PROCEDURE FOR LABORATORY NOTEBOOK
ORGANIC CHEMISTRY

The laboratory notebook is an important tool in preparing for an experiment, recording data and observations during an experiment, and assessing results after an experiment has been completed. The format described in this handout is only one of several possible formats.

*Note that a significant portion of the notebook must be prepared in advance of each experiment.*

Lab notebooks are a tool. Don't be afraid if this tool gets dirty! Record all data on these pages - never temporarily on paper towels or on your shirt sleeve! If your penmanship is not great, you need to cross out a mistake, or you spill some water on the notebook, do not be concerned. This is a *working* document. Your goal is to complete a lab notebook so that another chemist could reproduce your work and get similar results.

All notebooks MUST be written in *ink*. Errors are to be crossed out with a single line. No erasing! No whiteout! Notebooks are written in bound books of sequentially numbered pages where no pages can be removed for any reason.

*Purchase TWO bound, composition-style notebooks for use in the lab. These books are bound so that no pages can be easily removed. Label the cover of each notebook with "Organic I Lab Notebook", along with your name, section, and instructor's name. Label one notebook with "Notebook A", the other with "Notebook B." Label the first three pages of each book with the heading "Table of Contents." You will build the Table of Contents on these pages as the semester progresses. Following the Table of Contents, number each page consecutively, using both sides of each page. Your instructor will inform you when to use Notebook "B." The use of two notebooks will allow the instructor to occasionally collect one notebook for grading while the student can prepare the other notebook for the next experiment.*

A suggested notebook format, along with some examples, is given below. Label each portion of your lab report with the headings given in capital letters.

If you choose to use an alternative format, you must include all pertinent information as described in these sections.

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The following sections **MUST** be completed **BEFORE** entering the lab.

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**EXPERIMENT TITLE:** List the title of the experiment and enter the title and page number in your Table of Contents at the front of your notebook.

**PURPOSE:** Briefly state the purpose of the experiment in a few sentences. Example: "The purpose of this experiment is to synthesize aspirin from salicylic acid and acetic anhydride".

**REACTIONS:** Write a balanced equation for any reactions that occur in the procedure. These should include the main reactions as well as any predicted side reactions. These reactions should be written as structures, not names, whenever possible. Think about potential mechanisms for these reactions and note any of these thoughts here.

**QUANTITIES and CONSTANTS:** Prepare a Table of quantities and physical constants. You will be issued a blank form that must be completed and be ready for inspection at the start of the lab. Be sure to leave a page in your lab notebook blank, just prior to your procedure section, so this completed form can be affixed after your instructor has approved it. Look up the needed data in the *Handbook of Chemistry and Physics* or the *Merck Index* (available from the library or the instructor) or from the Internet. Be sure to list the literature source of your reference data. The table should include the name and quantity (grams and moles) of any substances to be used, their molecular weights, and the solubility of these substances. Also include (as applicable) the density, melting points or boiling points of the substances. Note any anticipated hazards and any "Do's or Don'ts". Proper waste disposal techniques and clean-up information may be written here. *Data for the expected product should appear here also.*
PROCEDURE: This section of your notebook will provide an efficient outline of the work to be performed without having to constantly refer to the text. Quite often, your instructor will issue a "Modifications and Alert " handout a week in advance of the experiment. Be sure to incorporate any changes into your written procedure. Draw a line down the center of the page in this section. Label the left column as "Procedure" and the right column as "Observations/Modifications." The "Procedure" section is prepared prior to lab by reading the text procedure and translating this procedure into brief, stepwise instructions in this column. Write this in the third person; example: "Recrystallize the product" is better than "I will recrystallize the product". Leave several lines between each step.

The next section must be completed DURING the lab.

OBSERVATIONS/MODIFICATIONS: The "Observations/Modifications" side of the line discussed above will be completed in lab after each step has been completed (see attachment). It is important that actual quantities and pertinent observations such as colors, temperatures and test results be recorded here. A Table may be appropriate here for some types of experiments. Use as much additional space here as necessary.

The following sections may be completed outside of the laboratory session.

CALCULATIONS: Most experiments require some calculations. Theoretical yield and percent yield calculations appear in this section. SHOW the way that you set up these calculations, including units and conversion factors. Do not just record final answers. Be sure to always show units. Example:

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\text{5.00 g aniline} \times \left( \frac{1 \text{ mol aniline}}{93.1 \text{ g}} \right) \times \left( \frac{1 \text{ mol acetanilide}}{1 \text{ mol aniline}} \right) \times \left( \frac{152.0 \text{ g}}{1 \text{ mol acetanilide}} \right) = 8.16 \text{ g}
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QUESTIONS and EXERCISES: The assigned questions from the syllabus appear in the text. Briefly rewrite these questions and answer them completely.

CONCLUSION: Summarize your results and draw conclusions from the experiment using complete sentences in a narrative form. Did you prepare the proper substance or perform the experiment properly? Mention any data that will substantiate this. Always include your yield data (grams and percent) and any other pertinent data collected (melting point, etc). If your yield was low, discuss any possible sources of error. Can you suggest any improvements in the procedure? If you were given an unknown, always include the unknown code with your analysis.

SAMPLE: "Acetylsalicylic acid was synthesized from salicylic acid. The yield was 5.32 grams, which represents a 76% yield. The melting point of the acetylsalicylic acid was determined to be 131-134 °C which is slightly below the literature data of 135-136 °C, indicating the presence of impurities. The crystals were white and powdery in appearance, but did give a slight purple color on testing with ferric chloride, indicating the presence of some unreacted salicylic acid in the product.

SUBMISSION OF SAMPLES
You will be informed whenever a substance you have prepared or isolated must be submitted. A small, labeled sample vial containing your substance must be placed on the instructor's desk. The label MUST contain your name, the chemical identity of the substance, the gram yield and percent yield, and the melting / boiling point obtained for your sample (NOT the literature value). Be careful not to count the mass of your sample vial in your yield. Be aware that your instructor routinely reweighs your sample and even occasionally verifies your reported results.