**CHE111L Lab Schedule Spring 2020**

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| --- | --- | --- |
| **Dates** | **Experiment** | **Point Value** |
| 1/21 – 1/24 | Safety and Introduction (No lab Monday, Martin Luther King Day) | -- |
| 1/27 – 1/31 | Evaporation and Intermolecular Forces (Monday labs do Safety and Introduction as well) | 20 |
| 2/3 – 2/7 | Conductivity of Solutions: The Effect of Concentration | 20 |
| 2/10 – 2/14 | Effect of Temperature on Solubility | 20 |
| 2/17 – 2/21 | Molar Mass by Freezing Point Depression | 20 |
| 2/24 – 2/28 | Chemical Kinetics of Hydrogen Peroxide Decomposition | 20 |
| 3/2 – 3/6 | Dissolution Kinetics of Solids | 20 |
| 3/9 – 3/13 | SPRING RECESS – NO CLASSES | -- |
| 3/16 – 3/20 | Determination of the Acid Ionization Constant | 20 |
| 3/23 – 3/27 | Buffers | 20 |
| 3/30 – 4/3 | Determination of the Solubility Product Constant of Calcium Hydroxide | 20 |
| 4/6 – 4/10 | Entropy, Gibbs Free Energy, and Reaction Quotient | 20 |
| 4/13 – 4/17 | Vitamin C Analysis by Oxidation-Reduction Titration (No Lab Friday, University Holiday) | 20 |
| 4/20 – 4/24 | Cell Potentials and Electrochemistry | 20 |
| 4/27 – 5/1 | Computer Based Learning Lab | 10 |

**Laboratory Safety Rules**

**Department of Chemistry and Physical Sciences**

(safety contract between student and instructor)

**TRAINING**

1. SAFETY GOGGLES (which are indirectly vented for **splash and impact protection-** ANSI -Z87.1 1989 approved) ARE TO BE WORN AT ALL TIMES IN THE LABORATORY WHEN WORKING WITH HAZARDOUS CHEMICALS OR PROCEDURES--NO EXCEPTIONS AT ANY TIME FOR ANY REASON!!!.

**NOTE:** Individuals who are in the laboratory without adequate eye protection will be given **one, and only ONE warning,** (per semester); the second time you will be asked to leave the laboratory and will be given a grade of zero for the experiment with no chance for a makeup.

2. Adequate protective clothing, including shoes, must be worn. (NO open-toed shoes, sandals, or flip-flops, no shorts, mini- or short skirts, and all shirts, blouses, scrubs, sweat shirts should be tucked in.) A full length lab coat or rubber apron is recommended.

3. Learn the locations and operation of safety equipment. This includes the eyewash stations, safety showers, fire extinguishers, fire blankets and first aid supplies.

4. Read the chemical labels very carefully. Read them several times. Notice any hazard warning, (i.e. flammable, corrosive, NFPA BLUE CODE of 2 or 3, etc.) and take appropriate steps to minimize your exposure (i.e. putting on appropriate gloves, no flames, work only in a hood, etc.) and protect yourself.

5. Treat all chemicals with the respect they deserve. Know the hazards before you handle the materials. Read the appropriate MSDS. (Material Safety Data Sheets)

6. Dispose of chemicals properly. Nothing goes down the drain unless it is specifically indicated by the instructor. Containers will be available for waste chemicals. Broken glass goes into special receptacles.

7. Smoking, eating, drinking, chewing gum, and putting on of makeup (including

chap-stick) in the lab are forbidden.

8. Never taste a chemical. Avoid odors. Do not perform “sniff tests” on any chemical. Unnecessary exposure to hazardous chemicals may occur.

**INFORMATION**

9. Major spills, especially those covering the body, should be immediately flooded with water (from sink faucets, eye wash stations, and/or safety showers), then reported to the instructor at once. Send someone else if needed. It is essential that acid or caustic soaked clothing be removed as soon as possible (within seconds) and the affected areas rinsed with plenty of water.

