THE ELECTRONIC LABORATORY NOTEBOOK

In scientific work keeping a permanent record of all raw data, observations, calculations, et cetera obtained during an experiment is important. Therefore, a student must become proficient at keeping a good laboratory notebook in General Chemistry lab. An electronic laboratory notebook (ELN) is used in place of a traditional paper duplicate lab notebook in this course. This technology is now commonly used in many scientific workplaces as it digitizes and connects information, making it searchable and retrievable from anywhere.

All pre-, in-, and post- laboratory work must be done in or attached to your ELN. The following notes should help you prepare your notebook for each experiment.

GENERAL INFORMATION

Register Laptop on UCI’s Mobile Access Wi-Fi before coming to lab.
http://www.oit.uci.edu/mobile/registration.html

Type of Notebook Required: LabArchives provides the ELN for this course.
• Click on the ELN Sign up link under “Before the Quarter Starts” at the top of the course lab manual webpage. You must use your UCIDnet email to register for the account.
• Cost for a quarter’s use of the ELN: $7.50 (less than half the price of a traditional paper lab notebook.)
• After you have activated your account, use https://mynotebook.labarchives.com/ to return to your notebook. (Do not use link until after you have registered for the account.)
Types of Entries:

The Entry Editor Toolbar pictured above shows the possible types of Entry Editors available on the Notebook Pages of the ELN. The following is a description of the main entries used in this course.

- **Heading:** Divides a Notebook Page making it more readable and visually appealing. Each section outlined in the next few pages should be demarcated with a descriptive (but concise) Heading entry.

- **Rich Text:** Allows for text entry with color, sizing, tables, embedded images, et cetera. This is the main Entry Editor used when entering text.

- **Attachment:** Any file format can be uploaded. In this course acceptable attachments are Excel, Logger Pro (instrument), photo, and Spartan data files. Do NOT use this function to attach word documents for the Objectives, Equipment and Chemical Tables, Procedures and Observations, or Postlab questions. These must be entered using the other text editors.

- **Widgets:** Specific directions will be given when these extra functionalities are needed.

Format:

- The Notebook Navigator (the column on the left side of the ELN webpage) will already be partially populated with folders and a few Notebook Pages for you. Do not erase any of these documents.

- To create a new page, click on the folder and then click on “Add new item” and then choose “Add New Page”.

- Do not use scrap paper to record any data; all entries must be made in the ELN. You will need to be entering information as the experiment proceeds into your computer. Protect your device from spills or contamination. It is a good idea to purchase a cover for your keyboard.

- You may use the delete button to correct general typing errors or misspellings, however, if a significant amount of text is entered and then believed to be in error, highlight the text, then click the button to draw a line through the text, indicating the section is no longer believed valid. Such errors are NEVER erased because the original entry may prove valid at a later date. Remember, the notebook is a "work-in-progress" and is not expected to resemble a finished manuscript.
• After each entry, be sure to click on the **save to page** icon. If you fail to do this, your work in that entry will be lost.

• To insert an entry in between two existing entries, bring the pointer just below one entry to the left end of the dotted line. When a green field appears, choose the desired entry editor.

**Other Details:**

• Files may be emailed to your lab notebook: inbox@labarchives.com from the email address associated with your Lab Archives account.

• All entries are time and date stamped. Every time you log in another version of the document is stored by the system. This function serves two main purposes: no work is ever lost (so accidently deleted data can be recovered) and scientific honesty (the notebook proves the work was done how and when the scientist says it was).

• If you simply cannot reproduce something within the ELN Entry Editors, draw it on a piece of paper, take a picture of the paper, then attach the picture file to the ELN. This option should not be used more than once for an experiment.

**BEFORE COMING TO LAB:**

1. **Required Documentation:**

   a. **Lab Manual Documents:** As you prepare for each lab experiment, place a copy of the experiment and any technique reading from the course website into the Lab Manual Folder in the ELN. Because experiments are frequently revised, this process insures you have the revision applying to you. Furthermore, a complete record of all material covered in the course will be cataloged digitally in your ELN. TAs will check to make sure these additions are done as you complete each experiment.

   b. **(Material) Safety Data Sheets (MSDS or SDS):** Find the Safety Data Sheets for all of the chemicals involved in an experiment before coming to lab. These documents must be saved in the SDS folder in Notebook Navigator (left side of the ELN window).

   o The following website provides links to many SDS sources:

     [http://www.ilpi.com/msds/index.html](http://www.ilpi.com/msds/index.html). To attach to the ELN, SDSs must be a *pdf*.

   o On the left hand side of the screen find the **SDS** folder and click on “Add new item” and then choose “Add New Page”. Name the page for the chemical (you may need to use the formula or a shortened formula to keep the name from being too long).
In the middle of the new page, click on Attachment in the Entry Editor toolbar and attach the SDS file.

If the same chemical is used in a future experiment, another SDS does not need to be attached.

2. **Experiment Title:** To prepare for coming to lab, find (or create) the folder for the experiment that you will be doing in the Notebook Navigator, click on “Add new item”, and then “Add New Page”. Name the page with the experiment title as it appears in the lab manual: *Expt #. Experiment Title.*

3. **Objective:** On the Entry Editor Toolbar, click on Heading, and type *Objectives.* Click on Rich Text. Provide an objectives statement that clearly outlines the main chemical event, the central theory or theories used, and the technique to be employed in the experiment. In other words, write a *brief* description of the problem under investigation and the method to be used to investigate the problem. Include pertinent formulas or equations.

4. **Chemicals, Equipment, and Table of Physical Constants:** Click on Heading again, type *Equipment & Chemical Table(s).* Click on Rich Text. Create tables by clicking on . Set the correct number of columns and rows for a table. If you need to adjust the table in anyway, right click or control click on the table to bring up a formatting menu.

