

# SEPARATION OF ALCOHOLS

## LAB GC 1

From Juniata College SIM

### INTRODUCTION

Gases and volatile liquids can be separated by a gas chromatograph, GC. This instrument allows a chemist to separate a mixture, identify the components, and measure the relative quantities of the components. A GC takes advantage of a component's unique interaction with a stationary phase and a mobile phase. The stationary phase is the material found in a coiled column. Helium gas serves as the mobile phase. This experiment uses a GC to separate three different alcohols with the same molecular formula but different chemical properties, referred to as isomers. Because of these different properties, the time required for each of the isomers to pass through the stationary phase, retention time, will be unique. If the temperatures and other conditions remain the same, the retention time of a peak can be used to identify an unknown species

### PURPOSE

The purpose of this experiment is to determine the composition of an unknown alcohol mixture using gas chromatography.

### MATERIALS

gas chromatograph	1-butanol
syringe	2-butanol
Kimwipes	2-methyl-1-propanol
unknown alcohol mixture	

### SAFETY

- Always wear safety glasses in the lab.
- DO NOT misuse the syringes. These are very dangerous, especially when filled with hazardous chemicals.
- The gas chromatograph is like an oven, so the ports and top of the instrument may be hot. Use with caution.

## PROCEDURE

1. When more than one GC is present in the classroom, complete your portion of the experiment on a single instrument.
2. Record the following parameters which have been preset on the gas chromatograph:
  - Column temp:
  - Detector temp:
  - Detector current:
  - Carrier gas flow:
3. Obtain a microliter syringe and a vial of a known alcohol standard, noting its identity. Clean the syringe by rinsing it 3 times with this alcohol. Be careful not to inject any of the rinse back into the vial as this will contaminate the sample. Pull 2 microliters,  $\mu\text{L}$ , of alcohol into the syringe. Wipe the needle with a Kimwipe.
4. Carefully insert the needle of the syringe into the injection port. *At exactly the same time*, one member of the group injects the sample and a second group member presses the **Space-Bar** on the computer.
5. After the peak is recorded, press the **End** key on the computer.
6. Label the chromatogram with your name and the identity of the sample.
7. Repeat ALL of steps 1 - 6 for the other 2 known alcohols and the unknown alcohol.

**DATA SHEET**

Name \_\_\_\_\_

Name \_\_\_\_\_

Period \_\_\_\_\_ Class \_\_\_\_\_

Date \_\_\_\_\_

**SEPARATION OF ALCOHOLS**

**DATA TABLES**

column temperature	
detector temperature	
detector current	
carrier gas flow	

<b>Standards</b>	<b>Retention Time</b>
1-butanol	
2-butanol	
2-methyl-1-propanol	

**UNKNOWN #** \_\_\_\_\_

<b>Unknown Sample</b>	<b>Retention Time</b>	<b>Identity</b>	<b>Peak Area</b>	<b>% in Unknown</b>
Peak 1				
Peak 2				
Peak 3				

## CALCULATIONS

1. Calculate the **total area** of the peaks in the chromatogram of the unknown sample.
  
  
  
  
  
  
  
  
  
  
2. Using the equation given below, calculate the percentage of each component in the unknown sample. Record your results in the data table.

$$\% \text{ component} = \frac{\text{area of component}}{\text{total area}}$$

## QUESTIONS

1. Why is it important to run known samples of the possible components in the unknown mixtures?
  
  
  
  
  
  
  
  
  
  
2. If an alcohol is injected into the gas chromatograph and several peaks are observed, what can be concluded about the sample?
  
  
  
  
  
  
  
  
  
  
3. Why is it important to clean the syringe between samples?
  
  
  
  
  
  
  
  
  
  
4. Why is it important to wipe the needle before injecting the sample into the instrument?
  
  
  
  
  
  
  
  
  
  
5. Why is gas chromatography important to chemists?