

Chem 173 General Chemistry for Engineers Laboratory Fall Semester 2018

Requirements: Chem 171 should be taken concurrently with or before Chem 173.

Instructor: Dr. Paul Chiarelli, Flanner Hall 102, phone 508-3106, E-mail: mchiare@luc.edu. Office hours 9:30 to 11:30 AM Monday and 2-4 PM Wednesday.

Teaching Assistant: Kathryn Renyer, Flanner Hall 101, Email: krenyer@luc.edu. Office hour: Thursday from 10:00 – 11:00 AM.

You will need one **bound** laboratory notebook, such as a National-brand composition book sold in Barnes and Noble or Beck's bookstore. You will need laboratory goggles and a lab coat. All of which are available at the bookstore.

Other Materials: You will need an inexpensive calculator having logarithmic (base 10 and base e), exponential, and trigonometric functions to do routine mole-mass and volumetric calculations associated with this lab.

Objectives:

- 1) To acquaint students with fundamental concepts of chemistry and good laboratory practices.
- 2) To teach wet chemical lab skills, efficiency, and planning of experiments.
- 3) Teach critical evaluation of experimental results.
- 4) To acquaint students with proper ways to write and present their experimental results

Laboratory Procedures: The lab will be conducted in FH 016 Tuesdays from 2:30 PM to 5:15 PM. The laboratory will start with a pre-lab lecture. We will provide you with handouts before lab and explain the procedures and goals for each assignment prior to its execution. You will be given handouts that are pertinent to each lab assignment beforehand. You will be required to take a pre-lab quiz on Sakai to demonstrate you are prepared for lab. The instructor will explain during the first lab period of the semester how the notebook is to be written. You will be required to construct data sheets to present your data for grading for each of the ten labs. The instructor will explain how this is to be done during the pre-lab lecture.

Disabilities Accommodations: If you have a documented disability and wish to discuss academic accommodations, please see your instructor by the second meeting of lab. (The Coordinator of Services for Students with Disabilities is located in the Sullivan Center for Student Services, Suite 260, 508-7714, and must be contacted independently.)

LOST AND FOUND: Any items mistakenly left in lab will be taken to the Chemistry Department office, 125 Flanner Hall, and can be identified and claimed there. **Please put your name on your data sheets, lab manuals, calculators and other personal items.**

Tentative Schedule of Laboratory Assignments

Aug 28	Check in, Review of Syllabus, Lab Safety orientation, Lab Notebook, Review of Significant Figures.
Sept 4	Lab 1 Chemistry of Ordinary Materials and Lab 2 Calibration of a Digital Pipette
Sept 11	Lab 1 Chemistry of Ordinary Materials and Lab 2 Calibration of a Digital Pipette
Sept 18	Lab 3: Group 1 Qualitative Analysis of Unknowns
Sept 25	Lab 4: Group 3 Qualitative Analysis of Unknowns
Oct 2	Lab 5 Energy Relationships in Chemical Equations
Oct 9	Midterm break
Oct 16	Midterm Exam
Oct 23	Lab 6 Percent Calcium Carbonate in a Mixture
Oct 30	Lab 7 Determination of Heat Capacity of Unknown Liquid
Nov 6	Lab 8 Spectrophotometric Determination of Aspirin
Nov 13	Lab 9 Determination of Acid Dissociation Constant Values for a Diprotic Acid
Nov 20	Lab 10 Synthesis and Characterization of a Conductive Polymer
Nov 27	Lab 10 Synthesis and Characterization of a Conductive Polymer
Dec 4	Final Exam, Checkout

Learning Outcomes for Chem 173:

- Understand and demonstrate safe laboratory practices.
- Use laboratory generated data to reach sound conclusions about chemical phenomena.
- Learn the proper use of an analytical balance
- Develop good laboratory practices in conducting experiments and reporting experimental results.
- Observe and interpret chemical reactions: color change, temperature change, precipitate formation, and gas evolution
- Learn the proper use of a digital pipet
- Learn the proper use of volumetric glassware
- Understand the equivalence of chemical and electrical energy
- Use a calorimeter to measure heat transfer
- Observe and interpret chemical reactions: color change, temperature change, precipitate formation, and gas evolution
- Understand Beer's Law
- How to perform a titration and calculate equilibrium constants from the data.

Notes concerning laboratory assignments: **We will be collecting and grading laboratory notebooks periodically. Please come to lab prepared. You should have a brief outline of your procedure for that period written in lab notebook as discussed in an earlier lab period.**

Grading: Each of the (ten) prelab quizzes are worth 1.5% (15% total). The midterm and final are worth 10% of your grade apiece (20% total). The lab notebook is worth 5% of your grade. Each lab (worksheet) is worth 6% of your grade (60% total).

Scale: **A** 100-93; **A-** 92-89; **B+** 88-85; **B** 84-81; **B-** 80-77; **C+** 76-73; **C** 72-69; **C-** 68-65; **D** 64-57; **F** <56.

Course Repeat Rule: Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W).

