

EXPERIMENT 40: ESTERS

Equipment: 4 small test tubes, one 150 mL beaker, ring, ringstand, Bunsen burner.
 Materials: 50mL CH₃OH, 10mL of the following: 2 methyl butanol, acetic acid, sulfuric acid, ethanol, butanol, salicylic acid, wooden splints.

In this experiment you will learn how organic esters may be prepared.

WARNING: Sulfuric acid is a powerful dehydrating agent. It can injure your eyes and skin and dissolve clothing. Safety goggles must be worn. Rinse with plenty of water.



PROCEDURE: Set-up a hot water bath inside your hood.
 Keep your test tubes inside the hood as much as possible.

A. In a small test tube place 10 drops of methyl alcohol. Add some salicylic acid, as much as you can put on the end of a wooden splint. Add two drops of concentrated sulfuric acid. Note the odor, if any, of the three materials. Place the test tube in a hot water bath for five minutes.

1. How does the odor compare with that of the original materials? _____
2. What substance has a similar odor? _____
3. What is the chemical name for this material? _____

B. Prepare the following mixtures in small test tubes and heat for five minutes in a hot water bath.

- a. 10 drops of 2 methyl 1 butanol (amyl alcohol) + 5 drops of ethanoic acid (acetic acid) + 2 drops of concentrated H₂SO₄
 - b. 10 drops of ethanol (ethyl alcohol) + 5 drops of ethanoic acid + 2 drops of concentrated H₂SO₄
 - c. 10 drops of butanol + 5 drops of ethanoic acid + 2 drops of concentrated H₂SO₄
4. Describe the products you made in a, b, and c above, in terms of familiar materials.

- a. _____

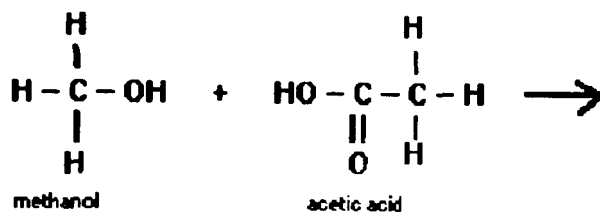
- b. _____

- c. _____

Continue with summary questions on next page.

SUMMARY QUESTIONS

5. What is the general formula for alcohols? _____
6. What is the general formula for organic acids? _____
7. Complete the following:



8. What is the name of **the** compound always produced in a reaction between an alcohol and an acid?

9. What **kind** of an organic compound is produced in a reaction between an alcohol and an acid?

10. Complete the following equations:

alcohol + acid → _____

2 methyl-1 butanol + ethanoic acid → _____

methanol + salicylic acid → _____

butanol + ethanoic acid → _____

ethanol + butanoic acid → _____

1,2,3 propane triol + nitric acid → _____

glycerol + nitric acid → _____

11. Why is sulfuric acid used in making esters? _____

12. If you use 46 grams of ethanol and 30 grams of acetic acid, how many grams of ethyl acetate can you make? (Hint: Look up limiting reagent. Start with a balanced equation.)

13. At STP, 100 mL of the vapor of an unknown ester weighs 0.257 grams. What is its molecular weight? (Hint: Use Mole-y-go round.)
