

## Chem 1212 L Lab Syllabus

**Learning Outcomes – Students will:** employ high scientific standards in their laboratory notebook; use safe practices (when handling chemicals and equipment) in the laboratory; read and interpret appropriate safety information or instructions; demonstrate appropriate academic engagement (preparation for class, attendance, timeliness, etc.); demonstrate metacognitive skills such as self-directed learning behaviors, personal growth as scientists, and strengths and weaknesses; demonstrate the ability to work effectively as part of a team; produce written work that clearly and concisely articulates scientific ideas and arguments; construct logical arguments based on the interpretation of scientific data; integrate mathematical skills (graphing, algebra, statistics, etc.) to problem solving; integrate mathematical skills (graphing, algebra, statistics, etc.) to data interpretation; operate chemical instruments and glassware properly; demonstrate knowledge of scientific software appropriate to a chemist; design an experiment to investigate chemically important systems or variables.

**Proper attire is required for admission into lab.** Proper attire consists of:

1. Lab coats are required of **ALL** students in the lab when chemicals are set out or in use.
2. Clothes must cover from the shoulder to the ankles. There should be no skin visible on the leg, ankle, or foot. This is a minimum requirement for entry into the lab, regardless of whether or not chemicals are out.
3. Shoes must be closed-toe and cover the entire foot. This is a minimum requirement for entry into the lab, regardless of whether or not chemicals are out.
4. Safety glasses or goggles, approved by the instructor, must be worn whenever any person has chemicals in use.
5. Long hair should be confined.

**Students are also expected to bring:** Their laboratory notebook (prenumbered with duplicate pages), lab coat, safety glasses, pen and a calculator. Students who do not bring these items will not be permitted to participate in lab.

**Each experiment will have a prelab.** The prelab will let you know the topic of the experiment and how to prepare. Completion of the prelab is also a requirement for admission to the lab. There will be a variety of prelabs. Some examples include: watching on-line videos, looking up information that will be used during the experiment that should be recorded in your notebook; practice calculations to complete. The prelab will be worth 10 points out of the 50 points for each lab and 5 points will be deducted for late pre-lab assignments.

**Attendance/Grading Policy:** To receive credit for attending a lab, students must be on time for all pre-lab meetings and remain for the entire experiment. Arriving late to a pre-lab lecture is cause for dismissal from that day's lab. Lab partners/groups will be assigned at the discretion of the instructor. Any missed lab earns a zero grade and there are no make-up labs. A student can miss up to two labs in a semester, however a third missed lab will result in withdrawal from the course. A student may replace their lowest lab grade by attending the last experiment of the semester. For example, a student who has missed only one lab the entire semester, can exchange that zero for the grade they earn on the last week's experiment. A student who missed two labs, will have two zeroes, but only one of those zeroes can be replaced by attending the last week's experiment. The topic of the last experiment will be on the final exam for the Chem 1212 lecture, so attendance is highly recommended even if no other labs have been missed throughout the semester. The end of the semester will incorporate a multi-week research project that will require a formal lab report and will count for 20% of the final grade. The remaining 80% of the course grade will come from an average of all other weekly lab grades.

**Withdrawal Policy:** CHEM 1212 is a co-requisite for this course, meaning you must be signed up for that course as well as this one. Normally, if you withdraw from one course, you must also withdraw from the other. If you withdraw from CHEM 1212 late in the semester (well after midterm), with instructor permission, you may be allowed to finish CHEM 1212L.

Other Safety Information:

Accidents and Spills

1. Know the location of laboratory fire extinguisher, eyewash, first aid kit, broken glass container and clean up materials for spills.
2. Report all accidents immediately to the instructor.
3. Report all significant spills immediately to the instructor.  
If you are in doubt as to whether it is significant, report it!  
If you got some of the chemical on yourself, report it!
4. If you get a chemical on yourself, wash it off immediately. Wash two more times after you think you have removed it all. It is recommended to wash your hands before leaving lab.
5. Clean all chemical spills properly and promptly.

General

1. Students may not perform unauthorized experiments or work in lab without supervision.
2. All equipment must be used properly and safely.
3. No food, chewing gum or drink (or even their containers) should be brought into lab.
4. No horseplay.
5. Cosmetics should not be applied in lab.
6. Clean up after yourself, leaving things as you found them or better.
7. Each chemical is labeled with a diamond indicating the hazards of working with the material. Just remember that higher numbers indicate more danger. If you want more information, ask the instructor.
8. Keep your notebook properly and remember that you will need sufficient detail from early experiments to refer back to later in the semester in order to be successful in later experiments.