   • List the chemicals with pertinent constants (molecular weights, boiling points, etc). Therefore, to have a complete table, look ahead at the calculations and figure out what is needed.

   • The NFPA (National Fire Protection Association) 704 Diamond must also be present for each chemical. Fire Diamonds can be created using a widget. To get them into the table, take a screen shot of the widget image and then attach the image file into the table by clicking on .

   • Include pictures, graphics, or images corresponding to the equipment and/or instruments used in the experiment by also using the key and attaching the appropriate file. (Avoid links, as these images can disappear from websites.) You can also take a picture of the actual set up or a sketch and attach it to this table. Special reaction set-ups must be always be included. Typical equipment and instrumentation can just be listed. (If you don’t know whether something is typical or special, then it’s special.)
Mac users: Safari will not allow you to embed .api images. Use another browser.

- Subscripts are required in chemical formulae. Special symbols (such as a degree sign (°) or an arrow (→)) can be found by clicking on the omega symbol (Ω) on the left hand side of the top toolbar.
- Reference any source (such as the “CRC Handbook”, a textbook, or a chemical manufacturer’s website) used beneath the table.

**PRE & IN LAB:**

5. **Procedures:** Click on *Heading*, type *Procedures and Observations*. Click on *Rich Text*. In this section procedures with the appropriate observations will be entered as the steps are performed in lab.

- The entries should logically grouped in reasonably sized paragraphs. Use bolded text to label different parts of an experiment.
- Initial or rudimentary procedures and data tables should be entered before coming to lab. Any prelab calculations and results should be included. For example, the calculations and data tables for the concentrations of stock and standard solutions needed for a Beer’s Law plot should be done before lab.
  - Vernier (LabQuest2 or Logger Pro) instructions do not need to be repeated. Just indicate once you are “following lab manual instructions (see lab manual folder, Expt #, Expt Name)”.
- In lab, observations and data can be added to the *Rich Text* section started before lab. Move the cursor to the horizontal dotted line just below the Procedures and Observations title. The following line will appear:  
  
  Choose “edit” to reopen the *Rich Text* section.
  - A procedural step can be followed by a separate sentence containing the resulting observation. Or, combine the procedure and observation together in a sentence. *For example:* 10 mL of clear, colorless 1 M KI (aq) was added to the reaction mixture. Immediate precipitation of a bright yellow solid was observed.
  - All observations must be recorded DIRECTLY into the ELN. Data recorded on scraps of paper will be confiscated by the TA.
Italicized questions should be answered in *italics* as they appear in the procedures.

- Delete simple typing mistakes, but if you have followed a procedure or collected data as written, do not delete it. Highlight the text in question and click on abc.
- Pictures should be taken during lab and attached within this section.

- Include lab calculations. Use whatever format works best:
  - Rich Text window for basic equations and sample calculations.
  - Spreadsheet widget for repetitive calculations.
  - Attach data tables and plots from Excel.
  - Attach data files from newer instruments, photos of printout from older instruments.

- Open a new *Rich Text* entry after the addition of each photo, spreadsheet, data files, etc. Do not go back to the initial entry and add more information – keep data as close as possible to the procedures that produced it.

- **Before leaving lab**, go to your TA and click on sign in the *Page Tools* toolbar near the top right of the ELN window. This will lock the page so no further edits can be made. If you do not do this, you will not receive a grade for the experiment.

**POST LAB:**

**6. Postlab (Calculation, Discussion, & Conclusion) Questions:** The answers to postlab questions provide a discussion and conclusion of the data, observations, and results of the experiment. Think of these questions as a guide for when you will have to write a discussion and conclusion without any questions or prompts.

- In the Notebook Navigator (left side of the screen) go to the folder for the experiment and create a separate page for the Postlab. Use the *Heading* Entry editor to introduce each question. Copy and paste the question to be answered in a *Rich Text* editor and then answer the question. If another of the entry editors (Sketch, for example) will help you answer the question, use it.
- For repetitive calculations, show one example complete with units and chemical formulae in a *Rich Text* entry, then complete all the calculations with Excel and attach the file to the ELN.
• You may find advantageous to open your inlab data in another internet browser window to view the data while answering the postlab questions.
• Create a PDF of your Postlab by right clicking (Ctrl-Click on Mac) on the notebook for the experiment and choose PDF. You will receive an email from Lab Archives with a link for the PDF. Download the PDF and then upload it to turnitin.com.

At the end of the quarter: To save the entire notebook as a PDF, go to the Utilities menu and choose Notebook to PDF. A window will appear asking Create a PDF file containing the contents of your notebook? Click OK. At this point a window will appear instructing you an email will be sent with a link to download the file. You have 24 hours to follow the link and download the file.

NOTEBOOK GRADING:
When grading notebooks, Teaching Assistants will be looking at:
• Preparation before lab begins (intro, procedural steps etc.)
• Quality of observations
• Recording measurements with correct number of sig figs and units
• Organization of data
• Precision and accuracy of data
• Presentation of data in graphs
• Calculations
• Discussion and assessment of errors
• Conclusions supported by data

TAs will also be assessing notebooks on more general criteria: Using ONLY the notebook as a guide,
• Could another student understand what problem was investigated, assemble chemicals and equipment, perform the experiment, and acquire the same data and observations?
• Could a comprehensive, formal laboratory report of the experiment be written one year later?
• Would you be able to devise an experimental procedure to solve a similar lab problem or work a similar problem in a lab practical?
An example of a notebook entry can be found in your ELN under the name *Expt 0. Sample Experiment*.

Remember a lab notebook is a WORKING TOOL for the lab. The CONTENT is what counts.