# University of Texas at Tyler
# CHEM 3153: Physical Chem I Lab
# Fall 2024

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**Instructor Information**


Dr. Rachel Mason

- rmason@uttyler.edu
- 903/565-5641
- RBS 3002


Office Hours:

- MWF 9:30-10:30 am
- T 3:30-5:30 pm
- By appointment. Please email to set an appointment
- I have an open door policy welcoming drop-ins when I am available.
- I expect you to have questions so be sure to ask them.

## Course Description

Physical Chemistry is concerned with the physical principles underlying the properties of chemical substances. In order to learn physical chemistry, students must become familiar with the experimental foundations on which the theoretical principles are based. Generally, the ability to utilize the principles requires an intimate knowledge of experimental techniques. For this reason, the lecture course in physical chemistry is accompanied by this laboratory course.

## Student Learning Outcomes

By the end of the course the students should be able to:

- Thoroughly understand and apply principles, laws and theories of introductory physical chemistry discussed in lecture.
- Utilize common laboratory apparatus, instruments and equipment to measure physical properties of substances.
- Demonstrate good laboratory technique and skills.
- Competently communicate results.
- Work cooperatively with others.

## Meeting Times and Locations

The class will meet on from 26 August to 6 December 2024, except for the week of Thanksgiving (25-29 Nov). Normally the class will meet in RBS 4014. However, the experiments utilize a variety of instruments located throughout the Department. A **tentative** schedule of experiments is provided on page 3.

Section 001—Thursdays 1:30 - 6:00 pm

## Important Dates

Administrative Dates to Know:
September 2nd (Mon) – Labor Day holiday, no classes held
September 9th (Mon) – Census date, last day to file for grade replacement
October 1st (Tues) – FINAL deadline for Fall 2024 graduation
November 1st (Wed) – Enrollment for Spring 2024 opens for Seniors (Nov 2nd for Juniors)
November 4th (Fri) – Last day to drop or withdraw from courses with a W
November 20th–25th (Mon-Sat) Thanksgiving Holiday, no classes

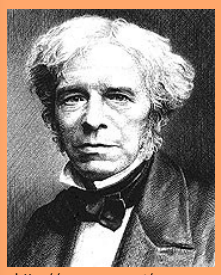
## Pre-Requisites and Co-Requisites

- General Chemistry I & II lab/lecture
- Organic Chemistry I & II lab/lecture
- Analytical Chemistry
- Physical Chemistry I lecture (Co-req)
- University (or College) Physics I & II
- Calculus I, & II

Additionally, students must show credit for or be concurrently enrolled in Chem 3354: Physical Chemistry II Lecture.

**Thus Faraday approached both his science and his everyday conduct unhampered by ego, envy, or negative emotion. In his work, he assumed the inevitability of error and failure; whenever possible, he harnessed these as guides toward further investigation. Faraday adhered to no particular school of scientific thought. Nor did he flinch when a favored hypothesis fell to the rigors of experiment."**

**— Alan Hirshfeld, *The Electric Life of Michael Faraday***



http://www.aps.org/publications/apsnews/200108/history.cfm

## Instructional Materials:

**Required Textbook:**

There is no required textbook for the course. All instructional material will be posted on the course Canvas site. Students are expected bring the printed laboratory exercise to class with them.

**Additional Supplies:**

Students are required to have:

- Laboratory notebook:
  Bound 8 x 10" notebook with cross-lined and removable duplicate pages.
- Splash proof ANSI Z87 goggles
- Scientific calculator
- Access to a computer with excel. Having a latptop/table is essential.

## Grade Computation

Grades will be tentatively based on a 90/80/70/60 scale, but may be adjusted on my evaluation of the class.

Course grade will be determined by:

| | |
|---|---|
| Lab Reports | 80% |
| Lab Practices | 10% |
| Requisitions | 10% |
| Teamwork | 5% |

Generally five to six experiments are assigned during the semester. The instructor reserves the right to adjust this number if conditions warrant the deletion and/or the addition of exercises or reports.

**All assigned experiments must be completed with submitted reports to receive a passing grade**.

The lab practices grade includes technique, safety, professional attitude, work ethic, *etc.*

Students are strongly encouraged to use literature in the writing of their lab reports, but cautioned against plagiarism. Please see the plagiarism information posted on the course Canvas.

Students will be placed in groups to complete the laboratory exercises.

