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### CHMY 142N.01: College Chemistry I Lab

Earle R. Adams

*University of Montana, Missoula*, [earle.adams@umontana.edu](mailto:earle.adams@umontana.edu)

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## CHMY 142n

## LABORATORY GUIDE

Spring 2019

Instructor: Earle R. Adams, Chem122, 406-830-7620, earle.adams@umontana.edu

Office hours: 1) There will be times set in the chemistry computer room 2) schedule a specific time 3) email me anytime.

Required Materials

1. *Inquiries into Chemistry*, M. R. Abraham and M. J. Pavelich (A&P) (, 3<sup>rd</sup> Edition, Waveland Press, 1999.
2. A bound laboratory notebook with permanently numbered duplicate pages.
3. Splash-protection safety goggles.
4. This Course Pack and a continuing series of handouts containing details about lab reports, and experiments not included in *Inquiries into Chemistry*.
5. Graph paper and pen:

Recommended Materials:

1. Permanent marker pen
2. USB data storage device.
3. calculator

Course Objectives

1. Provide students with concrete, hands-on experiences that demonstrate and reinforce the chemical concepts presented in lecture.
2. Develop students' skills using the scientific method of inquiry
  - a. Design and implementation of experiments
  - b. Interpret data and results, including their significance
3. Develop students' quantitative reasoning skills
4. Gain experience with various chemical laboratory methods and techniques

Corequisite

College Chemistry I, UM CHMY 141

Strategies

Many of the exercises that you will conduct are described or outlined in *Inquiries into Chemistry*, and others are described and outlined in a CoursPack. **To be successful, it is important that you read the relevant material and complete the related protocols before you come to lab.**

Makeup Labs:

Since the lab is busy all week long with a number of different chemistry labs and multiple sections, there isn't a way to make up a lab if you miss your designated lab section. However if

you let me know early enough, we can try to put you in another section to make up the lab. If you can not attend any of the other lab sections to make up the lab, then you can use one lab during the course of the semester in which you do not need a written excuse whereby the TA will give you the data for your lab and you can earn up to half the points of the lab (ie: if it's a 10 point lab you may earn up to five points. If you are gone to a school sanction function with a written excuse then you may receive the lab data and earn potentially up to its full credit. You may not use this option during the two open inquiry labs.

## 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.

## Schedule

Week	Topic	Source
1	Measurement I	
2	Measurement II	A&P B-1
3	Gas Relationships	A&P E-1 A&C

4	Mass Relationships I	A&P C-1
5	Mass Relationships II	A&P C-2
6	Mass Relationships III	A&P C-4
7	Energy Relationships I	A&P D-1
8	Lab Midterm Exam	—
9	Energy Relationships II	A&P D-2
10	Energy Relationships III	A&P D-3
11	Molecular Geometry	A&P H-1 (dry lab)
12	Spring break	
13	Chemical Properties	A&P F-1
14	Net Ionic Equations	
15	Lab Final Exam	—
F	No meeting	—

### Grading

12 laboratory reports @ 100 points each	1200
1 midterm exam @ 100 points × 3	300
1 final exam @ 100 points × 5	500
Total possible	2000

A+ Not awarded at UM	A 1860–2000 points	A– 1800–1859 points
B+ 1740–1799 points	B 1660–1739 points	B– 1600–1659 points
C+ 1540–1599 points	C 1460–1539 points	C– 1400–1459 points
D+ 1340–1399 points	D 1260–1339 points	D– 1200–1259 points
(1200 or more required for CR for those using CR/NCR option)		
F 0–1199 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 allow additional time outside of the laboratory. When additional time is allowed, reports are due 48 hours from the conclusion of the laboratory period, in this case it will be Monday morning by noon.

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: F: 11-2 and 2-5. 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.

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## 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 Disability Services for Students in Lommasson 154 for assistance in developing a plan to address program modifications. If you are already working with Disability Services, 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 Disability Services 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. Adams