10. Clean up all spills immediately

11. Burns should be treated immediately. Place the burned area under cold water and leave it there. Send someone else to get the instructor. Cold water markedly reduces the following pain and blisters.

12. Long hair should be tied back and loose clothing should be avoided

13. Perform the experiments as directed. Do not do anything which is not part of the assigned experiment.

14. Never work without faculty supervision and **never work alone** in the lab.

15. No horseplay or fooling around in the lab.

16. Never return unused reagents to the reagent bottle. Be careful to take only what you actually need. Do not contaminate the reagents.

17. Clean your lab bench and put away all equipment and reagents at the end of the lab period as directed by instructor.

18. If you feel faint or sick, sit down, put your head down, and send for your instructor.

19. If you are pregnant, notify your instructor.

20. Allergic reactions to chemicals should be reported to your instructor.

21. In order to monitor the general safety of various laboratory procedures, report all accidents, injuries, and close calls to your instructor.

Student

I have read, understood, received safety training where appropriate, and agree to follow the

Laboratory Safety Rules as listed above.

Name (Print)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Signature)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Course/Section\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Instructor

I have gone over each rule and provided safety training where appropriate.

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Course Policies**

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**Laboratory Guidelines**

The CHE110-111 laboratory sequence is designed to give students the opportunity to examine the principles and applications of general chemistry which are discussed in the accompanying CHE110-111 lecture sequence. The lecture-lab combination is interrelated. Therefore, **it is strongly recommended** that students who withdraw from the lecture also withdraw from the lab. Successful completion of the CHE110 lecture-lab combination is **required** for enrollment into the CHE111 lecture-lab course.

**Required Equipment**

* Approved safety goggles
* Approved clothing (see Laboratory Safety Rules)
* An approved notebook capable of carbon-copying
* Laboratory Manual for the Course
* A pen (pencil is **NOT** to be used in the lab notebook at any time)
* A calculator

**Experiments**

The schedule of experiments and dates are provided. To prepare for the experiments, you must read the material thoroughly and answer pre-lab questions in your notebook BEFORE coming to the laboratory. The lab experiments have been chosen to correlate with topics in CHE110-111 lecture, so use your textbook as a reference source.

**Lab Attendance**

It is expected that all students will meet their weekly laboratory obligations. These rules have been formulated to encourage all students to attend their assigned lab sections, properly prepared to perform the lab experiment assigned for that week.

**Make-up labs** are available **only** to students who are absent due to a documented illness, i.e., student has visited the infirmary, a doctor, etc., or due to a documented scheduling conflict such as a university athletic event. Staying in your room when you don’t feel well is **not** a documented illness. You need to visit Health Services or get a note from your doctor when you feel ill to document your illness.

**Approval to make-up a lab** must be obtained from the lab coordinator, Dr. Robert Grosso. In the event of an illness, contact Dr. Grosso by e-mail as soon as possible. In the case of a scheduling conflict due to sports or professional meetings contact Dr. Grosso, a minimum of one week in advance. The e-mail address is: robert.grosso@quinnipiac.edu. The e-mail should include: 1) your name, 2) day of week, time and date of lab you missed (or will miss), 3) name of your instructor, 4) your reason for missing lab and 5) your first and second choices for the make-up lab. **All of this information must be in your e-mail.** Chemistry 111 labs are held Mon-Thurs, from 8-11, 11-2, 2-5 and 6:30-9:30. Friday labs usually run from 9-12 and 12-3.

Dr. Grosso will determine if the situation and the documentation submitted, warrants approval for a make-up. If approved, he will assign the student a make-up lab time during the week of the actual experiment based on space availability and the student’s class schedule, and will provide notification to both the student’s regular and make-up lab instructor. Without such approval, no make-up will be made available and will result in a zero for that lab experiment. Make-up labs can’t be performed anytime after the week, during which, the lab is done. Make-up labs must be done during the week that the lab is done.

