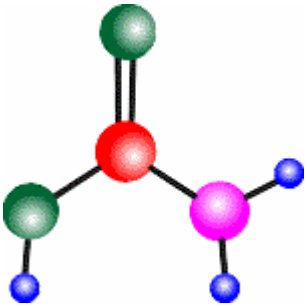
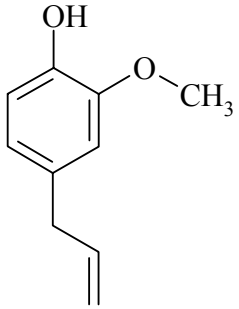


CHM 2210C Lab Manual
Organic Chemistry I



Eugenol

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Safety

The safety rules listed below are very important. By following these rules you help protect yourself and those around you from potential harm. Your own common sense is also important in lab safety. If you have any questions or concerns regarding anything that may cause injury to you or others, bring up your concerns to the attention of your instructor immediately.

Safety Rules

1. Wear safety glasses at all times.
2. Know the location of the safety equipment
3. Never work alone in the laboratory. (In fact do not work in the laboratory at times other than your authorized lab period.)
4. Do not attempt unauthorized experiments.
5. Wear clothing that will provide the maximum possible protection. No open toed shoes or sandals. You will also not be allowed to wear shorts or short skirts.
6. Place items such as books sweaters etc. out of harms way. Aisles should not be blocked.
7. Never eat, drink, smoke or chew in the laboratory. Wash hands thoroughly upon completion of the experiment.
8. Dispose of waste properly.
9. Keep laboratory clean at all times
10. Use the fume hood when toxic vapors may be released.
11. Use good judgment and care when working in the laboratory.
    a) Add concentrated acid to water.
    b) Be careful when inserting glass tubing into rubber stoppers.
    c) Waft fumes gently toward your face.
    d) Never pipet by mouth.
    e) Never point a heated test tube toward you or your neighbor. The contents may erupt and cause serious burns.
    f) Do not heat glassware that is cracked or is severely etched.
    g) Do not leave flames unattended.
    h) Wash chemicals off your skin immediately. If you feel a burning sensation, immediately flush the area with cold water to remove any chemicals.
12. Avoid touching hot objects.
13. Read labels on reagent bottles carefully to make sure they contain the appropriate chemical at the right concentration.
    a) MSD sheets are available if you have any safety concerns about the chemicals
    b) Take what you need from the stock bottles. Do not return unused chemicals to the stock bottles because of the risk of contamination. Discard the excess in the appropriate waste containers.
14. Wash your hands before leaving the laboratory.
15. Report all accidents (Spills that leave your work area or any physical injury) to your instructor.

Material Safety Data Sheets

Material Safety Data Sheets (MSDS) are basic documents that communicate the hazards of chemicals to workers. The Occupational Safety and Health Administration (OSHA) requires MSD sheets be accessible to employees. The information described on MSD sheets can help answer the following questions:

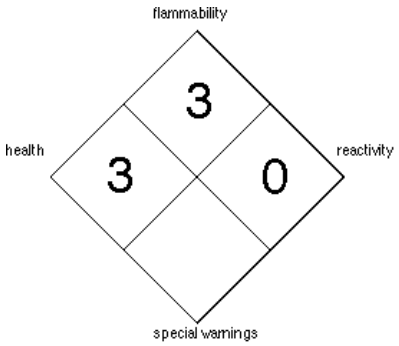
- Is the material toxic?
- Do I need to wear protective clothing?
- Is the material flammable?
- What should I do if it gets on my skin?
- How should the material be stored?

MSD sheets are created by the manufacturer and then are sent to the user. Unfortunately, not all MSD sheets are of the same quality. The amount of information may depend on the manufacturer or on the amount known about that material. Some MSD sheets may also be out of date and not contain the latest information about the substance, for example the latest information about the carcinogenic properties of the substance.

There are two large yellow notebooks in the stockroom area that are labeled MSD sheets. These are available if you are interested in the properties of a chemical. Please get your instructor to help you with this information.

National Fire Protection Agency Codes

On many bottles or packages of chemicals you may see a diamond shaped symbol (often colored with blue red yellow and whit sections) with numbers at each corner. An example is shown below. This system provides information on four areas; health, flammability, reactivity and other hazards from short term exposure to this compound. Each compound is assigned a number between zero and four in each of three areas, health (in blue), flammability (in red) and reactivity with 0 representing the least hazardous and 4 representing the most hazardous. A 4 for the health rating indicates that very short exposure could cause death or serious injury. A 0 for the health rating indicates that the material provides no health hazards beyond that of normal combustible material. Special warnings like a ~~**W**~~ indicates that the compound reacts with water and so should be kept away from water. The code **OX** indicates that the compound is a strong oxidizer and must be kept away from combustible materials. The NFPA codes are not as comprehensive as the MSD sheets but they can alert you to potential hazards.



The Laboratory Notebook

The lab notebook is used as a legal document detailing everything that occurred in the lab. You also use it in lab to keep track of what you have done and what you have to do. It is therefore very important to prepare your notebook well and take meticulous notes.

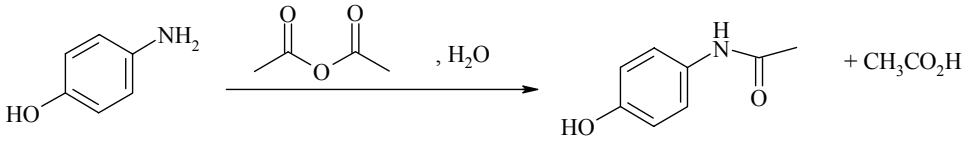
Students are required to purchase a Lab Notebook (NCR paper) from the bookstore. All writing in the notebook should be in non-erasing **black ballpoint pen**.