## Safety Notice

Physical Chemistry students have a bad habit of believing that they are advanced chemists and no longer need to follow safety rules. **This is NOT TRUE**. Physical Chemistry students must recognize that while their increased knowledge allows them to participate in laboratory exercises utilizing a wider array of chemicals, procedures, and equipment, these things carry increased risk and possibility for danger if used careless or incorrectly. Many of the experiments have the potential to cause serious injury. Students are expected to utilize safe lab practices and abide by all Departmental safety policies. (Found on Pages 5-8 of this document.) **Safety goggles must be worn in the laboratory at all times!!!**

Appropriate lab wear should be worn. This includes long pants or skirts and shorts with sleeves. Tank tops, tube tops, shirts with spaghetti straps, strapless shirts, sleeveless shirts and crop tops are all examples of inappropriate clothing. Closed toes shoes which fully encase the foot are also required. Students who come to lab inappropriately attired will be asked to leave.

**Safety goggles must be worn in the laboratory at all times!!!** At this level it should go without saying that safety goggles are a necessity. Goggles must be splash-proof (indirectly vented) and meet ANSI Z87 criteria.

Students must have a safety contract for the current semester on file with the Department prior to participating in the first laboratory exercise. Please see page 13. The safety contract may be found on the last page of this document.

That's all very well in practice, but will it work in theory?

- G. Hill

*Education in Chemistry*

1992 (1), 28.

## Possible Experiments:

Laboratory exercises will be assigned to students from the following:

- Plagiarism Avoidance
- Error Analysis
- Gas Relations with Adiabatic Expansion
- Vapor Pressure of a Pure Liquid/ Heat of Vaporization
- Solution Calorimetry
- Bomb Calorimetry
- Heat-Capacity Ratios for Gases
- Partial Molar Volume
- Binary Liquid-Vapor Phase Diagram
- Binary Solid-Liquid Phase Diagram
- Kinetic of Reactions

Line engraving by Louis Jean Desire Delaistre, after a design by Julien Leopold Boilly

**The impossibility of separating the nomenclature of a science from the science itself, is owing to this, that every branch of physical science must consist of three things; the series of facts which are the objects of the science, the ideas which represent these facts, and the words by which these ideas are expressed. Like three impressions of the same seal, the word ought to produce the idea, and the idea to be a picture of the fact.**

**— Antoine-Laurent Lavoisier *Elements of Chemistry* (1790), trans. R. Kerr, Preface, xiv.**

## Tentative Schedule

This is a tentative schedule of proposed experiments. We reserve the right to alter the schedule and/or experiments performed as needed throughout the course of the term.

Experimental procedures will be posted to Canvas prior to the lab period. Students are responsible for downloading and reading the materials prior to the lab period. See page 4 Course Responsibilities—Come Prepared for more information about the students' pre-lab responsibilities, including the requisition lists.

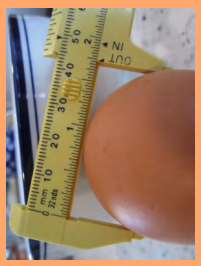
| Date | In Class | Assignments Due |
|---|---|---|
| **Aug 29** | Safety & Plagiarism | Plagiarism Assignment |
| **Sep 5** | Error Analysis | Safety Contracts & Training |
| **Sep 12** | Excel Workshop | Hand Calculations |
| **Sep 19** | Heat Capacity of Gases | Error Analysis |
| **Sep 26** | Data Workshop | --- |
| **Oct 3** | Group A: Bomb Calorimetry<br>Group B: Solution Calorimetry | Heat Capacity of Gases |
| **Oct 10** | Data Workshop | --- |
| **Oct 17** | Group A: Solution Calorimetry<br>Group B: Bomb Calorimetry | Group A: Bomb Calorimetry<br>Group B: Solution Calorimetry |
| **Oct 24** | Data Workshop | --- |
| **Oct 31** | Phase Diagram | Group A: Solution Calorimetry<br>Group B: Bomb Calorimetry |
| **Nov 7** | Data Workshop | --- |
| **Nov 14** | Kinetics | Phase Diagram |
| **Nov 21** | Data Workshop | --- |
| **Nov 28** | Thanksgiving | --- |
| **Dec 5** | TBD | Kinetics |

Don't despise empiric truth. Lots of things work in practice for which the laboratory has never found proof.

- Martin H. Fischer in *Fischerisms* (1944).