**Missed Labs**

Sometimes protracted illnesses or special circumstances will cause a student to miss a lab legitimately. In this circumstance the student is excused from having to perform that lab. A write up of a lab may still be required; but the student is not required to perform the lab. **However, if a student misses four or more labs throughout the semester, that student cannot receive credit for having completed the laboratory course, even if the absences are excused and legitimate.** Laboratory science, by its nature, requires students to be present performing the lab to get credit and complete the laboratory course. Lab courses are different from lecture courses; students must be present in order to complete the lab.

**Late arrivals (**students who arrive more than ten minutes late for a lab) will not be allowed to perform the experiment. A student who arrives late will not be allowed to make-up the lab and will be given a "0" for that lab as well as a "0" for a missed quiz.

**Lab Preparation**

It is the responsibility of students to arrive to lab properly prepared. This includes bringing safety goggles, a pen, a calculator, and an official lab notebook containing the appropriate write-up for that day's experiment. Failure to be properly prepared will result in a zero for that lab experiment, and opportunity for a make-up will not be given.

**Pre-Lab**

Complete your Pre-Lab before coming to the laboratory. Your lab instructor must check your Pre-Lab before you may begin the experiment. The Pre-Lab includes answering any Pre-Lab Questions, writing the Title, Purpose, and creating appropriate tables ready for data collection. **You do not have to write out procedure as part of the pre-lab.**

**Pre-Lab Lecture**

You are required to attend the weekly pre-lab lecture. Your lab instructor will discuss safety, procedures, and calculations needed to help you complete the experiment. **Most errors and delays in finishing the lab are directly attributable to not paying attention during the pre-lab lecture.**

**Late Lab Reports**

All lab reports are due at the start of the next scheduled meeting of the student's **regular** lab section. Late lab reports will be subject to a **25% (5 point) grade deduction (5% (1 point) off per day late).**

Reports turned in more than one week late, will receive a grade of zero. To avoid receiving a zero, a late report must be turned in prior to the start of the next scheduled lab session.

**Lab Cleanup**

Before you leave the lab, you will be required to clean your station. This includes all of your glassware, equipment, tray, bench top, and your entire work area. Finding your lab area messy prior to the start of lab is not a legitimate excuse for not completely cleaning up your lab area at the end of lab. Your lab instructor will not sign you out of lab if your work area is not clean. This may also result in lowering the performance portion of your grade.

**Sign Out**

In order for you to be able to leave lab, your lab instructor must sign your lab notebook. Both you and your lab instructor need to sign and date your data sheets to validate that the data recorded corresponds to that done during the lab. If you leave the lab without your instructor’s signature, this will result in a “0” for the lab.

**Help**

Ask for help when you are uncertain about a given procedure. Be safety conscious at all times. Your lab instructor is there to help you.

**The Lab Notebook**

**Keeping a Lab Notebook**

As observations are made during a chemical reaction, or as numerical data is recorded, a complete, up-to-date record must be made of the observations and data. For this purpose, chemists and other scientists keep a notebook. Scientists never record data on "scrap paper", because such papers may be easily lost, or errors in transcription may occur if data is recopied.

**Notebooks used in the lab should be the designated notebook for sale at the bookstore and capable of carbon copying.** All pages should be numbered consecutively, from front cover to last page. Only the right hand pages should be numbered consecutively. Your name must be written on the cover of the notebook. Listed below are procedures to follow:

1. All entries to the notebook must be made, in ink, as they occur. **Never record data on scrap paper or other pieces of paper.** This doesn’t constitute “official” data that can be signed at the end of lab. **Pencil or erasable ink is never permitted in a notebook.**

2. The first one to two pages of the notebook are to be used for the **Table of Contents**. Your notebook may already have a section designated for the Table of Contents. When you begin an experiment, make an entry in this table that will permit you and your instructor to locate information easily. (e.g., Experiment Title, page number)

3. Only the right-hand pages of the notebook are to be used for recording data and observations, not the back sides of previous pages. Start each experiment on a new, right-hand page. The experiment must include**:**

1. Page Number
2. Title
3. Date
4. Partner's Name, only if applicable
5. Pre-Lab Questions if applicable
6. Purpose: A short statement of the purpose of the experiment
7. Data Sheet(s): Subsequent right hand pages should be used for recording all data and observations. All data recorded must include proper units, and the appropriate number of significant figures.

