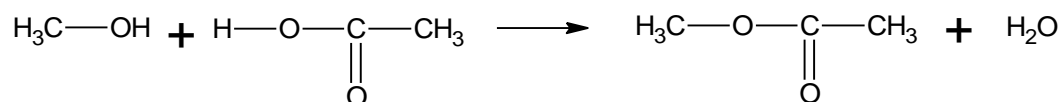


Date: _____**Name:** _____

Many esters have wonderful smells. The esters in rum, pineapple, apple, and banana are examples. Esters are made by the reaction of an alcohol with an organic acid.

For example,

methanol + ethanoic acid → methyl ethanoate + water







Making an ester requires the use of a dehydrating agent, which is a chemical that removes water from molecules. Usually concentrated sulphuric acid is used as the dehydrating agent. The product can be purified but requires a fairly sophisticated apparatus. you will be able to tell you have made an ester by comparing the smell of the reactants to the smell of the products.

Purpose

To produce several esters and observe their odours

Equipment and Materials

- chemical safety goggles
- 500 mL beaker
- utility stand and ring clamp
- hot plate 
- wax pencil
- 4 test tubes
- test-tube holder
- test-tube rack
- Evaporating dish
- Samples of
 - methanol 
 - ethanol 
 - isopropyl alcohol 
 - Salicylic acid
- dropper bottles containing
 - concentrated ethanoic acid (glacial acetic acid), CH₃COOH(l)
 - 2 mL concentrated sulfuric acid, H₂SO_{4(aq)}
- wash bottle containing cold tap water



Use caution around the hot plate. Avoid touching the heating surface with your hands. To unplug the hot plate, pull on the plug itself rather than the cord.



Alcohols are flammable. They should be used only in a well ventilated area. There should be no open flames or other sources of ignition in the laboratory.



The acids are corrosive and flammable. Avoid skin and eye contact. If you spill these chemicals on your skin, wash the affected area with a lot of cool water.

Procedure

1. Put on your safety goggles.
2. Switch on the hot water bath. When the water begins to boil turn the heat down to keep the water simmering.
3. Using a clean dry dropper place 10 drops of glacial acetic acid in a clean, dry test tube. Use a second dropper to add 10 drops of methanol to the acetic acid.
4. Place 5 drops of concentrated sulphuric acid into the test tube. Gently shake the test tube to mix the contents. Carefully smell the test tube and record the results.
5. Heat the test tube containing the mixture for about 5 minutes using the water bath. Remove the test tube from the bath and quickly pour the contents into an evaporating dish half-filled with water. Carefully smell the contents and describe the odour of the product.
6. Repeat steps 3 to 5 using 10 drops of ethanol instead of methanol.
7. Repeat steps 3 to 5 using 10 drops of isopropyl alcohol instead of ethanol.
8. Repeat steps 3 to 5 but use about one-tenth of a test tube of salicylic acid crystals instead of acetic acid. Use 10 drops of methanol and 5 drops of sulphuric acid as before.

Analysis

- a) Write a chemical equation to represent each reaction.
- b) What is the odour of each ester produced?
- c) Use your observations to write a statement about the solubility of esters in water.
- d) What is the function of the concentrated sulfuric acid in the reactions?

Apply and Extend

- e) Suggest a use for each of your products.
- f) What must be done before the esters are used as you suggested in (e)?