**Physics is the taking of very accurate measurements on impure and poorly defined materials. Chemistry is characterized by sloppy measurements on very pure materials. Thus Physical Chemistry is sloppy measurements on impure and poorly defined material. Although they like to think of themselves as the only ones making very accurate measurements on very pure materials.**

**—Reed Howard, Montana State University**



## Course Responsibilities

**Students must keep a record of their work in their lab notebook.**

This will be a complete record of all experiments performed. All prelab notes, procedures, data, calculations and observations should be written in either a physical or digital notebook. The data should be submitted to the instructor BEFORE leaving the class.

**Lab reports are required.**

A formal word-processed report is to be prepared and submitted (usually within one week) after each experiment is completed unless stated otherwise. Late reports will be penalized with a letter grade deduction per day unless arrangements have been made with the instructor. Report grades will be based on requisitions, formatting, completeness, clarity, experimental results, calculations, discussion of results and error, and understanding of the theory involved in the experiment. More information will be posted on the course Canvas page.

**Proper references are required.**

All information obtained from a source (not from yourself) must be referenced. This includes procedures, diagrams, physical constants and literature values. Primary sources are strongly preferred. Wiki references are not acceptable (anyone can edit that stuff!)

**Come prepared.**

Study the experiment and be familiar with the theory, apparatus, design and procedure before coming to lab. A requisition requesting all equipment and chemicals needed for the experiment must be submitted by noon two days preceding the experiment. Number & sizes of glassware and volumes/masses of chemicals are mandatory information in the requisition. You will only be supplied with the items and chemicals you requisition.

**Take care of the equipment.**

Much of the equipment used in the laboratory is expensive and or/difficult to replace. Handle all equipment very carefully and leave it clean and in good condition. Report any damage to the instructor as soon as it occurs or is noticed.

**Work appropriately with your partners.**

For most experiments, you will work together in teams composed of two to six students. All students in the team are expected to contribute to the completion of the experiment. Groups are required to vary job assignments throughout the term. Students are encouraged to discuss the experiment outside of class. However, each group must submit their own original lab report unless otherwise directed. Excel spreadsheets should not be shared. Please note changing font is NOT original work.

**Do not plagiarize.**

Plagiarism and other forms of cheating will not be tolerated. University regulations are explicit about academic dishonesty and will be enforced. These regulations are contained in *A Student Guide to Conduct and Discipline at UT Tyler,* which may be obtained in the Office of Student Affairs or accessed at http://www.uttyler.edu/mainsite/conduct.html. In the laboratory, an honor code will apply under which students are not to copy material from any source without proper citation. Students are expected to help enforce this code.

## Late-Work & Make-up Policy

The nature of the course makes it extremely difficult to accommodate absences. Students are expected to be in lab sessions if at all possible as your lab group depends on you. If you must miss, please, talk to me before the absence to create a plan. Specific options will depend on the lab session missed as doing the lab at an alternate time is not feasible for some labs.

Labs are accepted up to 48 hours after the due date with no penalty as long as students have communicated the need at least 12 hours before the due date. However, students are strongly encouraged to not to make this a habit.

**Experiment is the sole source of truth. It alone can teach us something new; it alone can give us certainty.**

**- Henri Poincare**

***Science and Hypothesis* (1902), trans. W. J. G. and preface by J. Larmor (1905), 140.**

## Student Resources

The following are resources available to UT Tyler students. Many of these offices provide additional programming throughout the academic year.

- Office of Student Accessibility and Resources (903.566.7079 or saroffice@uttyler.edu)
  Work collaboratively to create inclusive equal access educational environments.
- Student Counseling Center (www.uttyler.edu/counseling or 903.566.7254)
  Confidential dealing with stress/anxiety, improving study skills, time management, *etc*
- UT Tyler Student Health and Wellness (www.uttyler.edu/student-life/health-wellness/recovery/studentservices/)
  Substance abuse, household violence, community resources, Patriot Pantry, finances, etc.
- Academic Success (www.uttyler.edu/success or 903.565.5964 or tutoring @uttyler.edu)
  Supplemental Instruction (SI), Student Learning Communities (SLC), and the tutoring center.
- The Writing Center (CAS 2nd Floor or www.uttyler.edu/writingcenter)
  Helps you learn how to write better. 903.565.5995 writingcenter@uttyler.edu
- The Mathematics Learning Center, RBN 4021
  Computer Lab with tutors to assist students enrolled in early-career courses.
- Robert Muntz Library (www.uttyler.edu/library) & your Library Liaison, Kristine Duncan
  If you don't know where else to find it ask the Librarian; they have all the answers.