ACADEMIC INTEGRITY: All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed at:

<http://www.luc.edu/media/lucedu/cas/pdfs/academicintegrity.pdf>

Anything you submit that is incorporated as part of your grade in this course (e.g., quiz, examination, homework, and discussion sheet) must represent your own work. Any students caught cheating will, at the very minimum, receive a grade of "zero" for the item that was submitted, and this grade cannot be

dropped. If the cheating occurred during a course exam, the incident will be reported to the Chemistry Department Chair and the Office of the CAS Dean. Depending on the seriousness of the incident, additional sanctions may be imposed.

Appropriate in Class Behavior and use of Electronic Devices: Rude, disruptive behavior (such as viewing computer materials not concerning class subjects, texting or talking on phones...) will not be tolerated. Voice recording but not visual recording is allowed for pre-lab lectures. Cell phones, pagers, wireless PDAs, etc. must be turned off during lab. If your device is activated during lab, you must leave the lab immediately and cannot return for the duration of that lab period.

Safety in the Laboratory: Laboratory Safety is everyone's responsibility. By registering for and participating in this course you agree to abide by the following rules. Failure to follow these rules constitutes grounds for withdrawing the offending student from the lab session and or course at any time.

1. To wear approved safety goggles at all times in the laboratory.
2. To know both the location of and how to use eye washes.
3. Not to wear contacts in the laboratory.
4. To wear appropriate clothing that minimizes potential chemical contact with your skin. Shoes that adequately cover the entire foot are required. Sandals, open-toes shoes, perforated shoes, open-backed shoes are not acceptable. **No skin should be exposed on your feet or legs, so clothing that covers and protects your body from the waist down (including your ankles) should be worn.** You must be dressed appropriately to perform an experiment, including your lab coat and goggles.
5. To know both the location of and how to use the safety showers.
6. To know both the location of and how to use the fire extinguishers.
7. Not to perform unauthorized and unknown experiments, nor work in the lab without appropriate supervision.
8. Not to take chemicals or equipment out of the laboratory.
9. Not to engage in horseplay or any clowning around that might endanger you or other students.
10. Not to eat, drink, chew gum, or smoke anything in the laboratory **at any time.** No headsets or cell phones.
11. To keep your lab space clean and tidy.
12. To ask your instructor or TA when in doubt about procedures.

By using common sense and following these rules, it is unlikely that you or your classmates will be involved in or injured in a mishap in the laboratory. While it is very important that you do your part to prevent an accident from occurring, it is just as important to know what to do if someone is injured. *Critical Injuries* include: glass in his/her eye(s), serious cuts, severe chemical burns, severe fire burns, seizures. **Immediately call for help using either the lab**

phone (security number is taped to phone handle) or the emergency phone in the hallway directly outside the laboratory.

Anyone with chemicals or foreign objects in his/her eye(s) will be escorted to the Wellness Center or to the hospital.

First Aid Basics:

- Minor Cuts: Band-Aids are available. If you bleed through one Band-Aid, another should be applied over the first. If you bleed through two Band-Aids in a few minutes, or if there is any possibility of broken glass in a cut, you will be escorted to the Wellness Center.
- Minor Burns from Fire: If the skin is unbroken, run cool water over the area or submerge in a cool water bath for at least 5 min. Apply a cool, damp towel.
- Chemicals in Eyes: Immediately flush eyes with water at the eye wash. Continue with flush for at least 10 minutes. You will probably need to hold the affected eye(s) open to do this properly.
- Chemicals on Skin: Dust any dry chemical off with a dry towel and then flush with water. Flush any wet chemical from the skin immediately with water at the sink or safety shower. If clothing is affected, remove clothes before rinsing! Continue with rinse for at least 10 minutes.

Fire Hazards: The primary heat source in this laboratory is the Bunsen burner, which is fueled by natural gas. A lit Bunsen burner is a small, controllable fire, but the heat generated by the burner fire can be quite hazardous in certain circumstances. It can serve as an ignition source for other combustible materials in the lab such as paper (lab handouts, paper towels, filter paper, etc.), plastics (wash bottle), flammable liquids (acetone, ethanol). A burner fire can also ignite clothing and hair. Proper operation of a burner and the absence of combustible materials in the proximity of the burner will significantly reduce the risk of a fire. Each lab is equipped with a fire extinguisher, fire blanket, and safety shower, which should be used in a fire emergency.

- Procedure in a case of a fire: Remain calm; alert the instructor and your immediate neighbors. Personal safety, yours and others in the labs, is always the top priority. A small fire in a small container can be suffocated by covering it with a watch glass or inverted beaker. With a somewhat larger fire, you need to decide whether or not you think you can control it with a fire extinguisher.
- **Use of a Fire Extinguisher:** Located by the doors in both labs; a back-up fire extinguisher is located at the west end of the floor. Maintain an escape position; i.e. stay between the fire and the doorway. **Break the plastic ring, pull out the metal ring, release the hose from the bracket, direct the hose at the base of the flames, and press the lever down.**

Note: the fire extinguishers are heavy and not particularly easy to direct. These are multipurpose dry chemical extinguishers, safe for anything we use in lab.

Policy on missed assignments: Skipping a Lab period is highly discouraged. You will be allowed only one make up or one redo lab during the semester. Any make up lab will have to be done on the student's own time, not during a regular lab period.