

## Lab 8 - Making Scents of Esters

An ester is an organic compound that is formed along with water when a carboxylic acid is reacted with an alcohol. This process is called **esterification**.

The general formula is:



Esterification typically requires a catalyst to speed up the reaction, the catalyst is concentrated sulfuric acid (18M  $\text{H}_2\text{SO}_4$ ). This is a very dangerous chemical which can cause severe burns when it comes in contact with skin. Make sure to have your goggles on at all times during this lab.

**Use the utmost care when handling Sulfuric Acid !**

When carboxylic acid is esterified the result is a liquid with a fruity smell. When smelling the ester in the flask do not put your nose too close to the flask but wave your hand over the flask to direct the smell toward your nose.

### Lab Procedure

There are five stations setup in the lab, you will have 10 minutes at each station to complete the procedure before moving to the next station. Remain at your lab station until told to proceed to the next station.

At each of the 5 stations the you will find:

Hot plate - Be careful it is hot !

400 ml beaker containing 200 ml of water for the hot water bath.

test tubes and test tube holder

plastic pipets

125 ml flask

a carboxylic acid, an alcohol and sulfuric acid.

For each station follow the procedure for the different combination of chemicals given.

After completing all the stations record the data in the table and answer the analysis questions.

**Lab Procedure** – Wear goggles at all times during the lab  
and be careful touching hot test tubes.

### **Station 1**

In a clean dry test tube carefully add the following:

**10 drops of Octyl Alcohol**  
**30 drops of Acetic Acid**  
**2 drops of Sulfuric Acid**

Gently mix by tap it against the palm of your hand as shown.

Place the mixture in the hot water bath for 5 minutes, the mixture should change color.

Pour the mixture into a 125 ml flask containing about 50 ml of cold water, swirl to mix.

Carefully **sniff** the flask but don't place your nose directly over the opening.

Write the reaction here:

Record the data in the table on the next page.

With the cold water running pour the mixture into the sink and rinse out the test tube and flask.

### **Station 2**

In a clean dry test tube carefully add the following:

**10 drops of Amyl Alcohol**  
**30 drops of Acetic Acid**  
**2 drops of Sulfuric Acid**

Gently mix by tap it against the palm of your hand as shown.

Place the mixture in the hot water bath for 5 minutes, the mixture should change color.

Pour the mixture into a 125ml flask containing about 50 ml of cold water, swirl to mix.

Carefully **sniff** the flask but don't place your nose directly over the opening.

Write the reaction here

Record the data in the table on the next page.

With the cold water running pour the mixture into the sink and rinse out the test tube and flask.

### Station 3

In a clean dry test tube carefully add the following:

**10 drops of Isopropyl Alcohol**

**30 drops of Acetic Acid**

**2 drops of Sulfuric Acid**

Gently mix by tap it against the palm of your hand as shown.

Place the mixture in the hot water bath for 5 minutes, the mixture should change color.

Pour the mixture into a 125 ml flask containing about 50 ml of cold water, swirl to mix..

Carefully **sniff** the flask but don't place your nose directly over the opening.

Write the reaction here:

Record the data in the table on the next page.

With the cold water running pour the mixture into the sink and rinse out the test tube and flask.

### Station 4

In a clean dry test tube carefully add the following:

**.5 gms of Salicylic Acid**

**20 drops of Methyl Alcohol**

**2 drops of Sulfuric Acid**

Gently mix by tap it against the palm of your hand as shown making sure the powder has dissolved.

Place the mixture in the hot water bath for 5 minutes, the mixture should change color.

Pour the mixture into a 125 ml flask containing about 50 ml of cold water, swirl to mix.

Carefully **sniff** the flask but don't place your nose directly over the opening.

Write the reaction here:

Record the data in the table on the next page.

With the cold water running pour the mixture into the sink and rinse out the test tube and flask.

### Station 5

In a clean dry test tube carefully add the following:

**.5 gms of Benzoic Acid**  
**20 drops of Methyl Alcohol**  
**2 drops of Sulfuric Acid**

Gently mix by tap it against the palm of your hand as shown making sure the powder has dissolved.

Place the mixture in the hot water bath for 5 minutes, the mixture should change color.

Pour the mixture into a 125 ml flask containing about 50 ml of cold water, swirl to mix.

Carefully **sniff** the flask but don't place your nose directly over the opening.

Write the reaction here:

Record the data in the table below.

With the cold water running pour the mixture into the sink and rinse out the test tube and flask.

Complete the Table :

Station	Alcohol	Drops Added	Carboxylic Acid	Drops Added	Ester Produced	Odor of Ester
1						
2						
3						
4						
5						

### **Analysis**

1. What is the process of Esterification?
2. Why was the Sulfuric Acid added to the mixture?
3. What are Esters commercially used for?
4. Why don't artificial flavors taste the same as natural flavors?
5. If the properties of a chemical say it is "Odorless" do you think that is true? Why