Images Hubble M87

## Course Format

The course is conducted in person. Students usually will work in groups of three with the following roles alternating between students after the first lab. All students are expected to hold each role at least once across the term. Each student will complete an assessment for the group after each report is submitted. Groups may be subject to change throughout the term.
In some instances data may be shared between multiple groups. In the Error Analysis lab data is shared across the entire class, though each individual student will complete their own report.

**Advance**

1. Identify safety concerns.
2. Complete & Submit requisition.
3. Suggest reasonable division of labor.
4. Lead Introduction & Methods sections of Report.

**Data Handler**

1. Identify needed data
2. Prepare data collection plan.
3. Lead Calculations for Report.
4. Provide relevant figures and tables.

**After Action**

1. Coordinate Group for report writing.
2. Lead on Discussion section of Reports.
3. Responsible for citations.
4. Compile, edit and submit report.

**An experiment in nature, like a text in the Bible, is capable of different interpretations, according to the preconceptions of the interpreter.**

**- William Jones**

***Physiological Disquisitions* (1781), 148.**

## Self-Care Reminders

Students are reminded that the spread of most communicable diseases can be reduced by using good health hygiene practices such as covering coughs & sneezes, frequent hand washing, surface cleaning and staying home when ill. Students feeling ill or experiencing symptoms such as excessive sneezing/coughing, digestive issues or fever are encouraged to stay home. Students are further encouraged to maintain a healthy immune system through practicing good self-care including sleeping and eating regularly. College is stressful enough without getting sick!

https://commons.wikimedia.org/wiki/File:Albert_Edelfelt_Louis_Pasteur.jpg

**Without laboratories men of science are soldiers without arms.**

**- Louis Pasteur**

***As quoted in The Wellcome Research Institution and the Affiliated Research Laboratories and Museums Founded by Sir Henry Wellcome* (1932), 3.**

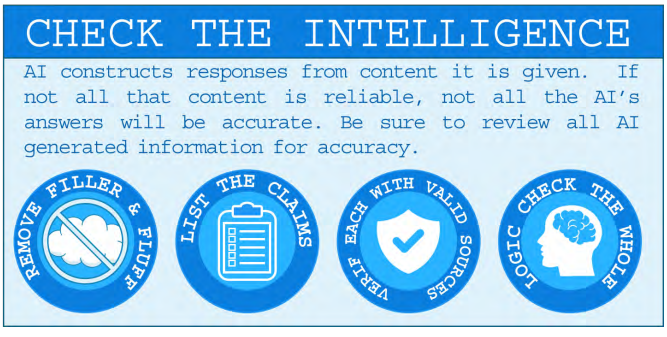
## Artificial Intelligence Policy

Image generated using Canva's Magic Media with the prompt 'student studying using artificial intelligence tools'

UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.

**AI is permitted only for specific assignments or situations, and appropriate acknowledgment is required.** Students can use AI platforms to help prepare for assignments and projects. You can use AI tools to revise and edit your work (e.g., identify flaws in reasoning, spot confusing or underdeveloped paragraphs, or correct citations) and generate graphics. However, your ethical responsibilities as a student remain the same. You must follow UT Tyler's Honor Code and uphold the highest standards of academic honesty.

- As with any work not original to the student, appropriate citation is required. The American Chemical Society has not yet updated its style guide to include AI citations so you may use one of the following formats for AI citations: APA Style Citation Information, MLA Style Citation Information, Chicago Style Citation Information
- Be aware that AI tools cannot accurately cite their own sources. References provided by AI tools may themselves be generated—that is they may not actually exist. Always confirm that any sources cited or suggested by AI actually exist and that they contain the information the AI response claims they do.
- References should provide clear and accurate information for each source and should identify where they have been used in your work.
- When submitting work, students must identify any writing, text, mechanisms, derivations, calculations or figures generated by AI. Sections of assignments generated by AI should appear in a different colored font. The relationship between those sections and student contributions should be discussed in the supplemental material section of the lab report when submitted. This should include:
  a) a description of precisely which AI tools were used
  b) an explanation of how the AI tools were used (e.g. to generate ideas, elements of text, to clean up/clarify writing, *etc.*)
  c) an account of why AI tools were used (e.g. to save time, to stimulate thinking, to experiment for fun, *etc.*)
  d) the entire exchange (e.g., prompts given, responses received, revised prompts, *etc.*) highlighting the most relevant sections. You may find an extension such as https://aiarchives.org/ useful in saving your AI exchanges.
- Because AI-generate content is not necessarily accurate or appropriate, you must assess the validity and applicability of any submitted AI output. You will not earn full credit if inaccurate, invalid, or inappropriate information is found in your work.



