Fall 9-1-2021

CHMY 142N.00: College Chemistry Lab I

Mark Cracolice
University of Montana, Missoula, mark.cracolice@umontana.edu

UM CHEMISTRY 142 COLLEGE CHEMISTRY LABORATORY I
AUTUMN 2021

Instructor: _____

Contact information: _____

Office Hours: _____

Office Hours Location: Chemistry & Biochemistry Learning Center (CBLC), CHEM 107

You are encouraged to get help in the CBLC any time it is staffed. All course laboratory instructors will help you with both CHMY 142 and 141 during their office hours. Office hours of all laboratory instructors are displayed in the CBLC.

Corequisite

College Chemistry I, UM CHMY 141

Course Purpose, Objectives, and Learning Outcomes

Abraham and Pavelich state the following:
"Science is much more than a bunch of facts and theories. The heart of every science is research; that is, the investigation of nature. The laboratories are designed to give you experience with research. As such you will be using scientific processes such as collecting data, interpreting data, forming hypotheses, testing hypotheses and explaining results." (p. 3).

In general, the laboratory exercises are intended to serve as an introduction to the principles that subsequently will be discussed in lecture. "The purpose of the lab experiments is to introduce you to the subject area, and to give you a concrete experience with the concepts before they are discussed in a more abstract way in the lecture." (A&P, p. 3).

Objective 1: Develop your understanding of the nature of science.

Objective 2: Develop your scientific reasoning skills.

Objective 3: Develop your understanding of chemical principles.

Objective 4: Know how to use and know the limitations of some elementary measurement instruments used in the sciences.

Objective 5: Develop your interpersonal competencies.

Required

All required materials will be used in the second semester of laboratory as well.

Abraham, M. R., & Pavelich, M. J. (1999). *Inquiries into chemistry* (3rd ed.). Prospect Heights, IL: Waveland Press, Inc.

Graph paper

Splash-protection safety goggles

Straight edge

Schedule

Week	Dates	Topic	Source
1	1–3 Sep	Measurement I	Class handout
2	8–10 Sep	Measurement II	Check in; A&P B-1
3	15–17 Sep	Gas Relationships	A&P E-1 A&C
4	22–24 Sep	Mass Relationships I	A&P C-1
5	29 Sep–1 Oct	Mass Relationships II	A&P C-2
6	6–8 Oct	Mass Relationships III	A&P C-4
7	13–15 Oct	Lab Midterm Exam	—
8	20–22 Oct	Energy Relationships I	A&P D-1
9	27–29 Oct	Energy Relationships II	A&P D-2
10	3–5 Nov	Energy Relationships III	A&P D-3
11	10–12 Nov*	Molecular Geometry	A&P H-1
12	17-19 Nov	Chemical Properties	A&P F-1
13	24–26 Nov	No lab	—
14	1–3 Dec	Lab Final Exam W & F Sections	—
15	9 Dec	Lab Final Exam R Sections	—
Finals		No lab	—

*R 11 Nov is Veterans Day Holiday. Thursday students will do A&P H–1 on R 2 Dec.

Grading

11 laboratory reports @ 100 points each	1100
1 midterm exam @ 100 points × 3	300
1 final exam @ 100 points × 5	500
Total possible	1900

A+ Not awarded at UM	A 1767–1900 points	A– 1710–1766 points
B+ 1653–1709 points	B 1577–1652 points	B– 1520–1576 points
C+ 1463–1519 points	C 1387–1462 points	C– 1330–1386 points
D+ 1273–1329 points	D 1197–1272 points	D– 1140–1196 points

(1140 or more required for CR for those using CR/NCR option)

F 0–1139 points

Laboratory report grading criteria vary based on the nature of the laboratory exercise. In general, most errors result in a deduction of 5 or 10 points.

In general, laboratory reports are due at the end of the laboratory period. However, time demands of data collection and report writing vary considerably among exercises, so your laboratory instructor may intermittently allow additional time outside of the laboratory. When additional time is allowed, reports are due 48 hours from the conclusion of the laboratory period.

There are no makeup laboratory exercises. You may arrange with your lab instructor to attend an alternate lab period in the same week, if necessary. Lab periods are: W 8–11, W 3–6, R 8–11, R 1–4, and F 8–11. If it helps your grade, your lab final exam score will replace one missing lab report score or your lowest lab report score if you do not miss any lab periods.

Graphing

A thread that is common to many laboratory exercises is the investigation of data with an independent variable and a dependent variable that have a linear relationship. You will typically plot such data on a graph, estimate a line of best fit, and determine the equation of the line. The following grading criteria will apply to these laboratory reports:

1. Graphing must be done by hand. Computer-generated plots are not allowed.

2. Graph paper with a light green or blue background must be used. Dark-lined graph paper such as that at the back of Abraham & Pavelich is not permitted. The grid lines must be light enough so that data points made with pencil can be easily and clearly seen.

3. The independent variable—the measured quantity that is being manipulated by experimental design—is plotted on the x-axis. The dependent variable—the measured quantity that depends on the value of the independent variable—is plotted on the y-axis.

4. Each axis must be scaled so that the range of your data is represented by half of the length of the page or more. Round-number values must be used on major grid lines.

5. Each axis must have a label that describes the variable being plotted and states the unit in which the quantity was measured.

6. The graph must have a title that accurately and succinctly summarizes the nature of the plot.

7. Data points are to be made by placing a dot on the page and then circling that dot.

8. An estimated line of best fit must be drawn by eye so that the sum of the distances from the points to the line in each direction is minimized. The line must be drawn with a straight edge tool.

