# NOTEBOOKS

## A. General.

The notebook to be used in the laboratory is the "**LABORATORY RESEARCH NOTEBOOK**," available from Laboratory Supplies (4-450). It has 100 pairs of duplicate numbered pages (each white page being followed by a blue page, perforated at the side for easy removal). No carbon paper is necessary. Supplementary material including spectra, graphs, etc. should be assigned a number when they are first produced, referenced in the notebook and submitted with the notebook number, the page number of the first reference and a letter to sequence the references on this page. For example, JD -I-38B identifies the second item on page 38 on Jane Doe's first notebook. Label the item with this number, your name, the date, and other relevant information. **At the end of each laboratory period have the teaching assistant initial, and date your day's entries.**

## B. Submission for Grading.

Your T.A. must sign and date your notebook at the end of each day's work.

Laboratory reports are to be submitted in the following manner:

- The colored copy of the of the **pre-lab notes** is to be handed to your TA at the **beginning** of each experiment.
- The colored copy of each **day's work** is to be handed in to your T.A. at the **end** of each lab day.
- Using these data prepare a coherent report using the format described in the section in the lab manual on written and oral reports. Also, refer to the **grade sheets** for each experiment **as guidelines**.
- The report for each experiment will consist of:

  - the grade sheet (as a cover sheet)
  - the data summary sheet (directly below the grade sheet)
  - the written (or oral handouts) report (as described under report format)
  - all leftover unknowns and products (handed directly in to your TA)

## C. General Guidelines for Maintaining the Lab Notebook

**Manner of use**:

1. Duplicate blue pages work best with a ball point pen, press hard.
2. Write on one side only
3. No erasures:
   - If you make a mistake, cross it out neatly so it still can be read, and write the correct entry above or to the side.
   - If entire page is incorrect, cross it out with a single diagonal line and provide the reason it is believed incorrect.
4. Record all data and results with **units** and **experimental error** directly into your notebook:

- Data may not be transferred. Plan to have your Notebook with you wherever you make an observation. If circumstance forces you to record data remote from your notebook, date and sign the record and tape it in your notebook.

5. Start a new page for each experiment and each new major section:
   - Write the title of the experiment, date, your name and name of your TA on top of each page.
   - Indicate if the page continues an experiment from a previous page.
6. Never skip space for later recording. Data should always be recorded in a serial fashion except where it is appropriate to record it in tabular form.
7. Be neat! Do not overcrowd page:
   - If handwriting is large skip a line.
   - Write legibly or print. Illegible notebooks may receive a grade of zero. Other things being equal, **a neat and well organized notebook** is far preferable to a messy or poorly organized one, although, neatness and organization are distinctly secondary to other considerations: **legibility, accuracy and completeness**

D. **Pre-lab: What to record:**

1. **Title, date, your name, name of TA.**
2. **Introduction:** A brief statement of the purpose of the experiment with balanced equations as appropriate.
3. **Safety issues:** A brief outline of the safety issues for the experiment.
4. **Procedure:** From the information provided in the lab manual write out the step-by-step procedure you will follow. Be **concise** but **complete**. Do not just copy the lab manual.

**NOTE: THE LAB MANUAL MAY NOT BE BROUGHT INTO THE LABORATORY OR CONSULTED DURING THE LABORATORY SESSION.**
**(Exception: appendices with detailed instruction for running instruments and Excel.)**

**E. Factual Record: What to Record:**

**1. Title, date, your name, name of TA.**

**2. Procedure and observations** in the laboratory:
- Record procedure that you carry out in the lab; be concise; **do not copy lab book**
- Record observations: "solution turned blue"; "crystals were small and powdery"
- Sketch complex apparatuses; label parts. If cited later in the report, refer back to i.e., "Fig. 1, p.5"
- In a synthesis, use tabular form to record information about reactants (volume and density of liquid; volume and concentration of solution)

| Reaction name | Formula | Source | Grade | Weight | Mol. Wt. |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**3**. **Data.** Use tabular form wherever possible; e.g., weighing:

| | |
|---|---|
| 50 mL beaker & cmpd | 30.2684 ± 0.0001 g |
| 50 mL beaker | 20.2221 ± 0.0001 g |
| weight of cmpd. | 10.0463 ± 0.0002 g |

Examples:

*Synthesis and purification by recrystallization*

| | wt.(g) | % yield | m.p.(°C) | color | appearance |
|---|---|---|---|---|---|
| crude product | | | | | |
| recryst. #1 | | | | | |
| recryst. #2 | | | | | |

The **crude yields** of products or product mixtures should always be recorded. If the product is separated into crude acidic, basic, and neutral fractions, the weight of each crude fraction should be recorded. If any of the crude fractions is a solid, its **crude melting point** should be recorded. It is important to make every effort to **account for all of the reactants in the various fractions of crude products**. Thus, for a chemist to begin a reaction with 0.1 moles of a reactant and then to describe only the isolation of 0.013 moles of a product at the end of the reaction is inexcusable. The fate of the remaining 0.087 moles of material should be indicated, even if no additional pure substance can be isolated.

The **progress of the purification** of reaction products should be recorded by noting the weights and the physical constants (melting point or boiling point range, refractive index or optical rotation where appropriate) of the various fractions throughout the purification. One should never report the weight without melting point or other physical constants for a crude product or report only physical constant (s) without weight data for the pure product.

**For each pure reaction product**, important intermediate, or derivative, record the total yield (both weight and percentage), physical appearance, color, odor, and physical constants (m.p., b.p., etc.). For a solid product, record also the recrystallizing solvent used and the crystalline form obtained (e.g., needles, prisms, plates, etc.).

*Distillation as purification*

| fraction # | b.p. range (°C) | wt..(g) | appearance |
|---|---|---|---|
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| | | | |

Note: It is important to determine the weight of each fraction immediately after distillation to avoid loss due to evaporation.

Absorbance vs. Concentration

| sample # | concentration (M) | absorbance |
|---|---|---|
| | | |
| | | |
| | | |

**4**. **Calculation and graphs.**
- Show any formula used in calculations.
- Show a complete sample calculation substituting the number in with their units.
- If a calculation needs to be repeated several times, show results in a tabular fashion.

*Graphs:*
- Graph any necessary data and make copies to present with your report.
- Attach in your Notebook and reference to the appropriate table of data in tabular form, e.g., JD -I-38B.
- Label axes and title with units.

*Spectra:*
- Attach to Notebook and make copies to present with your report.
- Label axis with units.
- Reference to procedure, e.g., JD -I-38B.

**5**. **Data Analysis and Errors.**
- Perform error analysis.