"In my own field, x-ray crystallography, we used to work out the structure of minerals by various dodges which we never bothered to write down, we just used them. Then Linus Pauling came along to the laboratory, saw what we were doing and wrote out what we now call Pauling's Rules. We had all been using Pauling's Rules for about three or four years before Pauling told us what the rules were."

J.D. Bernal

The Extension of Man: A History of Physics Before 1900

# University Policy Highlights

These are just some selected highlights from the University policies. For the full and more complete list, please visit: www.uttyler.edu/academicaffairs/syllabuspolicies.pdf

**Withdrawing from Class**

Students may withdraw (drop) from this course using the Withdrawal Portal. Withdrawing (dropping) this course can impact Financial Aid, Scholarships, Veteran Benefits, Exemptions, Waivers, International Student Status, housing, and degree progress. Please speak with your instructors, consider your options, speak with your advisor, and visit the One-Stop Service Center (STE 230) or email enroll@uttyler.edu to get a complete review of your student account and the possible impacts to withdrawing. We want you to make an informed decision. UT Tyler faculty and staff are here for you and often can provide additional support options or assistance. Make sure to carefully read the implications for withdrawing from a course and the instructions on using the Withdrawal portal. Texas law prohibits students from dropping more than six courses during their entire undergraduate career*. The six courses dropped includes those from other 2-year or 4-year Texas public colleges and universities. Consider the impact withdrawing from this class has on your academic progress and other areas, such as financial implications. We encourage you to consult your advisor(s) and Enrollment Services for additional guidance. CAUTION #1: Withdrawing before census day does not mean you get a full refund. Please see the Tuition and Fee Refund Schedule. CAUTION #2: All international students must check with the Office of International Programs before withdrawing. All international students are required to enroll full-time for fall and spring terms. CAUTION #3: All UT Tyler Athletes must check with the Athletic Academic Coordinator before withdrawing from a course. CAUTION #4: All veterans or military-affiliated students should consult with the Military and Veterans Success Center.

Students who began college for the first time before 2007 are exempt from this law.

**Artificial Intelligence Statement**

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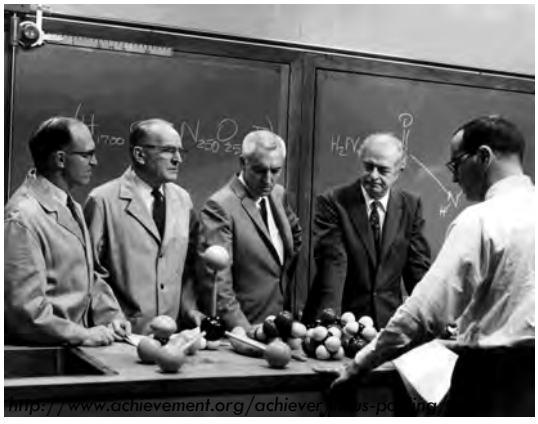
**Final Exam Policy**

Final examinations are administered as scheduled. If unusual circumstances require that special arrangements be made for an individual student or class, the Dean of the appropriate college, after consultation with the faculty member involved, may authorize an exception to the schedule. Faculty members must maintain student final examination papers for a minimum of three months following the examination date.

**Incomplete Grade Policy**



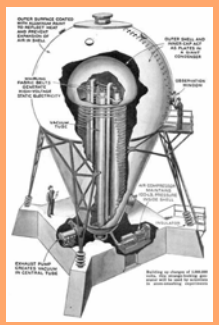

If a student, because of extenuating circumstances, is unable to complete all of the requirements for a course by the end of the semester, then the instructor may recommend an Incomplete (I) for the course. The "I" may be assigned in place of a grade *only when all of the following conditions are met*: (a) the student has been making satisfactory progress in the course; (b) the student is unable to complete all coursework or final exam due to unusual circumstances that are beyond personal control and are acceptable to the instructor, and (c) the student presents these reasons before the time that the final grade roster is due. The semester credit hours for an Incomplete will not be used to calculate the grade point average. The student and the instructor must submit an Incomplete Form detailing the work required and the time by which the work must be completed to their respective department chair or college dean for approval. The time limit established must not exceed one year. Should the student fail to meet all of the work for the course within the time limit, then the instructor may assign zeros to the unfinished work, compute the course average for the student, and assign the appropriate grade. If a grade has yet to be assigned within one year, then the Incomplete will be changed to an F, or NC. If the course was initially taken under the CR/NC grading basis, this may adversely affect the student's academic standing.