4. The left-hand pages of the notebook are not to be written on, as this will interfere with the carbon copies.

5. Mistakes do happen**.** No one expects your experiment to be perfect. Mistakes in recording data are especially common. However, mistakes in the lab notebook must be treated in a special way. No data may ever be erased, obliterated, or covered with correction fluid. If you make a mistake, draw a single line through it and write in the correct value.

6. **No pages are to be torn from the notebook unless they are carbon copies of your data. Original pages are never torn out of a lab notebook.** Indication of torn out pages in a notebook will result in a lowering of the lab grade.

**Before you are allowed to work in the lab, your notebook will be checked for the pre-lab write-up.** The pre-lab write-up will include the page number, date, title of the experiment, purpose, and data tables neatly set up ready for information to be entered. Data tables should be drawn using a ruler or straight edge, not sloppily drawn free-hand. You must also bring safety goggles, a pen, and a calculator, and be appropriately dressed for lab.

**If you are not prepared, you will not be allowed to stay and perform the experiment.** You will receive a “0” for that experiment. A make-up lab for that experiment will not be permitted.

**The Laboratory Report**

* This is the report to be submitted to your instructor.
* The information to write your report comes from your Laboratory Notebook.
* It is a report of what you did in the laboratory. It must be written in the third person past tense.
* Include only those parts of the experiment that were actually performed.
* Include all in-lab modifications.
* Lab reports must be typed.
* All pages of your report must be stapled together.
* Remember, this is a final report of your work. It must have a professional appearance!
* Check your report for correct grammar, spelling and completeness.

**I. Title Page**

* Title of the experiment must be centered on the cover page.
* The following information must be in the lower right-hand corner of the cover page:
  + Submitted By: (your name)
  + Partner's Name: (only if applicable)
  + Date of Submission:
  + Lab Section:

**II. Purpose of the Experiment**

* State clearly in one or two sentences the purpose(s) of the experiment. Use the past tense.

**III. Procedure**

* Cite the lab manual by title and page and note any modifications made to the original procedure. Use the past tense. Cite the pages on which the procedure can be found; don’t cite the pages of the entire lab. Do not copy the procedure from the lab manual!

**IV. Data Table**

* A single sentence referring the reader to the back of the lab report to find the data sheets is all that’s needed in this section. A signed, dated, initialed by instructor, legible carbon copy of the data sheet(s) from the notebook must be attached (stapled) to the back of the lab report. All data must contain the proper units and be recorded to the correct number of significant figures.

**V. Calculations**

* The details of the calculations must be shown, units included, for **every calculation** done for the lab. Calculations should be clearly labeled to indicate what calculation is being shown. Just a random, unorganized group of numbers is not an acceptable Calculations section. **The Calculations section needs to be typeset just like the rest of the lab report.** It may not be stapled to the back of the report, but must be included in the body of the report.

**VI. Summary of Results**

* Only final calculated results that will be used to draw conclusions about the objectives of the laboratory experiment are to appear in the Summary of Results Table.
* Include unknown number, the values of your different trials, and the average, or final value. Do not include intermediate values. Usually the Summary of Results Table will be shown in the lab manual for each lab.

**VII.** **Conclusions**

* First, discuss whether or not the purpose of the experiment was achieved.
* Next, include the results of the experiment. This is usually the same results in the Summary of Results Table, only in paragraph form.
* Third, write a brief conclusion based on the results.
* Fourth, discuss possible sources of error.
* If any data was discarded, discuss your reasons for rejecting that data.

**VIII.** **Attached Items**

* Include any graphs that needed to be printed out.
* Include carbon copies of data sheets containing data. Carbon copies used for other purposes do not need to be included.
* Include answers to post-lab questions if there are any for the lab. (This can be done in pencil on a separate sheet of paper.)

