**Lab Syllabus -- Chemistry 122: Chemical Principles II**

Block 7, Spring 2019

**Instructor**: Cindy Strong

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**Office Hours**:

Mon 11:00-12:30, Tue 3:00-4:30, Wed 11:00-12:30, Thu 3:00-4:30, Fri 11:00-12:30. Please stop by my office any time; if I’m not there but my door is open, check in the labs on the 3rd and 4th floor.

**Required Materials**:

A bound (not spiral) notebook, such as a composition book; you may use your notebook from CHE 121. Lab goggles (UVEX stealth S3960C) and a scientific calculator are also required.

**Learning Objectives (Educational Priorities and Outcomes):**

Students will:

1. Apply introductory concepts in intermolecular forces, colligative properties, kinetics, acid/base equilibria, and electrochemistry to solve problems and explain observations in the lab (Knowledge, Inquiry, Reasoning)
2. Develop accurate and precise lab technique, draw conclusions from data, and consider the error associated with results (Inquiry, Reasoning, Ethical Behavior)
3. Work effectively with others in the lab; communicate lab results clearly, both in writing and verbally (Communication, Ethical Behavior)

This course supports the Educational Priorities and Outcomes of Cornell College with emphases on knowledge, inquiry, reasoning, and communication.

**Meeting times and location*:***

Lab will meet from 12:30 - 3:00 pm on the dates listed in the schedule below, beginning with a meeting in room 319 and then moving to room 321 for lab.

**Assignments and deadlines*:***

Lab handouts will be distributed in class and posted on Moodle. Most handouts will include a **pre-lab assignment** that will be due at **12:30 pm** on the day you come to lab. Some lab handouts will have a **worksheet** format, while others will require a formal **lab report**. Worksheets, lab reports, and lab notebooks will be due at **9:00 am** on the dates indicated in the schedule below.

* For labs with a **worksheet** format, record all data in the space provided on the worksheet. You will not need to record information in your lab notebook for these experiments. Turn in the worksheet only.
* For labs requiring a formal **lab report**, record all data and observations in your lab notebook. Each time you submit a formal lab report, turn in your lab notebook as well. Detailed guidelines for lab notebooks and formal lab reports are provided later in this syllabus.

**Lab Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Lab experiment**  **(12:30-3:00 PM)** | **Skills (ES and AS from course syllabus) emphasized in this experiment** | **Skills reinforced in this experiment** | **Assignment and due date (12:30 pm)** |
| D1: M Mar 18 | Check-In; Alum Synthesis |  |  | Worksheet due F Mar 22 |
| D3: W Mar 20 | Solids; Lab Report Discussion | ES2, ES4, AS2 | ES1 | Worksheet due Th Mar 21 |
| D5: F Mar 22 | Kinetics | ES5, ES6 |  | Formal report and lab notebook due T Mar 26 |
| D6: M Mar 25 | Alum Analysis | ES3 | ES14 | Worksheet due T Apr 2 (both parts) |
| D8: W Mar 27 | Alum Project discussion (brainstorming) |  |  |  |
| D9: R Mar 28 | Titrations | ES11 |  | Formal report and lab notebook due M Apr 1 |
| D10: F Mar 29 | Salts | AS5 | AS4 | Worksheet due at end of lab |
| D11: M Apr 1 | Alum Analysis | ES3 | ES14 | Worksheet due T Apr 2 (both parts) |
| D13: W Apr 3 | Alum Project (half of class in AM, half in PM) |  |  | Worksheet due F Apr 5 |
| D16: M Apr 8 | Electrochemical Series; Check-out | ES18 |  | Worksheet due at end of lab |

**Grading:**

The percentage of points earned on lab assignments will be converted into lab competency points according to the scale on the main course syllabus. For labs with worksheets, points will be assigned for the completeness and correctness of each worksheet. For labs with notebooks and formal reports, points will be assigned according to the guidelines presented later in this syllabus.

**Absences, tardiness, and late assignments:**

Missing a lab session is quite problematic. It is difficult to find a time to make up a lab session, and you will lose the benefit of working with a partner. Under ordinary circumstances, make-up labs will not be scheduled. If you must miss a lab session due to illness or a scheduled College activity (such as an athletic competition), contact me as soon as possible and I will work with you to find a time to make up the experiment.