Details for how each experiment is conducted and how you should write your lab notebook follow. You might want to staple these into the first few pages of your notebook so that you can refer to them frequently. You will be given a handout with directions for the experiment and writing up the lab report. At the end of lab, you will turn in the duplicate pages of your lab notebook for grading. This will be both your lab notebook and your lab report.

## **NOTEBOOKS**

Even if it is not specifically in the handout, the following sections must always be included and should be labeled as shown below (also they should be in this order):

### **Title**

You may use the title on the handout, however, "experiment 1" or similar title is not acceptable.

You must include your name and the name of your lab partner.

You should include the date of the experiment.

There are convenient spaces at the top of the lab notebook to fill this information in; but is not required that you use them.

### **Introduction**

For most experiments, this will consist of a purpose paragraph.

The paragraph should be composed of complete grammatically correct English sentences. Be as specific as possible.

The intro should express the experimental purpose, not expected learning outcomes (the teaching purpose).

Make sure to address "the what" and "the how" for the experiment: What are you trying to prove/find?, and How are you going to do this?

### **Procedure**

You will normally not be asked to write a procedure because it will be given in the handout. However, it is recommended that you attach the procedure in your notebook so that you know what you did. Any attached materials to be part of a notebook must be secure and permanent (i.e. staples, tape, or glue)

### **Results and Discussion**

This is where you will put your collected data and analysis of that data.

Data must be entered directly into the notebook NOT on scrap paper.

Errors should be struck out, ~~like this~~, not erased or scribbled over so that they are illegible.

Collected data must have the appropriate significant figures and units.

Units and significant figures are determined by the measuring device used! Record all significant figures given by the measuring device.

Data is often collected into or directly written in a table. The criteria for titles is on page 4.

Data is often analyzed using graphs. The criteria for a correct graph is on page 5.

You are expected to follow the criteria for graphs regardless of whether your graph is hand-written or computer-generated.

### **Conclusions**

The conclusion should be a paragraph that answers the questions you addressed in your purpose. You should not only state your results from the lab, you should provide an assessment of those results. Here are just a few things to consider when writing your conclusions: Is this what you expected? If not, explain why? Did you accomplish what you set out to do in the lab? How precise/accurate were your results? What could you have done differently to improve your results?

**Table Criteria:**

- Title: Includes appropriate numbering (e.g., "Table 1. Absorbance of NiSO<sub>4</sub> Solutions")  
Trials in vertical dimension
- Columns: Heading includes units in parenthesis  
Heading is not the unit  
Columns consist of all data that changes and results of relevant calculations
- Entries: Use significant figures as determined by measuring device or calculation  
Units are in column heading not in entry  
If data is the same for each entry, do not include as column, but elsewhere in table  
Table is on one page

**Example:**

Table 1. Speed and momentum of Object 5.

Mass of object 5 = 20.382 g

| <u>Trial</u> | <u>distance (cm)</u> | <u>time (s)</u> | <u>speed (cm/s)</u> | <u>momentum (g·cm/s)</u> |
|--------------|----------------------|-----------------|---------------------|--------------------------|
| 1            | 5.00                 | 10.0            | 0.500               | 10.2                     |
| 2            | 25.21                | 51.2            | 0.492               | 10.0                     |
| 3            | 40.72                | 79.1            | 0.515               | 10.5                     |
| 4            | 63.55                | 129.3           | 0.4914              | 10.02                    |

**Graph Criteria:**

- Use spacing effectively: The graph size should be more than ½ page.  
Only show quadrants actually used or needed for context
- Title/Caption:  
Includes appropriate numbering  
Labeled as "Figure" not "graph" or whatever  
Does not repeat axes (Ask instructor if you do not know the name of the graph type)  
Include the identity of what you are measuring  
Put title (more appropriately called a figure caption) at bottom of table  
Figure caption should not overlap other components of graph  
Some graphs used in 1212: calibration curve, Beer's Law Plot, Spectrum
- Axes: The x-axis is used for the independent variable  
The y-axis is used for the dependent variable  
Do not include axes or axes sections where it is not used to graph data (or show context)  
Labeled (label is not unit, but includes unit)  
Include dimension (unit) in parenthesis  
Have visible tick marks  
Spacing between tick marks reasonable for reading  
Normally 1, 2 or 5 divisions  
Tick labels have correct significant figures (consistent decimal places)
- Data points: Visible but not inappropriately large  
Data points reflect actual data  
All the data!  
Include outliers on graph even if they were ignored when drawing trend line.  
If more than one data set is on the same graph, use different marker styles

Trend: Show data trend using line or curve as appropriate  
If more than one data set is used, use a different style line for each and include a legend.  
Do NOT include a legend if only one data set is used.  
If trend is linear, determine equation of the line

Example:

