“Protocol, alcohol, and geritol”
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INTRODUCTORY ORGANIC AND BIOCHEMISTRY
WOW, THAT HAS A KICK!
THE ALCOHOL CONTENT OF CONSUMER PRODUCTS

Purpose
The purpose of this lab is to determine the alcohol content of a consumer product using the organic laboratory technique of simple distillation.

Discussion

Alcohols are arguably some of the most important organic compounds. Not only are they prevalent in body chemistry in the guises of carbohydrates, cholesterol, visual pigments such as retinol—just to name a very few—but, their uses extend to many drug formulations such as the anticancer drug, taxol, and the antiemetic, emetrol. Because small alcohols are hydrophilic and such good solvents for water-based solutions, their uses include acting as a solvent for various consumer product formulations. Ethanol, the two carbon alcohol, in particular, is used in products such as after-shave lotion, cologne, liquid cold remedies, mouth washes, not to mention, alcoholic beverages such as beer, wine, champagne, and liquor.

Using the organic lab technique distillation, we can determine exactly how much ethanol is in a consumer product. In this experiment, we are not trying to separate the alcohol from the water in the solution, but instead, to remove these two volatile compounds from the rest of the sample mixture. In effect, we are separating alcohol and water from the rest of the mixture. Because we can’t distill all of the liquid in the sample—destruction of expensive glassware—we will be adding some water to our samples before distillation, and then stopping the process when just this same volume of water remains in the flask.

Once we’ve separated the alcohol and water from the mixture, we can determine the percent composition of the alcohol/water mixture in various ways. In this experiment we will use density. Remember that pure water has a density of 1.00 g/ml, and pure ethanol has a density of 0.798 g/ml at 20^{o}C. Mixtures of these two liquids will have densities between these values, and by reference to tables in handbooks; your measured density can be converted into percent alcohol.

Procedure

1. From home bring a consumer product to test for alcohol content. Check the label to make sure that ethanol is the alcohol present—rubbing alcohol is isopropyl alcohol and will not work, and cough syrups, although they do contain ethanol, don't work well for this experiment due to their thickness.
2. Set up a distillation apparatus as you have in previous experiments. Be sure not to use undue force when inserting the thermometer, and make sure that water is flowing correctly through the condenser and that your thermometer is properly located. Have your set up checked by your instructor.
3. If your sample is carbonated, you will need to shake it in a 500 ml Erlenmeyer flask for 5-10 minutes until the fizzing subsides before proceeding.
4. Remove the thermometer from the still set up, insert a long stem funnel, and pure 50 ml of your sample into the still pot followed by 25 ml of water. Remove the funnel, add boiling chips, and replace the thermometer.
5. Begin heating your flask. Heat strongly at first until a ring of condensing vapors is seen moving up towards the thermometer bulb, then cut back the heat so that the drops of distillate come over at a rate of about one drop per second.
6. Note the temperature of your distillate vapors during the course of the distillation and record your observations in the Observations section of this handout. By the time you have collected 50 ml of distillate, STOP. The temperature should have risen to 98^{o}C to 100^{o}C.
7. Determine the density of the distillate. Weigh an empty 50 ml graduated cylinder and tare. Add 35-45 ml of distillate and reweigh. The mass of your sample divided by its volume is its density. Record.
8. Refer to the alcohol/water density tables provided to determine the alcohol content of your solution. Record.

Observations

1. Nature of sample. Describe your sample—what is the product name, where did you buy it, how much did it cost, what is its color , smell, etc.

2. Distillation. List here any particular observations you made during the distillation process.

3. Distillate characteristics. Describe your final product, the distillate. What color is it? What does it smell like? How much did you get? Etc.

4. Temperature vs distillate volume

Distillate volume (ml)	Temperature (ºC)
1	
10	
20	
30	
40	
50	

Results

5. Density of distillate. Divide the mass of the distillate from step 7 in Procedure by the volume of the distillate.

6. What is the percentage alcohol in your product (use the table provided)?

7. What is the proof of your product?

Conclusions and Comments

Discuss how your experiment went, include comments about what results you expected, problems you encountered, factors that you believe might have affected the results, things you might have done differently. Did this experiment raise any questions that you would like to further explore?