Tardiness for pre-lab presents a safety hazard and will result in a deduction of 5 points from the total points possible for the experiment. If you are not present at 12:30 when roll is taken, you will not receive credit for attending pre-lab.

Late assignments will be assigned a penalty of 10% for each day late.

**Health issues:**

For your safety and the safety of those who will be working with you in the lab, please inform me if you have a health issue that may be exacerbated by exposure to chemicals. Examples would be severe asthma, severe allergies, seizure disorder, or pregnancy. I will keep this information confidential and work with you to minimize your risk.

**Other policies:**

Please refer to the policy on accommodations for learning disabilities in the main course syllabus.

We will follow Cornell’s policy on Academic Honesty, as presented in the College Catalogue and summarized in the course syllabus. I encourage you to work together in lab, on calculations, and to discuss your results. Examples of *in*appropriate cooperation would be copying from another student's lab notebook or lab report. Please be aware that these actions constitute academic dishonesty and will be handled in accordance with the policies in the College Catalogue.

Do not use your phone for any purpose during lab. It is a distraction and, therefore, a safety hazard.

**Important note:**

Please talk with me when you have questions about lab work, calculations, reports, etc., or with any concerns about the lab part of the course. I welcome your questions in person or by email.

**Guidelines for Lab Notebooks and Lab Reports:**

Lab notebooks will be used for experiments requiring a formal lab report. General guidelines:

* Number the pages consecutively.
* Reserve the first three pages of the notebook for a table of contents.
* Record entries in blue or black ink.
* Record all data directly in your notebook at the time the work is performed. Write on the right hand pages of the notebook only.
* If you make an error, do not erase it, scribble it out, or correct it with liquid paper. Cross out the error with a single line so that the number or word is still readable.
* Keep your notebook neat and organized so that the procedure, data, observations, calculations, and results of any experiment can be found quickly. If we cannot read your writing, we cannot evaluate your work.

**What to Include in the Lab Notebook:**

Title of the experiment (5 points): Begin the notebook entry by writing the title, date, and the name(s) of your lab partner(s) at the top of a new right-hand page. Add the experiment to the table of contents by listing the title, date, and page numbers for the new experiment.

Procedure (5 points): Write your procedure before you come to lab or as you do the experiment. Use passive past tense and complete sentences. (For example: “3.0 mL of 5 M HCl was poured into 250 mL of water with stirring.”) Leave space for observations. This can be done by dividing the page into two columns -- one for procedure, and one for observations.

Observations (5 points): Record what your senses tell you. Observations may be brief statements (“solution turned orange”) but need to include enough detail to be useful when writing your report.

Data (5 points): Record data in your tables with headings including the units of measurement and the same number of significant figures as were actually measured.

Calculations (optional, 0 points): Calculations for the experiment may be done in the notebook. A sample calculation for each relevant variable will need to be included in your report. Written calculations should be clearly labeled, with units for each quantity. Avoid rounding error by retaining one or two extra digits until the final result of the calculation is reported. Round the final result to the correct number of significant figures.

Results (optional, 0 points): A table or summary of results may be included in the lab notebook. You may want to add some notes that will help you with writing the report. Were there any mistakes made or other possible sources of error? Do you have any ideas that would make the lab go more smoothly or make the results more reliable?

**Formal Lab Reports:**

Becoming a good report writer does not happen overnight. To help you learn to write scientific reports, we have a set of goals for you to keep in mind during your introductory chemistry experience. Review these goals each time you write a report.

* To present procedure and data in a meaningful way. (Not all data/procedure may need to be in the report; it should be complete in your notebook.)
* To use terminology properly.
* To be able to separate facts (evidence) from interpretation (discussion).
* To be concise in your writing.

Reports must be typed (double-spaced with one inch margins and 12-point font); chemical reactions and sample calculations may be neatly written by hand. Write your report for an audience that has taken general chemistry and knows basic principles, concepts, and lab techniques, but is not familiar with the particular experiment. Your report should include no more than two pages of written text (not including calculations, chemical equations, graphs, and tables).

**Report format:**

1. Name, Experiment Title, and Date.
2. Claim (5 points): The claim is a one- or two-sentence statement about the results of your lab work. The claim is the thesis statement of your report; it is the main point you will try to make in your discussion.
3. Evidence: This section includes the procedure that was performed and the results that were obtained. For the sake of clarity and organization, divide this section into the following subsections.
   1. Method/Procedure Summary (5 points): In a few sentences, describe what you did in the experiment; give a bibliographic reference to the printed method used. Verbatim directions need not be given, but deviations from the printed directions must be described. A competent chemist should be able to use your procedure summary with the cited reference to reproduce what you did in the lab.
   2. Reactions (5 points): Include a balanced chemical equation for each reaction that occurred.
   3. Data (10 points): Data and results must be clearly identified and include the correct number of significant figures. Arrange your data in tabular form, taking the *essential* data from your lab notebook. It may help the clarity of your data presentation if you use two or more tables; if so, clearly label each table to indicate the nature of the data. You do not need to copy all of your original data from your lab notebook.
   4. Sample calculations (10 points): Show your calculations for one trial all the way through, including all units, significant figures, and conversion factors. (*Note: Carry an extra significant figure throughout your calculations to avoid rounding errors. Round to the appropriate number of sig figs when you reach the final result.*)
   5. Results table(s) with proper meaningful headings or captions (10 points). Be sure to include units and use the correct number of significant figures.
4. Results and Discussion (10 points): Report your result, the literature value, and the percent error (if applicable). Interpret your results; explain exactly how they support the **claim** you made above. Think about the logical connections that you are trying to make. Answer any guiding questions from the lab handout, and critically analyze your data. How well does your data agree with accepted theories? How confident are you in the data? Typically, this section will be two to three paragraphs in length.
5. Post-Lab Questions (5 points): Answer as numbered.
6. Visual and Stylistic Presentation (5 points): To earn 5 points in this category, the report must follow the required format and be well organized and neatly presented. Use correct spelling, grammar, and punctuation.

You will have the opportunity to revise and resubmit your first report based on feedback from the instructor.

**RULES OF THE LABORATORY**

1. Safety goggles must be worn at all times by everyone in the lab.
2. Dress appropriately for lab. This includes closed toes and top of foot shoes, at least T-shirt length sleeves, shirts long enough to cover the torso and at least knee length shorts/skirts/pants.
3. Do not bring food, beverages, or empty beverage containers into the lab and do not taste anything in the lab.
4. Never work alone in the lab and never work without the instructor's knowledge and consent.
5. Report all accidents to the lab instructor immediately, any cuts, burns, spills, or other injuries.
6. Learn the location and use of the emergency equipment including the fire extinguisher, safety shower, and eye wash fountain.
7. Use only clean glassware. Never assume that glassware is clean unless you were the last person to use it and washed it.
8. Read the labels of all chemicals carefully before you use them. Use only the quantities and concentrations called for in the experiment. Look closely at the hazard labels.
9. Treat any unknown substance as hazardous.
10. Wash your hands if they come into contact with any unknown or hazardous substance. Wash your hands before you leave the lab to avoid contamination of books or food (could lead to accidental ingestion).
11. Keep your lab area clean. Pay particular attention to the area around the balances. Any amount of a spilled chemical, whether solid, liquid, or solution, must be cleaned up immediately and disposed of properly. Ask if you are unsure of the best way to clean up or dispose of a chemical.
12. Place broken glass in the boxes provided for that purpose, not in the regular trashcans.
13. Use a fume hood whenever toxic or irritating gases are likely to be evolved. Never directly inhale vapors.
14. Never pour water into concentrated acid. Always pour the acid slowly into the water while stirring the mixture constantly.
15. Before lighting a flame make sure that there are not any highly flammable substances open in the lab.
16. Never heat mixtures in graduated cylinders. When you are heating a test tube, always point the mouth of the test tube away from yourself and others.
17. Do not contaminate the reagent bottles. Pour some of the reagent into a beaker for your own use when necessary. Do not pour the excess back into the bottle. Do not use a dropper to remove a solution from a reagent bottle unless the dropper is provided with the bottle.
18. Do not remove any chemicals from the lab.
19. Do not perform unauthorized experiments.
20. Inform the lab instructor if you have any medical conditions or learning disabilities that might affect or be affected by your performance in lab.

**Don't hesitate to ask questions!**