

CHEM 3155 Physical Chemistry II Laboratory

The University of Texas at Tyler, Spring 2025

Class Meeting Information

Thursday 1:30pm -
Ratliff Building South (RBS) 4014

Instructor Information

Prof. Kai Zhang
Office: RBS 3007A
Phone: (903)566-6276
Email: kzhang@uttyler.edu
Office Hours: 10am-noon Monday and Wednesday,
Noon-1pm Tuesday,
and whenever I am in my office

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. This course is the second in a two-semester sequence. It is concerned primarily with reinforcing concepts and developing experiences with experimental techniques in kinetics, quantum mechanics and spectroscopy.

Concurrent course: CHEM 3354

Learning Objectives

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.
- Learn and work independently.
- Work cooperatively with others.

Required Textbook(s)

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. Students should have a Physical Chemistry textbook for reference. The associated Physical Chemistry lecture course is using Atkins' Physical Chemistry 11th edition by Atkins, de Paula & Keeler (ISBN: 9780198769866), but any current physical chemistry text is acceptable. Including the free Chem Libre text found here: <https://chem.libretexts.org/Bookshelves>

Additional Required Supplies

- *Laboratory notebook: Bound 8 x 10" notebook with cross-lined*
- *Splash proof goggles (Must meet ANSI Z87 specifications)*

Evaluation and Grade

Course work	%
Lab Reports	80%
Lab Practices	20%

The total number of points you attained on all graded work determines your final grade.

Grade	%
A	90 - 100
B	80 - 89
C	70 - 79
D	60 - 69
F	below 59

Tentative Schedule

Timeframe	Topic
Week 1 Jan 16	No Lab
Week 2 Jan 23	Lab 1 Diffusion Coefficient of KCl
Week 3 Jan 30	Recitation for Lab 1
Week 4 Feb 6	Lab 2 Kinetics of Ester Hydrolysis
Week 5 Feb 13	Recitation for Lab 2
Week 6 Feb 20	Lab 3 Universal Constants Lab: Planck constant and (Speed of Light)
Week 7 Feb 27	Recitation for Lab 3
Week 8 March 6	Lab 4 Atomic Orbital Lab (Python)
Week 9 March 13	Recitation for Lab 4
Week 10 March 20	No Lab for Spring Break
Week 11 March 27	Lab 5 Carbocyanine Dyes: Particle in a Box
Week 12 April 3	Recitation for Lab 5
Week 13 April 10	Lab 6 Vibrational-Rotational Spectra of HCl: Experiment and (ORCA)
Week 14 April 17	Recitation for Lab 6
Week 15 April 24	No Lab

Preparation for Lab

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 Course Responsibilities—Come Prepared for more information about the students' pre-lab responsibilities.

Students will need to submit a requisition list for each lab to Canvas by noon on Monday prior to the lab. The requisition should include all supplies (chemicals, equipment, glassware, ironware and incidentals needed to perform the experiment). Major pieces of equipment (IR, UV-Vis, etc) do not need to be requisitioned. Only requisitioned items will be provided. This list counts toward the lab practices portion of the course grade.

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. PChem 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 if not performed correctly. Students are expected to utilize safe lab practices and abide by all Departmental safety policies. (Found on Pages 8-11 of this document.) Safety goggles must be worn in the laboratory at all times!!! Goggles must be splash-proof (indirectly vented) and meet ANSI Z87 criteria. Appropriate lab wear should be worn. This includes long pants or skirts and shirts 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. Students must have a **safety contract** for the current semester on file with the Department prior to participating in the first laboratory exercise.

Students are expected to observe safe laboratory practices at all times. Please see the Laboratory Safety Guidelines. Be advise that students creating a hazard in the laboratory will be asked to leave immediately.

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.

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.

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.
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.

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. Dress properly during a laboratory activity. 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. Shoes must completely cover the foot. No sandals allowed.
4. Lab aprons are available, and you are encouraged to wear them to provide additional protection.

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.**

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.
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.
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.

University Resources for Students

Resources to assist you in this course

- [UT Tyler Student Accessibility and Resource \(SAR\) Office](#)[Links to an external site.](#) (provides needed accommodations to students with document needs related to access and learning)
- [UT Tyler Writing Center](#)[Links to an external site.](#)
- [The Mathematics Learning Center](#)[Links to an external site.](#)
- [UT Tyler PASS Tutoring Center](#)[Links to an external site.](#)
- [UT Tyler Supplemental Instruction](#)[Links to an external site.](#)
- [Upswing \(24/7 online tutoring\) - covers nearly all undergraduate course areas](#)[Links to an external site.](#)[Links to an external site.](#)
- [Robert Muntz Library](#)[Links to an external site.](#) and [Library Liaison](#)[Links to an external site.](#)[Links to an external site.](#)
- [Canvas 101](#)[Links to an external site.](#) (learn to use Canvas, proctoring, Unicheck, and other software)
- LIB 422 -- Computer Lab where students can take a proctored exam
- [The Career Success Center](#)[Links to an external site.](#)
- [UT Tyler Testing Center](#)[Links to an external site.](#)
- [Office of Research & Scholarship Design and Data Analysis Lab](#)[Links to an external site.](#)

Resources available to UT Tyler Students

- [UT Tyler Counseling Center](#) [Links to an external site.](#) (available to all students)
- [My SSP App](#)[Links to an external site.](#) (24/7 access to Student Support Program counseling through phone or chat and online wellness resources available in a variety of languages)

- [Student Assistance and Advocacy Center](#)Links to an external site.
- [Military and Veterans Success Center](#) Links to an external site.(supports for all of our military-affiliated students)
- [UT Tyler Patriot Food Pantry](#)Links to an external site.
- [UT Tyler Financial Aid and Scholarships](#)Links to an external site.
- [UT Tyler Registrar's Office](#)Links to an external site.
- [Office of International Programs](#)Links to an external site.
- [Title IX Reporting](#)Links to an external site.
- [Patriots Engage](#)Links to an external site. (available to all students. Get engaged at UT Tyler.)

University Policies and Information

Withdrawing from Class

Students, you are allowed to [withdraw](#) (drop) from this course through the [Withdrawal Portal](#). Withdrawing from classes can impact Financial Aid, Scholarships, Veteran Benefits, Exemptions, Waivers, International Student Status, housing, and degree progress. Please read this page, speak with your instructors, consider your options, and speak with your instructor. UT Tyler faculty and staff are here for our students and often can provide additional support options or student assistance. Please read the implications for withdrawing from a course and the instructions on using the Withdrawal portal on the [Registrar's Withdrawal page](#). Texas law prohibits students who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at 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 financial aid 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](#).

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.

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; this is separate from the Application for Appeal form submitted to the Student Appeals Committee, which does not rule on grade disputes as described in this policy. 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 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](#).

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 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 the Assistant Director Student Accessibility and Resources/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at <https://www.uttyler.edu/disability-services>, 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 and meet with the Office of International Programs 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 approved absences as noted by the Student Manual of Operating Procedures ([Sec. 1 -501](#)).

Absence for Religious Holidays

This course follows the practices related to [Excused Absences for Religious Holy Days as noted in the Catalog](#).

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>.