https://c250.columbia.edu/c250_celebrates/remarkable_columbians/chien-shiung_wu.html

**There is only one thing worse than coming home from the lab to a sink full of dirty dishes, and that is not going to the lab at all!**

**- Chien-Shiun Wu**

***As quoted in Cosmic Radiations: From Astronomy to Particle Physics* (2001), 344.**



https://design-dash.com/2024/01/29/chien-shiung-wu-more-than-a-nobel-prize-in-nuclear-physics/

# University Policy Highlights

### Grade Appeal Policy

Disputes regarding grades must be initiated within sixty (60) days from the date of receiving the final course grade by filing a Grade Appeal Form with the instructor who assigned the grade. A grade appeal should be used when the student thinks the final course grade awarded does not reflect the grades earned on assessments or follow the grading scale as documented in the syllabus. The student should provide the rationale for the grade appeal and attach supporting document about the grades earned. The form should be sent via email to the faculty member who assigned the grade. The faculty member reviews the rationale and supporting documentation and completes the instruction section of the form. The instructor should return the form to the student, even if a grade change is made at this level. If the student is not satisfied with the decision, the student may appeal in writing to the Chairperson of the department from which the grade was issued. In situations where there is an allegation of capricious grading, discrimination, or unlawful actions, appeals may go beyond the Chairperson to the Dean or the Dean's designee of the college from which the grade was issued, with that decision being final. The Grade Appeal form is found in the Registrar's Form Library.
NOTE: The Grade Appeal Form is different from the Application for Appeal form submitted to the Student Appeals Committee, which does not rule on grade disputes as described in this policy.

### Disability/Accessibility Services

In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit https://hood.accessiblelearning.com/UTTyler and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.

### Military Affiliated Students

UT Tyler honors the service and sacrifices of our military-affiliated students. If you are a student who is a veteran, on active duty, in the reserves or National Guard, or a military spouse or dependent, please stay in contact with your faculty member if any aspect of your present or prior service or family situation makes it difficult for you to fulfill the requirements of a course or creates disruption in your academic progress. It is important to make your faculty member aware of any complications as far in advance as possible. Your faculty member is willing to work with you and, if needed, put you in contact with university staff who are trained to assist you. The Military and Veterans Success Center (MVSC) has campus resources for military-affiliated students. The MVSC can be reached at MVSC@uttyler.edu or via phone at 903.565.5972.

### Students on an F-1 Visa

To remain in compliance with Federal Regulations requirements you must do the following:

- Traditional face-to-face classes: Attend classes on the regular meeting days/times.
- Hybrid Classes: Attend all face-to-face classes convened by the instructor according to the schedule set for your specific course.
- Online course: Only one online course can count toward your full-time enrollment. Students are expected to be fully engaged and meet all requirements for the online course.

### Academic Honesty and Academic Misconduct

The UT Tyler community comes together to pledge that "Honor and integrity will not allow me to lie, cheat, or steal, nor to accept the actions of those who do." Therefore, we enforce the Student Conduct and Discipline policy in the Student Manual Of Operating Procedures (Section 8).
FERPA
UT Tyler follows the Family Educational Rights and Privacy Act (FERPA) as noted in University Policy 5.2.3. The course instructor will follow all requirements to protect your confidential information.

### Absence for Official University Events or Activities

This course follows the practices related to Excused Absences for University Events or Activities as noted in the Catalog.

### Absence for Religious Holidays

This course follows the practices related to Excused Absences for Religious Holy Days as noted in the Catalog.

### Absence for Pregnant Students

This course follows the requirements of Texas Laws SB 412, SB 459, SB 597/HB 1361 to meet the needs of pregnant and parenting students. Part of the supports afforded pregnant students includes excused absences. Faculty who are informed by a student of needing this support should make a referral to the Parenting Student Liaison. NOTE: Students must work with the Parenting Student Liaison in order to receive these supports. Students should reach out to the Parenting Student Liaison at parents@uttyler.edu and also complete the Pregnant and Parenting Self-Reporting Form.