**Course Grade**

The CHE111L laboratory course is a one-credit course graded separately from the lecture component. In an attempt to ensure that all lab reports are graded on the same basis, the following guidelines are presented for your information.

Lab Reports 65%

Post-Labs and Quizzes 30%

Lab performance 5%

Total 100%

**Laboratory Report Grading Guidelines (65%)**

Grading for lab reports is done in four different sections, evaluating four different aspects of the lab report, individually. The grade on the lab report is the sum total of all four sections and is based on 20 points. The four segments of the lab report that are evaluated are Writing and Formatting, Calculations, Accuracy of Results, and Tables and Graphs. Details of what is included in each section and how they are graded are presented below.

1. **Writing and Formatting**

Writing and Formatting includes grammar, spelling, and punctuation. Also evaluated: whether sentences are accurate, both in its statement and format. It also evaluates how well students followed the format of the lab report. Were the right things in the right sections? Was anything omitted? Is the conclusion correct? Etc. Other formatting mistakes include pages being out of order, white out being used, pencil being used, etc. Guidelines are as follows:

|  |  |
| --- | --- |
| Score | Guidelines |
| 5 | Grade: A. Student has done A work. 0-2 mistakes. Grammar and spelling is correct, each section is formatted correctly, lab manual is cited correctly, calculations are clearly labeled, verb tense is in past tense, voice is passive, no personal pronouns, title page is done correctly. Data sheet is signed and dated. |
| 4 | Grade: B or B-. Student has done a good job; but more than 2 mistakes. 1 or 2 errors in formatting, lab manual pages or title is cited incorrectly. Data sheet is signed and dated. |
| 3 | Grade: C or C-. Student has done average job; but more than 4 mistakes. More than 2 errors in formatting. Data sheet is not signed. |
| 2 | Grade: D or F. Student has done unsatisfactory job. Many mistakes in grammar, spelling, formatting; but not enough for complete failure. |
| 1 | Grade: F. Student has failed to turn in acceptably written and formatted report; but student has handed something in. |
| 0 | Student hasn’t written lab report or data sheet not included. |

In general, each section omitted is -1 on its own. No conclusion is -1. Data sheet not signed by instructor is -2 on its own.

1. **Calculations**

Calculations include whether or not calculations are done correctly, whether answers are correct, whether units are labeled, and whether significant figures are accurate. It also includes whether calculations are presented in a logical manner (in the correct order). Guidelines are as follows:

|  |  |
| --- | --- |
| Score | Guidelines |
| 5 | Grade: A. Student has done A work. 0-1 mistake. All units are labeled and correct. All calculations have been done. All significant figures are correct. |
| 4 | Grade: B or B-. Student has done a good job; but more than 1 mistake. This includes calculation error, sig fig error, or unit isn’t labeled correctly. |
| 3 | Grade: C or C-. Student has done average job; but more than 3 mistakes. Again, this includes wrong answers, sig figs, or units. |
| 2 | Grade: D or F. Student has done unsatisfactory job. Many mistakes in calculations, sig figs, or units. Or student has omitted many units. |
| 1 | Grade: F. Student has failed to turn in an acceptable calculations section. A lot of mistakes, wrong answers, wrong units, wrong sig figs; but student has done calculations section. |
| 0 | Student hasn’t included calculations section. |

Calculations attached as separate page: -2. Calculations not labeled: -1.

1. **Accuracy of Results**

Grading for this section will be provided in the grading schemes of the lab manual. This score is based on how accurately students achieved a result compared to a known value.

