

EXPERIMENT 23: ACIDS AND ACID ANHYDRIDES

Equipment: 3 test tubes, 1 gas collecting bottle, 1 deflagrating spoon, stopper, charcoal
Materials: pH papers, phenolphthalein, red litmus paper, blue litmus paper, methyl orange, 20 mL of 3M HCl (hydrochloric acid), 10 mL 3M H₂SO₄ (sulfuric acid), 10mL HC₂H₃O₂ (CH₃COOH) (acetic acid), 4-5 pieces of Zn_(s), 10-20g sulfur and phosphorus

In this experiment you will learn some important properties of acids and one method of preparation. Common household substances containing acids are vinegar (acetic acid) and lemon juice (citric and ascorbic acids).

- A. Test 3M hydrochloric acid (HCl) with red and blue litmus papers and pH paper as follows: Put 10 mL of water into a test tube. Add a drop of the acid. Use a glass rod to transfer a drop of the diluted acid to the litmus paper. Record the result in table I below.
- B. Pour 5 mL. of 3M HCl into a test tube and add 2 drops of phenolphthalein.
- C. Pour 5 mL. of 3M HCl into another test tube and add a few drops of methyl orange. Record the results below.
- D. Repeat "A" "B" and "C" above with 3M H₂SO₄ (sulfuric acid) and 3M HC₂H₃O₂ (acetic acid). Record the results below.

**Table I**

	3M HCl	3M H ₂ SO ₄	3M HC ₂ H ₃ O ₂
Blue Litmus			
Red Litmus			
pH paper			
Phenolphthalein			
Methyl orange			

- E. Place a small piece of zinc in the bottom of a test tube and cover this with 3M HCl. Test the ensuing gas with a burning splint and record the results below. Repeat, using 3M H₂SO₄ and 3M HC₂H₃O₂ in separate test tubes. **Caution: This experiment should be performed in the hood.**

Table II

Zn (metal) +	Which Gas Evolved	RATE of REACTION (Fast, Moderate, Slow)	Reaction Products
HCl			
H ₂ SO ₄			
HC ₂ H ₃ O ₂ or CH ₃ COOH			

F. Put a very small piece of zinc in a test tube. Add 3M HCl. When all of the zinc is consumed in the reaction transfer the solution to a beaker and evaporate to near dryness. **Caution: Watch out for spattering!**

1. How does the residue compare in appearance with the original zinc? _____

2. What is the name of the compound formed? _____

Teacher Demonstrations.

G. Lower a deflagrating spoon containing burning charcoal into a gas collecting bottle one third full of water. After a half minute remove the spoon with the burning charcoal, stopper the bottle and shake. Test with litmus and pH paper.

3. Describe the results. _____

H. Repeat "G" using burning sulfur, then burning phosphorus.

4. Results: _____
5. What type of compound must have been formed in each case? _____

SUMMARY QUESTIONS

6. Complete and balance the following equations:



7. In Part E one of the acids produced hydrogen more slowly than the other two.

Explain. _____

8. What element is present in all acids? _____

9. How can we often tell, just by looking at a formula, if a substance is an acid? _____

CONCLUSIONS

Acids are compounds containing the element _____ which is easily replaced by an active _____. Acids have a _____ taste, and change litmus from _____ to _____. An acid anhydride is a _____ oxide that reacts with water to form an _____ solution.