LAB REPORT INFORMATION

Lab reports will be due one week from the date of the experiment, before the lecture begins. Lab reports must be typed; chemical structures and calculations in the report may be handwritten, but should be in ink. *Late lab reports will not be accepted.* Most labs are conducted individually and thus the lab reports should be written individually. Academic dishonesty will not be tolerated and may result in zero credit on the report or dismissal from the course.

The lab reports should not take more than about an hour to write. If you find yourself getting stuck on parts of the report and grinding away at them for hours on end, chances are you are not making good use of your time. A good habit to adopt is to attempt the report a day or two after completing the lab, so you have time to ask questions on the difficult parts. I am more than happy to help people on the labs, but I am not terribly responsive to emails received the night before the lab is due. In general, students that ask questions about the difficult or confusing parts of the lab tend to score two or three letter grades higher than those who put the report off until the last minute and run into problems. Each lab report should contain at least the following sections:

INTRODUCTION
The introduction is like an abstract, and is a sentence or two summarizing the experiment.

EXPERIMENTAL
The experimental section is not the place for a recap of the procedure detailed in the lab manual. Rather, it is a short section telling what you did in the lab. This section needs to be written in past tense and third person. The experimental section does not need to be long, but needs to be detailed enough that another person could use it to replicate your results. You should be sure to include details like amounts, temperatures, reaction times, and the like in the experimental section.

RESULTS
This section contains the results of your experiment. It will be mostly data (quantities, physical properties, etc.), and the calculations appropriate to the lab. For large amounts of data, a table is appropriate. Some labs will require preparing a graph or plot of data.

DISCUSSION
The discussion section rationalizes your observations and your results. The results section is where the numbers go, and the discussion section is where you make sense of them. This section is not the place for a lengthy discourse on the theory of the lab or a repetition of the printed procedure. In this section you will offer a couple reasons why your results turned out the way they did. General things to consider may include equilibrium position, reaction rate, material loss in the equipment, limitations of the technique, and so on. Good results must be explained as thoroughly as bad ones.

QUESTIONS
The questions posed in the lab are meant to pose a challenge and to ensure understanding of the important concepts behind the lab. Their answers should be through and complete. Implicit in every question is "Why?" and a one or two line response is rarely, if ever, adequate.

SAMPLE LAB REPORT

INTRODUCTION
In this lab, ethylbenzene is oxidized to benzoic acid by potassium permanganate.

EXPERIMENTAL
To a 500mL round-bottom flask, 5.6g of $KMnO_4$, 60mL water, 1.0mL ethylbenzene, and 0.3 mL 3M NaOH were added. This solution was heated at reflux for 90 minutes. The reaction mixture was allowed to cool to room temperature and solid $NaHSO_3$ in portions until the solution was no longer a purple color.

The solution was vacuum filtered and the filter cake was washed with two 5 mL portions of hot water. The filtrate was concentrated to approximately 15 mL by boiling off the water. The resulting solution was slowly acidified with concentrated hydrochloric acid. This mixture was then cooled in an ice-water bath. The solution was vacuum filtered to isolate the crude benzoic acid.

The crude benzoic acid was dissolved in a minimum amount of boiling water (about 4 mL). The solution was then allowed to cool slowly to room temperature and then in an ice-water bath. The recrystallized benzoic acid was then collected by vacuum filtration.

REACTIONS

$$2\,MnO_4^- + 3\,HSO_3^- + H_2O \rightarrow 2\,MnO_2 + 3\,HSO_4^- + 2\,OH^-$$

$$PhCH_2CH_3 + 4\,MnO_4^- \rightarrow PhCO_2^- + CO_2 + 4\,MnO_2 + 3\,OH^- + H_2O$$

RESULTS

Compound	MW (g / mol)		Amount	mmol
ethylbenzene	106.17	density = 0.867	1.0 mL	8.17
benzoic acid (crude)	122.12		0.20 g	1.64
benzoic acid (pure)	122.12		0.10 g	0.82

Yield of reaction = 1.64 mmol / 8.17 mmol = 20.1%
Yield of purification = 0.82 mmol / 1.64 mmol = 49.9%

DISCUSSION
The initial oxidation of the arene side chain is a difficult step in the oxidation process. This is evidenced by the poor yield of crude benzoic acid isolated from the reaction mixture. Since this reaction is kinetically somewhat slow, the yield of the oxidation reaction could have been improved by refluxing the reaction for a longer period of time. The yield from recrystallization was also low. This likely resulted because too much water was used to dissolve the crude benzoic acid. When the solution was cooled, excess product was lost due to solubility in the cold water.

QUESTIONS