1. **Tables and Graphs**

Tables and Graphs include how well the student has presented the summary of results tables in the lab report, as well as the carbon-copied data tables from the lab notebook. Also, if the student attaches any graphs or charts, these are evaluated in this section of the grade. The guidelines are as follows:

|  |  |
| --- | --- |
| Score | Guidelines |
| 5 | Grade: A. Student has done A work. 0-1 mistake. All items from summary of results table included. Unknown # is included. No typos in rows or columns (ML instead of mL, etc.) Data tables are clear, legible, and complete. Units are indicated for each value. Graphs are labeled. Axes are labeled. Points are accurate. Etc. |
| 4 | Grade: B or B-. Student has done a good job; but more than 1 mistake. This includes typos or misspellings, units not included. For graphs, point is in wrong place or incorrect. Axis isn’t labeled. Graph isn’t labeled. |
| 3 | Grade: C or C-. Student has done average job; but more than 2 mistakes. Again, this includes typos, misspellings, wrong or missing units. Axes not labeled on graph, no title on graph, points wrong on graph. |
| 2 | Grade: D or F. Student has done unsatisfactory job. Many mistakes in presenting tables: typos, misspellings, units, formatting, missing rows or columns. Graphs are missing axes labels, titles, or points. |
| 1 | Grade: F. Student has failed to turn in an acceptable summary of results section. A lot of mistakes, typos, misspellings, wrong units; wrong or missing columns or rows. Graphs are unacceptable. |
| 0 | Student hasn’t included summary of results section or graph. |

Student didn’t sign data sheet: -1.

The following list contains some (but not all) common mistakes made when writing a lab report. Please be aware to avoid these mistakes, as they will result in a lowering of your grade.

**General**

-wrong tense or person (i.e. the first person or present tense)

-significant figures recorded incorrectly, whether 1 or more

-units missing

-incomplete sentences, wrong spelling and/or grammatical errors

-invalid statement

-not stapled

-pages out of order

-white out, handwritten, or cross outs

-pencil used

**Title Page**

-title page missing

-title page erroneous, incomplete, or missing information

**Purpose**

-purpose section missing

-purpose section incorrect or unclear

**Procedure**

-modifications to procedure not noted

-procedure section missing

-citation to lab manual incorrect title

-citation to lab manual incorrect pages

-citation to lab manual missing

**Data Sheet** (carbon copied)

-data sheet copy illegible

- no carbon copy of data sheet attached or data sheet not initialed by instructor

-unknown number missing from data sheet

-name of partner(s) missing from data sheet

-data scribbled out or obscured

-data sheet not dated

-data sheet not signed by student

**Calculation Section**

-calculation section not included

-units not included

-calculations not done correctly

-calculations not labeled

-not using data values for calculations

-incorrect significant figures

**Summary of Results**

-unknown number not included in summary of results

-no summary included in lab report

-missing or incomplete summary information

-missing units

-incorrect significant figures

-table separated on different pages

**Conclusion**

-omission of conclusion section

-omission of results from conclusion

-omission of conclusion

-omission of unknown number or sample ID from conclusion

-discussion of sources of error missing, incomplete or poor

-data or calculations included in conclusion

-procedure included in conclusion

-no discussion of whether or not purpose was met

-no discussion of discarded data, if appropriate

-wrong or invalid statement

**Accuracy**

For some experiments unknowns are given. In such cases, results will be graded on the % error. The greater the % error, the more points will be lost. A maximum of 5 points can be lost due to large % error.

**Quizzes and Post-Lab Questions (30%)**

Short, weekly quizzes may be given at the beginning of the laboratory. You must arrive on time in order to take these. No makeup quizzes will be given. Quizzes will cover concepts from the previous lab. Review questions from the previous lab will help greatly. Instructors are required to give at least 6 quizzes during the semester. Quizzes will be 10 points each.

Post-Lab Questions are located at the end of most of the labs. Please complete these and hand them in with the lab report. They will not be graded as part of the lab report, but will be graded independently. Post-Lab Questions can be done on separate pieces of paper in pencil. Post-Lab assignments will be 5 points each.

**Lab Performance (5%)**

This portion of the grade will include: technique, preparedness, ability to use equipment, adherence to safety guidelines, and cleanliness. It should be noted that this portion of the grade is earned and is not given full credit without validity.