ANALYSIS OF MOUTHWASH

LAB GC 2
From Juniata College SIM

INTRODUCTION
Gas chromatography is an analytical method that can separate gases or volatile liquids and allow determination of the relative quantities of the components of the sample. A gas chromatograph, GC, takes advantage of a component’s unique interaction with the stationary phase and the mobile phase. The stationary phase is the material found in the coiled column of the instrument. Helium gas serves as the mobile phase. Commercial mouthwashes are mixtures of water, alcohol, dyes, flavorings, and other compounds, making them well suited for analysis by GC. This experiment will allow the alcohol content of mouthwashes to be determined by gas chromatography.

If 50 mL each of alcohol and water are mixed, the total volume of the mixture will not equal 100 mL. This reduction in volume is due to the attractive forces between the alcohol and water. Since the volumes of alcohol and water are not additive when mixed, a calibration curve must first be prepared to provide the correction needed to determine the quantity of alcohol in alcohol-water mixtures. The calibration curve will be prepared by placing a known amount of alcohol in an alcohol-water mixture. The observed percentage of alcohol will be plotted against the actual percentage of alcohol.

Once the calibration data is collected and plotted, samples of mouthwashes will be analyzed using the gas chromatograph. The observed percentage of alcohol will be determined and the true percentage will be found using the calibration graph. These values may then be compared with the values reported by the manufacturer.

PURPOSE
The purpose of this experiment is to use gas chromatography to determine the alcohol content of a mouthwash sample.

MATERIALS

- ethanol
- 30% ethanol
- gas chromatograph
- 10% ethanol
- mouthwash samples
- 50% ethanol
- 10 µL syringe
- Kimwipes
SAFETY

- An apron and goggles should be worn in the laboratory at all times.
- DO NOT misuse the syringes.
- The gas chromatograph is like an oven, so the ports and top of the instrument may be hot. Use with caution.
- Good laboratory procedure should be followed at all times.

PROCEDURE

1. The gas chromatograph needs time to warm up before it is used. Make sure the instrument is running and proper settings have been made before the laboratory begins. When more than one GC is present in the classroom, complete your portion of the experiment on a single instrument.

2. 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 1 microliter, µL, of alcohol into the syringe. Wipe the needle with a Kimwipe.

3. 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.

4. After the peak is recorded, press the End key on the computer.

5. Click on the Results icon to get the “Results Table”. Find the area under the peak and record the value in the Data Table.

6. Label the chromatogram with your name and the identity of the sample.

7. Repeat ALL of steps 2 –6 for the remaining alcohol standards and the mouthwash sample.

8. Plot % area of alcohol peak (y-axis) vs. % alcohol (x-axis) from the standards. Draw a best fit line. Use this calibration graph to determine the % alcohol in the mouthwash sample.
DATA SHEET  

Name ________________________  
Name ________________________  
Period _______ Class ___________  
Date ___________

ANALYSIS OF MOUTHWASH

DATA TABLES

<table>
<thead>
<tr>
<th>Percent Alcohol (w/w)</th>
<th>Retention Time for Ethanol</th>
<th>Area of Ethanol Peak</th>
<th>Total Area</th>
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<table>
<thead>
<tr>
<th>Brand of Mouthwash</th>
<th>Retention Time for Ethanol</th>
<th>Area of Ethanol Peak</th>
<th>Retention Time for Water</th>
<th>Area of Water Peak</th>
<th>Total Area</th>
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CALCULATION TABLE

<table>
<thead>
<tr>
<th>Brand</th>
<th>Total Area of Peaks</th>
<th>% Area Alcohol</th>
<th>% Ethanol from Calibration Curve</th>
<th>Accepted Value</th>
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QUESTIONS

1. Which brand of mouthwash contained the highest content of alcohol?

2. Which peak was due to the alcohol? How was this determined?

3. What component of mouthwash contributed to the other peak?

4. Why is an oven needed in gas chromatography?

5. How was the gas chromatograph able to separate the components in the mouthwash?