General Chemistry I – Laboratory

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Welcome to Chemistry 110 and to the Lycoming College Department of Chemistry! The labs this semester are meant to introduce you to aspects of chemical laboratory procedures and techniques that will help prepare you for success in later chemistry courses.

Learning Objectives

- Perform wet laboratory techniques as appropriate to the major sub-disciplines of chemistry
- Understand and use modern chemical instrumentation
- Exhibit integrative, problem-solving skills, such as experimental design, data manipulation, and data interpretation
- Communicate the results of chemical investigations effectively in written form
- Search the chemical literature, evaluate the results of the search, and access desired research materials
- Demonstrate responsible conduct in the laboratory, including laboratory safety and ethical research practices

This course addresses the following institutional learning goals:

- be able to communicate effectively in written form
- be able to think critically
- have demonstrated technological competence appropriate for his/her discipline

Accommodations for Students with Disabilities

Lycoming College provides academic support for students who have been diagnosed with learning, physical, and psychological disabilities. If you have a diagnosed disability and seek academic accommodations, please contact Dean Jilliane Bolt-Michewicz (Sophomore Dean and Coordinator of Services for Students with Disabilities). Dean Bolt-Michewicz will help you arrange for academic accommodations in the classroom. You may contact her as follows: michewicz@lycoming.edu; 321-4050; Snowden Library, 3rd floor, ARC.

Overall Laboratory Grade

The overall lab grade is calculated based on the following. The total is converted into a percentage, which is used to find the number of points from lab in the overall Chemistry 110 grade. Please be aware that a point in lab is NOT the same as a point in the overall course.

NO STUDENT WILL PASS THE COURSE WITH LESS THAN A SCORE OF 60% IN THE LABORATORY PORTION OF THE COURSE.

	POINTS
Laboratory Reports *(Nine labs @ 40 points each)*	360
Laboratory Quizzes *(Three quizzes @ 15 points each)*	45
Laboratory Performance	20
TOTAL POINTS	**425**

$$\frac{\#\ \text{Laboratory Points}}{425} = \text{Percentage as Decimal } \times 115 = \#\ \text{Lab Points in Overall Course Grade (Out of 115 Total)}$$

Laboratory Notebook

Lab notebooks should be neat, well organized, up-to-date and complete, with a Table of Contents. Leave room to record your data, the uncertainties in measurements, and any observations about the experiment. Use a different notebook page for each day's data, and submit the carbon copies at the end of the lab period. Original pages should never be removed from the laboratory notebook.

Laboratory Reports

Reports consist of a Title, Objective, Approach, Lab Observations, Report Form (if required), Calculations, and answers to any Questions. They are due one week following completion of the experiment unless otherwise noted. Additional instructions may be given in the pre-lab lectures. **Reports are due prior to the pre-lab lecture** on the date shown on the schedule below- again, changes may be announced in lab.

Late labs will be penalized 10% per school day (weekend counts as 1 day), and are not accepted more than one week late. Pre-lab questions and TOA (Title, Objective, and Approach) are due prior to the pre-lab lecture and will not be accepted late.

In most experiments, you will work individually. You are welcome to consult with your laboratory instructor, teaching assistant, or lab mates but remember that your grade ultimately depends on your own work.

Laboratory Quizzes

Lab quizzes will be held at the start of lab the weeks of Sep. 26-28, Oct. 31-Nov. 2, and Dec. 5-7. The three lab quizzes are worth 15 points each, for a total of 45 points. More information will be given on quiz content in the weeks before the quiz is given.

Laboratory Performance

Laboratory performance is worth 20 points and will be evaluated according to the "Lab Performance Matrix" printed on the inside back cover of the lab manual.

Lab Absences

Only absences where the instructor is notified ahead of time will be excused and a make-up permitted. All requests to make up a lab (or attend a section other than your normal lab) can be granted only ***after*** consultation with the Lab Manager, Annie Spencer. No student will be permitted to make-up more than 2 lab periods each semester!

Lab make-ups must be scheduled by the end of the week that the lab is missed and must be completed by the end of the following week. Labs must be made up between the hours of 8am-5pm.

Students who simply show up at a different lab section will not be admitted to that lab. Missing pre-lab lecture or showing up late for the pre-lab lecture will be considered an absence (which will not be considered as an excused absence) and the student will not be permitted to participate in that laboratory period. The student will receive a zero for the laboratory. Showing up to lab on time is paramount to your success in this course!

Laboratory Safety

Unsafe behavior in the laboratory will not be tolerated. Repeated unsafe behavior will result in a reduction of your grade (1st offense → ZERO for experiment; 2nd and additional offenses → 20% reduction of final lab grade)

As a student chemist, you will be working in many situations that demand your utmost care and attention to protect not only yourself, but your lab mates, instructors, and the environment. Preparation and careful, patient work is needed to obtain the results required of each experiment.

You will each sign a Department of Chemistry Safety Contract. You are expected to know and understand all safety regulations and safety policies of the Department of Chemistry. The signed contract will be turned in and a copy is available in the laboratory notebook on pages 12-13.

