

GUIDELINE FOR WRITING LAB REPORTS IN LABORATORY NOTEBOOK

The laboratory notebook is the primary record of the work you accomplish in the laboratory. It should be well organized, **legible**, and an **accurate record of your work**.

ALL PARTS OF THE LABORATORY REPORT MUST BE HANDWRITTEN INTO YOUR LABORATORY NOTEBOOK. **NO** TYPEWRITTEN OR COMPUTER GENERATED PARTS OF THE LABORATORY REPORT WILL BE ACCEPTED BY YOUR LABORATORY INSTRUCTOR!!

1. Use a **hardcover or softcover bound gridded composition book with numbered pages and tear-out carbon-copy duplicate pages**. Write your name, address, course number, section number and lab instructor's name on the cover.
2. Start a new experiment on a fresh page. **Make all entries in ink** - never in pencil.
3. **Hand-write directly in the notebook** not on scraps of paper; do not tear out pages (except to hand in laboratory reports to lab instructor – there **MUST** always be the duplicate record remaining in your lab notebook). Record a complete, accurate account of all experiments and results. Show all calculations. Follow guidelines for writing a laboratory report shown below.
4. Never erase incorrect entries; merely draw a line or two through blank spaces and/or incorrect words so that they are still legible.

Guidelines for writing a laboratory report

The laboratory report is divided into 2 parts:

- I. Pre-laboratory notes (to be turned in at the beginning of the laboratory period) & In-laboratory data (to be turned in at the end of the laboratory period)
- II. Post-lab (to be turned in at the beginning of the next laboratory period EXCEPT when noted)

The entire report should be no longer than 4-6 handwritten pages using the format shown below.

I. PRE-LABORATORY NOTES & IN-LABORATORY DATA

Guidelines for writing the Prelab Notes for Each Experiment

(NOTE: YOU MUST HAVE THE PRELAB AND PROCEDURE WRITTEN UP **BEFORE** YOU COME INTO THE LAB FOR EACH OF YOUR LABORATORY SESSIONS). YOUR LABORATORY INSTRUCTOR WILL NOT ALLOW YOU INTO THE LABORATORY UNLESS YOU HAVE THE PRELAB NOTES AND PROCEDURE COMPLETED.

1) Title of Experiment: You will have to write the title of the experiment and **follow** it with a reference.

References:

If you used the procedure from the textbook, then the Reference would be the pages of the book from which you wrote the procedures, followed by the author's name and the title of your textbook.

Example: Synthesis of Cyclohexanone from Cyclohexanol (Reference: pg. 317-319 Williamson, K. Macroscale and Microscale Organic Experiments

If you used a handout, then the Reference would be "Chemistry 311 Handout".

2) Prelab Questions:

If assigned, the prelab questions will be listed in lecture and/or the website every week under the "Announcement" link (on the Thursday prior to the beginning of the experiment on the following Tuesday). To answer these questions, you may write your answers in partial sentences. It is **highly** recommended that you write out the questions in your laboratory notebook and then answer them since this will be a record of the questions for you to study from. Many questions on the exam are taken directly from the assigned prelab questions.

3) Statement of Purpose: For the first 5 experiments, you are learning new techniques so one of your purposes would be to learn a particular technique (look at the title of your experiment). There also would be additional purposes that you will have to include - you will learn your purpose in lecture and by reading the experiment. The statement of purpose should be brief (1-2 sentences).

4) Pertinent balanced equation(s) for the reaction(s) using structures and names of reactants and products. Equations for important side-reactions should also be included. **You will start writing these out from Experiment #6 onwards.**

5) Sketch of the apparatus: You will be informed of which sketch to draw during the lecture.

6) Table of Reagents: You have to list physical characteristics of compounds you use in the experiments. General rule of thumb: solids - you will need name, molecular weight, melting point and solubility. Liquids - you will need name, molecular weight, boiling point and density. In order to know whether a compound is a solid or liquid - if a compound has a melting point over room temperature, it is a solid. Otherwise, it is a liquid. Sources where you can get the information is listed in the "Laboratory Notebook" part of the syllabus. Look at table below:

Name	Mol. Wt. (g/mol)	Melting Point (°C)	Solubility	Boiling Point (°C)	Density (g/mL)
Urea	60.06	135	Soluble in water		
Methanol	32.04			64.6	0.791

From Expt. #7 onwards: you will need a table of reactants (for starting materials used) as well as table of products (for MAJOR AND SIDE products) INSTEAD of a table of reagents. You will need similar information as the table of reagents AS WELL AS g used and moles used for table of reagents and theoretical yield (for MAJOR PRODUCT ONLY) for table of products. See example below.

