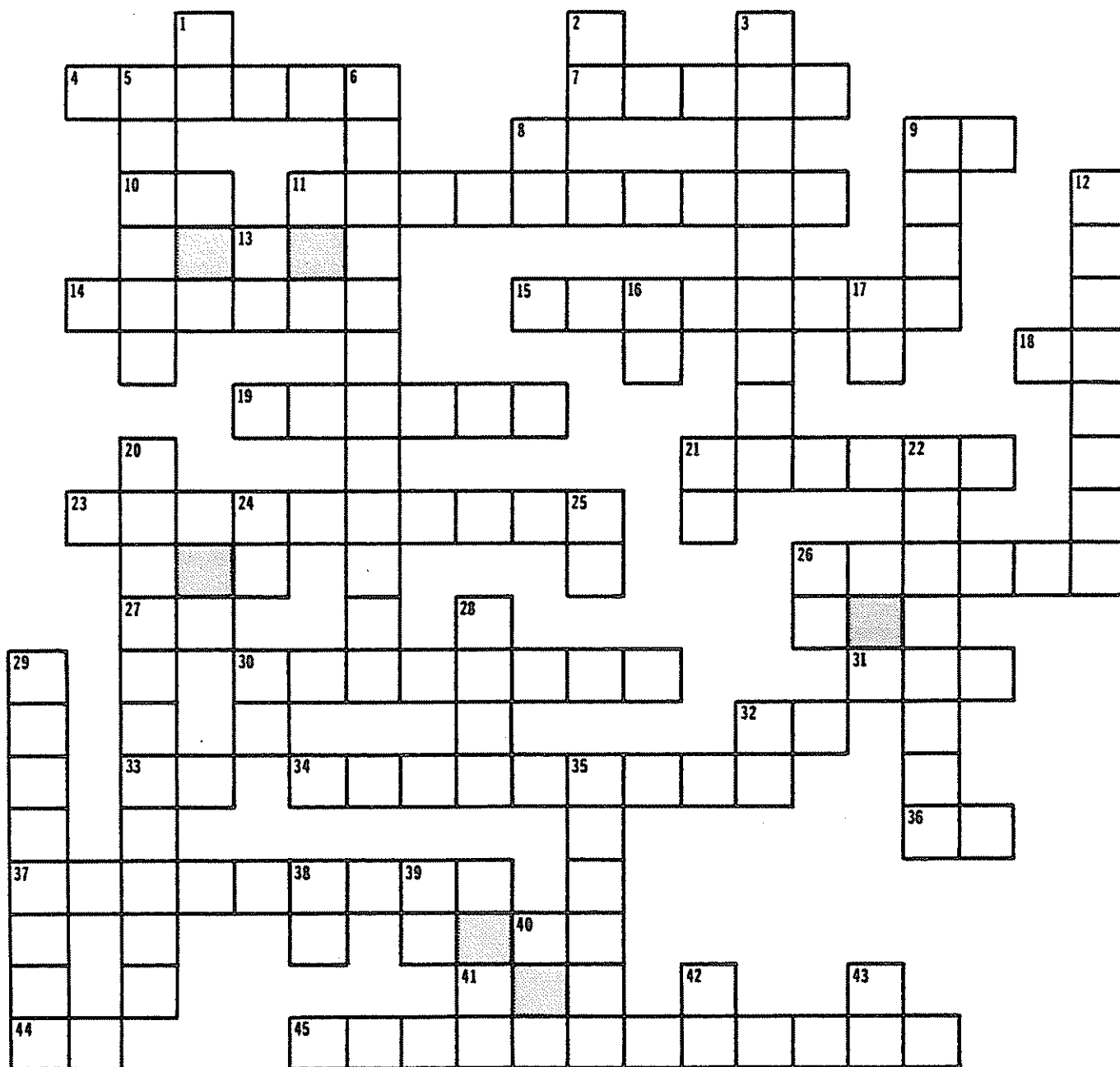
4. An acid found in vinegar
7. An atom that gives up protons is called a proton  
-----
9. Chemical symbol for actinium
10. Chemical symbol for tantalum
11. Litmus is one of these.
14. A solution containing a small amount of solute
15. This Danish chemist advanced the concept that an acid is simply a proton donor.
18. A noble gas (chemical symbol)
19. An indicator
21. Hydrochloric acid turns protein this color.
23. Bases do this to acids.
26. Many elements (excepting the noble gases) form oxides with this element.
27. Atoms of this element have 70 protons (chemical symbol).
30. A type of weak bond sometimes referred to by this element
31. Chemical symbol for hydrochloric acid
32. Atoms of this element have 47 protons (chemical symbol).
33. Poisons are made from this element (chemical symbol).
34. A hydrated proton
36. Chemical symbol for tin
37. ----- agent; the atom or ion that takes up electrons during an oxidation-reduction reaction
40. Stable atoms of this element have 68 electrons (chemical symbol).
44. Atomic weight = 92.9064 (chemical symbol)
45. A very strong acid composed of hydrogen and chlorine

Oxygen  
Hydrogen  
Hydronium  
Oxidizing  
Hydrochloric  
Nitrogen  
Citric  
Dehydrating