Laboratory Schedule

Date	Experiment	What's Due
Aug. 29-31	Orientation, Check-In, Laboratory Safety	PRE-LAB in LSC 253 Signed Safety Contract Lab Deposit Due
Sep. 5-7	The Measurement of Mass and Volume: Density of Liquids and Solids	TOA for Density
Sep. 12-14	The Separation of a Mixture: Week 1	TOA for Separation **Report for Density**
Sep. 19-21	The Separation of a Mixture: Week 2 Qualitative Organic Analysis (QOA): Week 1 Distillation and Measurement of the Boiling Point (BP) of a Solvent	PRE-LAB in LSC 253 TOA for QOA: Week 1
Sep. 26-28	Qualitative Organic Analysis (QOA): Week 2 Freezing Point (FP), Density, and Infrared (IR) Spectrum of the Solvent	**LAB QUIZ ONE in LSC 253** TOA for QOA: Week 2 **Report for Separation**
Oct. 3-5	Qualitative Organic Analysis (QOA): Week 3 Recrystallization of the Solute	TOA for QOA: Week 3 **Report for QOA Weeks 1-2**
Oct. 10-12	Qualitative Organic Analysis (QOA): Week 4 Melting Point (MP), Gas Chromatography (GC), and IR Spectroscopy of the Solute	NO PRE-LAB TOA for QOA: Week 4
Oct. 17-19	The Determination of Glucose Concentration in Common Beverages	TOA for Glucose **Report for QOA Weeks 3-4**
Oct. 24-26	Synthesis of Aluminum Potassium Sulfate (Alum) from Aluminum Scrap – Week 1	TOA for Alum **Report for Glucose**
Oct. 31- Nov 2	Synthesis of Aluminum Potassium Sulfate (Alum) from Aluminum Scrap – Week 2	**LAB QUIZ TWO in LSC 253**
Nov. 7-9	The Nine Bottle Problem	TOA/Pre-Lab for Nine Bottle **Report for Alum**
Nov. 14-16	Calorimetry, ΔH, and Hess' Law	TOA for Calorimetry **Report for Nine Bottle**
Nov. 21-23	THANKSGIVING – NO LAB	
Nov. 28-30	The Atomic Weight of a Metal	TOA for Atomic Weight **Report for Calorimetry**
Dec. 5-7	Check-Out	**LAB QUIZ THREE in LSC 253** **Report for Atomic Weight**
Dec. 11-15	FINALS WEEK – NO LAB	

Material Covered on Laboratory Quizzes

Subject matter which may be included on laboratory quizzes is as follows:

- Calculations associated with the CHEM 110 lab reports (density, sig figs, % error, etc.)
- Operation of lab equipment and basic techniques (how to read a graduated cylinder, explain how to do a filtration, etc.)
- Laboratory safety
- Names and formulas (From list below and chemicals used in lab)
- All Laboratory Manual Chapters covered up to the date of the quiz (IR, GC, UV-Vis, MP, Dilution, Distillation, etc. Appendices and Moodle tutorials are fair game on any quiz!)

Chemical Elements and their Common Ions *(Names and Symbols/Ions)*	Group 1: Li, Na, K	forms +1 cations
	Group 2: Be, Mg, Ca, Sr, Ba	forms +2 cations
	Group 13: B, Al	forms +3 cations
	Group 14: C, Si, Pb	Carbon group
	Group 15: N, P, As, Sb	Nitrogen group or Pnictogens
	Group 16: O, S, Se	forms -2 anions
	Group 17: F, Cl, Br, I	forms -1 anions
	Group 18: He, Ne, Ar	Noble Gases
	Period 4: Fe, Ni, Cu, Zn	
	Period 5: Zr, Pd, Ag	
	Period 6: Pt, Au, Hg	

Common Polyatomic Ions and their Neutral Acids and Bases *(Names and Formulas)*	Acetate	CH_3COO^-		Acetic Acid	CH_3COOH
	Carbonate	CO_3^{-2}		Carbonic Acid	H_2CO_3
	Hydrogen Carbonate (or bicarbonate)	HCO^{-3}			
	Chromate	CrO_4^{-2}			
	Nitrite	NO_2^-		Nitrous Acid	HNO_2
	Nitrate	NO_3^-		Nitric Acid	HNO_3
	Phosphate	PO_4^{-3}			
	Hydrogen Phosphate	HPO_4^{-2}		Phosphoric Acid	H_3PO_4
	Dihydrogen Phosphate	$H_2PO_4^{-2}$			
	Cyanide	CN^-			
	Sulfate	SO_4^{-2}		Sulfuric Acid	H_2SO_4
	Hydrogen Sulfate (or bisulfate)	HSO_4^-		Sulfurous Acid	H_2SO_3
	Peroxide	O_2^{-2}		Hydrogen Peroxide	H_2O_2
	Permanganate	MNO_4^-			
	Hydroxide	OH^-			
	Ammonium	NH_4^+		Ammonia	NH_3
	Hydronium	H_3O^+		Water	H_2O