### Campus Carry

We respect the right and privacy of students who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at http://www.uttyler.edu/about/campus-carry/index.php.

http://
www.nobelprize.org/
nobel_prizes/physics/

**A scientist in his laboratory is not a mere technician: he is also a child confronting natural phenomena that impress him as though they were fairy tales.**

**Marie Curie**

***Madame Curie : A Biography*** **(1937) by Eve Curie Labouisse, trans. Vincent Sheean, p. 341**

# Laboratory Safety Guidelines

## Purpose

Chemistry is a hands-on laboratory class. You will be doing many laboratory activities, which require the use of hazardous chemicals. Safety in the chemistry laboratory is the number one priority for students, instructors, and assistants. To ensure a safe chemistry laboratory, a list of rules has been developed and provided to you in this student safety contract. These rules must be followed at all times. The student safety contract and signature page are provided to you and the signature page must be returned to the laboratory instructor before you can participate in the laboratory.

## Student Lab Safety Training

You are required to view the *Chemical and Biological Hygiene* training that is provided on Canvas. This presentation must be viewed before working in the lab and a passing score of 80% or better on the *Lab Safety Test* must be achieved before working in the lab.

## General Guidelines

1. Conduct yourself in a responsible manner at all times in the laboratory.

2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.

3. Never work alone. No student may work in the laboratory without an instructor present.

4. When first entering a chemistry laboratory, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.

5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.

The Curie Lab was so well ventilated that leaves and snow sometimes accumulated overnight. Source: *www.aip.org/history/curie.htm*

6. Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.

7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.

8. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.

9. Keep aisles clear. Protect personal gear—backpacks, pocketbooks, briefcases, coats, *etc.*—by placing them in the lab drawers or other locations designated by the instructor.

10. Know the locations and operating procedures of all safety equipment including the first aid kit, eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and the exits are located.

11. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.

12. Be alert and proceed with caution at all times in the laboratory. Notify the instructor immediately of any unsafe conditions you observe.

## Laboratory Safety Guidelines Continued

13. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the instructor. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.

14. Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your instructor.

15. Keep hands away from face, eyes, mouth and body while using chemicals or preserved specimens. **Wash your hands with soap and water after performing all experiments.**

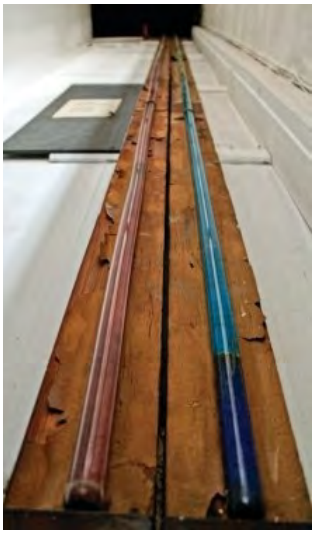
16. Clean (with detergent), rinse, and wipe dry all work surfaces (including the sink) and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.

17. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.

18. Students are never permitted in the chemistry storage rooms or preparation areas unless given specific permission by their instructor.

19. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.

20. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.



Lord Kelvin's diffusion experiment has been running a University of Glasgow lecture hall since 1872. Source:http://cen.acs.org/articles/91/i33/Old-Experiment-Even-Older-Curiosities.html

### Clothing

1. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles. **There will be no exceptions to this rule!**

2. Contact lenses should not be worn in the laboratory unless you have permission from your instructor.

3. Closed toes shoes, long pants/full length skirts and shirts having sleeve and covering the entire torso are required. Additionally, lab aprons are available, and you are encouraged to wear them to provide additional protection.

4. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured.

### Accidents and Injuries

1. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately, no matter how trivial it may appear.

2. If you or your lab partner are hurt, immediately obtain the instructor's attention.

3. If a chemical should splash in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify the instructor immediately.

**When you can measure what your are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind.**
**-Lord Kelvin**

**Electrical Units of Measurement" (3 May 1883), published in *Popular Lectures* Vol. I, p. 73;**

https://www.llnl.gov/str/Oct07/Libby.html

**[Chemistry] laboratory work was my first challenge. ... I still carry the scars of my first discovery—that test-tubes are fragile.**

**— Edward Teller**

**Edward Teller with Judith L. Shoolery, *Memoirs: A Twentieth-Century Journey in Science and Politics* (2001), 42.**

# Laboratory Safety Guidelines Continued

## Handling Chemicals

1. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for smelling chemical fumes will be demonstrated to you.

2. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.

3. Never return unused chemicals to their original containers.

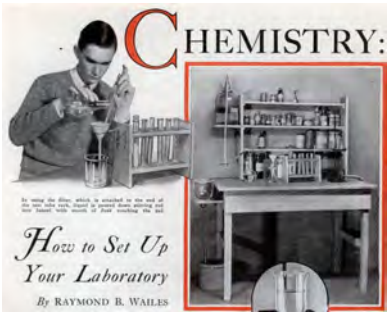
4. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.

5. When transferring reagents from one container to another, hold the containers away from your body.

6. Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.

7. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.

8. Never remove chemicals or other materials from the laboratory area.




The February 1932 issue of Popular Mechanics gives advice on setting up a home laboratory. . Helpful advice includes not tasting chemicals, handling acids with care and "consult[ing] the lady of the house before usurping the bathroom or the laundry tubs."

9. Take great care when transferring acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

10. **Solid materials are never allowed in the sinks!**

11. **Never discard liquids in the sinks unless specifically indicated by your instructor!**

12. Pay particular attention to the waste disposal instructions specific to each experiment.

## Handling Glassware and Equipment

1. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.

2. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.

3. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper. Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to your instructor for removal.

4. Fill wash bottles only with distilled water and use only as intended, e.g., rinsing glassware and equipment, or adding water to a container.

5. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.

Liebig taught the world two great lessons. The first was that in order to teach chemistry it was necessary that students should be taken into a laboratory. The second lesson was that he who is to apply scientific thought and method to industrial problems must have a thorough knowledge of the sciences. The world learned the first lesson more readily than it learned the second.

— Ira Remsen Address to the Industrial Chemistry Society, Glasgow (1910). Quoted in Frederick Hutton Getman, *The Life of Ira Remsen* (1980), 121-122.

## Laboratory Safety Guidelines Continued

6. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.

7. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.

8. If you do not understand how to use a piece of equipment, ask the instructor for help.

9. Do not place hot glassware in cold water or on cold surfaces; it may shatter.

### Heating Substances

1. Exercise extreme caution when using a gas burner. Take care that hair, clothing, and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas (or alcohol) burners only as instructed by the teacher.

2. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.

3. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.

4. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.

5. Never look into a container that is being heated.

6. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.

7. When bending glass, allow time for the glass to cool before further handling. Hot and cold glassware have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.


Bruce Banner

"I mean, what are we, a team? No, no, no. We're a chemical mixture that makes chaos."

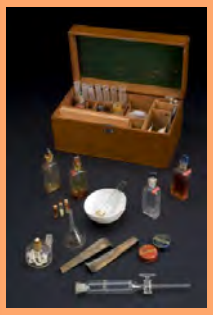
in The Avengers (2012)

http://pauling.library.oregonstate.edu/exhibit/column28.htm

**Like thousands of other boys, I had a little chemical laboratory in our cellar and think that some of our friends thought me a bit crazy.**

**- Linus Pauling**

**in 'Langmuir Winner Stumped Einstein", *New York Times* (23 Aug 1931), N2.**



## UT-Tyler Department of Chemistry Safety Contract

Name: _____ Course & Sec.: 3153-001

Student ID Number: _____ Semester: Fall 2024

I. Are you color blind? □ YES □ NO

Do you intend to wear contact lenses during lab? □ YES □ NO

I hereby release the Department of Chemistry at The University of Texas at Tyler and its agents from any responsibility for any injury to my person or damage to my contact lenses as a result of wearing contact lenses in the laboratory. I understand and agree to these special regulations.

Student Initials: _____

II. List any specific allergies (if none, enter NONE):

_____

_____

III. List any other medical conditions about which your instructor might need to inform emergency service personnel.

_____

_____

Student Initials: _____

### Agreement

I have read and agree to follow all of the safety rules set forth in this contract. I realize that I must obey these rules to ensure my own safety, and that of my fellow students and instructors. I have viewed the *Laboratory Safety Training for Students* presentation and have achieved a score of 80% or better on the *Student Lab Safety Test*. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of this safety contract that results in unsafe conduct in the laboratory or misbehavior on my part, may result in being expelled from the laboratory, receiving a failing grade, and/or dismissal from the course.

Student Signature: _____

Date: _____