9. The equation of the line of best fit must be expressed in terms of the actual quantities and their units, not y and x.

Safety

Workplace safety is a critical issue in many industries. Hospitals store potentially lethal drugs and have equipment that generates radiation. Retail stores have heavy items to move and storage on high shelves. Restaurants have knives and hot cooking equipment. The issue of workplace safety is sufficiently important to merit a division of the United States Department of Labor known as the Occupational Safety and Health Administration, OSHA. Federal law provides you with a right to a safe workplace.

Always be safety conscious. Learning about safety in a college chemistry laboratory will help you to be knowledgeable of workplace safety after you graduate. A chemistry laboratory has its own unique issues related to safety. The following rules are designed to assure your safety and the safety of your classmates. Alert your lab instructor if you see a potentially unsafe situation or witness unsafe behavior, either a violation of these rules or simply a lack of common sense.

1. Splash-protection safety goggles must be worn by everyone in the laboratory whenever anyone is performing an exercise. If one student is performing an exercise, everyone in the lab must wear goggles. You are responsible for obtaining your own pair of goggles and bringing them to lab each week (you may leave them in your drawer). Goggles must be worn over your eyes in such a manner that they form a seal between the goggles and your face. Particle goggles are not acceptable.

2. You are responsible for knowing the location and proper use of all safety equipment. This includes the fire extinguishers, eye-wash fountains, and safety shower. You must know the location of each laboratory exit.

3. Proper clothing must be worn. Long pants and closed shoes are recommended. Long hair should be tied back. Contact lenses are not recommended. If you do choose to wear contact lenses, notify your laboratory instructor at the beginning of the lab session.

4. All laboratory work must be supervised by an authorized laboratory instructor. You may not deviate from the assigned laboratory exercise without explicit permission from your laboratory instructor.

5. Never touch, taste, or smell any laboratory chemical.

6. Eating, drinking, vaping, and use of tobacco products is prohibited in the laboratory. You may not bring open food or drink containers into the laboratory. Water bottles are not permitted.

7. Books, backpacks, coats, etc. must be stored away from areas that must remain unobstructed in case of emergency. Store all such items against the walls of the laboratory which do not have exit doors.

8. Do not use chipped or damaged glassware. If you see a crack or chip in any piece of glassware, bring it to the attention of your laboratory instructor.

9. Be particularly cautious when a laboratory exercise calls for use of an open flame. Baggy sleeves, baggy clothing, and long hair are particularly susceptible to catching on fire. Keep paper items a safe distance from the flame. Check the immediate area for flammable solvents before igniting a flame.

10. Horseplay is not allowed. It is not safe to roughhouse or play practical jokes when in a chemistry laboratory. Examples include splashing or squirting water, pretending to “spill” chemicals on another student, and bumping into a student, running or jumping, and walking backwards.

11. Do not pipet by mouth. Do not use your mouth or teeth to open sealed containers.

12. Dilute acids and bases by adding them to water. Do not add water to acid or base solutions.

13. Chemicals must be disposed of safely and in an environmentally-friendly manner. Follow the directions of your laboratory instructor precisely.

14. Broken glassware must be disposed of safely. Do not endanger the custodial staff by placing broken glass into a standard trash container. Place broken glass into a container specifically designed for it.

15. Most laboratory exercises will have additional safety instructions that are specific to that exercise. Listen carefully to the prelab instructions and follow these instructions precisely. If you do not understand any such instructions, you are responsible for asking for clarification. If you are late for lab and miss safety instructions that are included in a prelab discussion, you will not be permitted to perform the exercise and you will receive a zero for that lab report.

You must act in a manner that insures your safety and the safety of others in the laboratory. If you behave in an unsafe manner, you will be dismissed from lab and you will receive a zero for the lab report. Continued unsafe behavior will result in being dropped from the course.

Additional Information

1. Late lab reports destroy the continuity of the 141/142 curriculum plan. Always strive to complete your lab report by the end of each laboratory period. When your lab instructor grants permission to turn in a report 48 hours after a lab, this is the *final* deadline to receive any credit. *Late reports are not accepted*. If you must make a choice, it is better to turn in a partially-completed report on time than to turn in a fully-completed report late.

2. The laboratory closes promptly at the end of each laboratory period. Plan your work so that you have everything put away and have cleaned your work area by the end of the period. If necessary, you may arrange with your laboratory instructor to work during another period.

3. Clean up after yourself. If you spill a solid substance on a balance pan, clean it off immediately. Place lids on containers and caps on bottles after use.

4. Never place an instrument into a stock container. You may potentially contaminate the stock. Instead, transfer some of the substance to your own container.

5. There are many benefits to working with a lab partner, e.g., manipulation of materials and instruments, discussion of chemical principles, development of your interpersonal competencies, conservation of materials, reduction of adverse environmental impact, etc. However, intellectual growth will occur only if you think through the exercise for yourself. Thus, you will work with an assigned partner during the data collection phase of a laboratory exercise and work individually to complete your lab report. Reports from partners or any other student in the course that have substantial duplication will "split the grade," e.g., a report that earns an 80 will be graded as 40 for each person.

6. If you are a student with a disability who will require reasonable program modifications in this course, please meet with the Office for Disability Equity in Lommasson 154 for assistance in developing a plan to address program modifications. If you are already working with ODE, correspond with me by email and/or arrange to meet with me during my office hours to discuss reasonable modifications that may be necessary. For more information, visit the ODE website at http://www.umt.edu/disability.

7. This course syllabus is *not a contract;* it is a tentative outline of course policies. Changes may be made before, during, or after the semester at the discretion of the course coordinator, Prof. Cracolice.