Table of reactants

Name	Mol. Wt. (g/mol)	Melting Point (°C)	Solubility	Boiling Point (°C)	Density (g/mL)	Grams used	Moles used
Cyclohexanol	100.16			161	0.96	0.150	0.0015
Acetic acid	60.05			117.9	1.05	0.080	0.0013

Table of products

Name	Mol. Wt. (g/mol)	Melting Point (°C)	Solubility	Boiling Point (°C)	Density (g/mL)	Theoretical yield (g)
Cyclohexanone	98.14			98.1	0.97	0.147

7. Brief outline of expected experimental procedure. PUT THIS PART ON A SEPARATE PAGE. You should divide the page into two columns. Write the outline on the left side of the page. The right side of the same page can be used for recording the In-laboratory observations and comments that are pertinent to each procedural step. Make sure that procedure is brief!! NOTE: Write procedure according to sequence in laboratory textbook NOT the “Hints for preparation”. MAKE SURE you read the “Extra Notes” listed under the “Announcement” link every week to see if steps are being added or omitted.

See example below:

The procedure from Synthesis of Tetraphenylcyclopentadienone on pg 619 (**part of** first paragraph) is written in outline form. Notice that many extraneous comments are omitted.

Procedure	Observations
1. Place 42 mg benzil, 42 mg 1,3 diphenylacetone and 0.4 mL triethylene glycol in a test tube.	
2. Clamp tube over hot sand bath, insert thermometer and heat until benzil is dissolved.	
3. Remove tube from heat and add 0.20 mL of Triton B at reaction temperature of 100°C	

In Laboratory Data

In-laboratory data should include:

1. The code letters or numbers of any assigned unknowns.
2. A precise record of all experimental data including weights, volumes, boiling point ranges, melting point ranges and other measurements pertinent to the experiment.
3. Your observations and comments for each procedural step. These should include changes in color, texture, clarity of solution, temperature, smell etc.

NOTE: A large number of points for each lab report will be attributed to the observations you make. Experimental work depends VERY heavily on accurate observations.

An example of observations is shown in procedure table below.

Procedure	Observations
1. Place 42 mg benzil, 42 mg 1,3 diphenylacetone and 0.4 mL triethylene glycol in a test tube.	Benzil: yellow crystalline solid, Weight: 40.5 mg 1,3-diphenylacetone: white powdery solid, Weight: 41 mg Triethylene glycol: clear, colorless, viscous liquid Volume: 0.4 mL Appearance of mixed solution: benzil forms a yellow suspension in clear solution
2. Clamp tube over hot sand bath, insert thermometer and heat until benzil is dissolved.	Benzil dissolves in solution when heated to form yellow clear solution at 120°C

Note: The Prelab notes must be turned in to your lab instructor at the beginning of the lab period and the In-Lab data must be turned in to your lab instructor at the end of the laboratory period. Failure to turn in the prelab at the appropriate time may result in significant deduction of points or it not being graded.

II. POST LAB

Post Laboratory Reports should include the following:

1. Post Lab Questions - if assigned. **The list of post lab questions will be listed every week in lecture and /or the website under the “Announcements” link.**

2. Analysis of experimental data - this will vary with the type of experiment. Include when appropriate:

(a) specified calculations using experimental data. For experiments involving a synthesis, the theoretical and percent yield of the product(s) should be calculated.

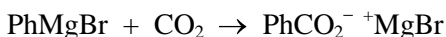
(b) Graphs using data from experiments and an analysis of graphs

(c) Results from analytical techniques like TLC, melting points, IR, NMR and explanations of results. (This can also be shown in the discussion section).

3. A discussion of these results.

(i) Each observation in the in-lab report should be explained. If an observation was a result of a chemical reaction, the balanced equation and mechanism (if applicable) should be used to explain the observation.

Example: When phenylmagnesium bromide was added to dry ice, there was initial fizzing until the excess dry ice evaporated. The reaction is represented by the following equation and mechanism.



(ii) In experiments involving synthesis, techniques used must be explained (Example: Simple distillation was used to separate cyclohexanone from cyclohexanol and water. Simple distillation was used because cyclohexanone and cyclohexanol have a large boiling point difference).

(iii) Comparison of products to accepted literature values - conclusion derived from the deviation from or similarity to literature value.

(iv) Possible sources of error to explain why product yield deviated from theoretical yield

4. A statement regarding the conclusions that can be drawn from these results.

Often, there are different requirements for the postlabs for the different experiments – detailed information is provided during the lecture.

Note: Postlab of an experiment must be turned in at the beginning of the subsequent lab period before beginning the next experiment EXCEPT when noted. Late postlabs may result in significant deduction of points or may not be graded.