General Usage Directions

- You will write on the facing pages making a single carbon copy. You will use the periodic table provided with the notebook to prevent multiple copies on several pages.
- The inside cover of your notebook has a place for a table of contents.

Preparing your notebook.

- Title your lab and fill out the top of the notebook page. Include a purpose.
- If we are doing a reaction, write the balanced reaction and underneath the reaction write down any pertinent information (such as bp, fw, expected moles, expected grams, density, volume.) Leave space for actual moles and actual grams. In fact, write down pertinent information for all chemicals for every lab. An example is shown below.



mp:188	bp:138-140	bp: 100	mp:169-172	bp: 118
FW: 109.13	102.09	18	151.17	60.05
	Density= 1.08g/ml			
expected amt: 0.150g	0.165g	0.450 ml	0.207 g	0.082 g
expected moles: 1.37 mmoles	1.62 mmoles		1.37 mmoles	1.37 mmoles
Actual amt _____	_____	_____	_____	_____
Actual moles _____	_____	_____	_____	_____

- Write down a concise but complete outline of the procedure you plan to follow. Remember to leave room to add information or make changes. As you are preparing your notebook, remember to leave room to record amounts that you actually use.
- Make a drawing of the apparatus you will use.

Using your notebook in lab

- Your notebook will contain all of your calculations, observations and measurements. Every measurement and observation and mistake should be recorded. Even your reasoning should be recorded. Example: "We started over because we dropped the reaction flask." Each entry should be labeled in a meaningful manner that indicates the part of the experiment that corresponds to the entry.
- Because a lab notebook is a working document, it will most likely contain errors. Errors should have a single line drawn through them. There should be no erasures or white out used in the lab notebook. .
- At the end of the lab period, sign and date each page and then let your instructor verify & initial your notebook.

Lab Reports

Your lab grade is based on your lab reports so make them good. Reports should be typed and in the format shown below. Attach your yellow sheets to your report.

Lab reports are written in the third person. You would write, "The metal sample was weighed." and not "I weighed the metal sample."

The format:

The first page must include the title of the lab, your name, the course number and section, the date and the purpose of the lab.

Purpose: The purpose of the lab. The purpose could be "To synthesize aspirin from salicylic acid" or "To determine the density of an unknown solid." The purpose is not phrased as a question but the questions we are asking for in the sample purposes are "Can we make aspirin from salicylic acid and in what yield?" and "What is the density of the object?"

Some labs have more than one purpose such as "to determine the density of an unknown and from that determine the composition."

Procedure & apparatus: A description of the procedure. It should include any modifications to the experiment. Be sure to describe or draw any important or interesting apparatus.

Data. This section contains all observations, including tables with measurements. You may wish to include the Rfs here.

Calculations: This is where you show how you did your calculations. If you did many density calculations you only have to show one sample calculation. You will have to show an example for each type of equation. (Density, percent error,...) Usually, this is only a % recovery or % yield equation. Show all your work.

Example: $d = \frac{m}{V} = \frac{64.67\ g}{7.25\ ml} = 8.92\ g/ml$

Discussion. A section that describes your results and how good you think your results are. *(For example: Although the density of my metal is close to the literature value for gold my results varied widely and the sample did not look like gold.)* You may want to begin this section with the statement; " My data is good (or bad) because…"

Example: The density of the solid is 8.80 g/cm^3 and is reddish colored. The solid has been identified as copper, which has a known density of 8.96 g/cm^3. My results are good because my %error was only 1.35%.

Error Analysis: Every lab has problems associated with them that potentially affect the outcome of the experiment. We refer to these problems as sources of error. They are parts of the procedure where

1) Our experimental value is changed from the correct value either by mishap or by something out of your control or
2) The yield or purity of the product was reduced.
3) If you repeated part of an experiment and did not use data, you should not use the error from that trial in your error analysis.

They are not personal confessions. No procedure is free of errors so this section does not necessarily represent something you did wrong, although it might. For example, if you dropped a flask and spilled 70 % of the reaction that would certainly be a error. Again you are not here to confess. The problem in this case would be, "the flask was dropped," not "I am a big klutz."

You are required to determine your 3 most significant sources of error. Using complete sentences, write down what the error was, and how it affected your result. For example: if you are measuring density how did your error affect your calculated density? It is a good idea to write down errors during lab in your lab notebook. It will make it easier to write your report.

While anybody can make an incorrect measurement reading, they are usually not one of the 3 most significant errors and should not be included in your report.

A better example: In step 5 of the procedure, the graduated cylinder was not completely dry and so the volume recorded was slightly higher that the actual volume of the sample. This would result in a slight decrease in the experimental measurement of density.

Modification: An error often has a good modification that can fix the problem. For example, a modification that fixes the error might be, "Drying the cylinder in a drying oven before use would give a more accurate volume measurement."

Conclusion: The conclusion is the answer to the problem posed in the purpose. If the purpose is "To determine the density of water.", then the conclusion could be, "From my experiment, the density of water is .949 g/mL."

Answers to the post laboratory questions: Answers to the post laboratory questions.

A note on cheating and plagiarism: While you often work in pairs in the laboratory, you must write your lab reports individually.

Individuals who turn in reports with some or all of the same wording will receive a failing grade for the assignment (1st offense), or the class (2nd offense).