Concentrated  
Sour  
Nitric  
Corrosive  
Acid  
Oxyacids

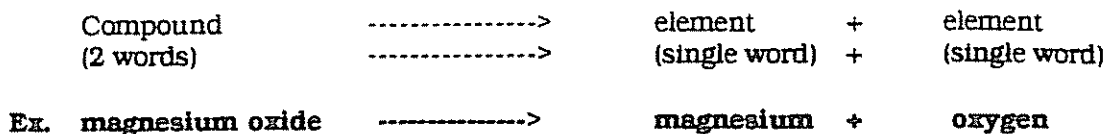
NAME \_\_\_\_\_ DATE \_\_\_\_\_

## 12. ACIDS

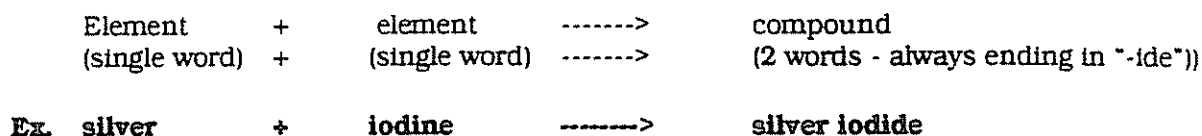


## Types of Reactions Summary Sheet

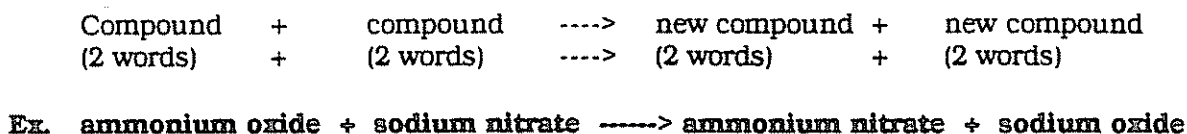
### Decomposition



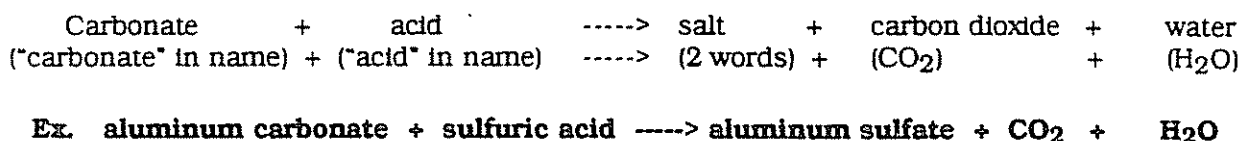
### Synthesis



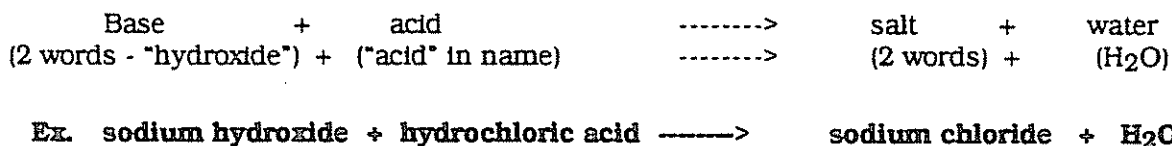
### Double Displacement



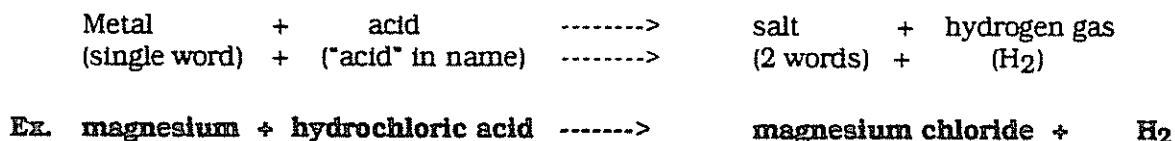
### Carbonate + Acid (need *Acids and Compounds* chart)



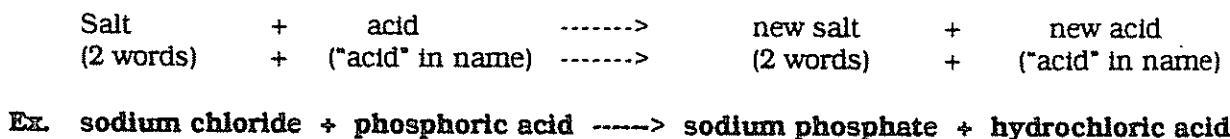
### Base + Acid (need *Acids and Compounds* chart)



### Metal + Acid (need *Acids and Compounds* chart)



### Salt + Acid (need *Acids and Compounds* chart)



## Acids and the Compounds They Form

Name of the Acid	Makes Compound Called...	<u>Formula of the Acid</u>
Acetic	acetate	..... $\text{CH}_3\text{COOH}$
Carbonic	carbonate	..... $\text{H}_2\text{CO}_3$
Chloric	chlorate	..... $\text{HClO}_3$
Chlorous	chlorite	..... $\text{HClO}_2$
Citric	citrate	..... $\text{H}_3\text{C}_6\text{H}_5\text{O}_7$
Hydrobromic	bromide	..... $\text{HBr}$
Hydrochloric	chloride	..... $\text{HCl}$
Hydrofluoric	fluoride	..... $\text{HF}$
Hydroiodic	iodide	..... $\text{HI}$
Hydrosulfuric	sulfide	..... $\text{H}_2\text{S}$
Hypochlorous	hypochlorite	..... $\text{HClO}$
Nitric	nitrate	..... $\text{HNO}_3$
Perchloric	perchlorate	..... $\text{HClO}_4$
Phosphoric	phosphate	..... $\text{H}_3\text{PO}_4$
Sulfuric	sulfate	..... $\text{H}_2\text{SO}_4$
Sulfurous	sulfite	..... $\text{H}_2\text{SO}_3$