CHEM 3240 – Advanced Physical Measurements

Physical Chemistry II Lab

Spring 2026

COURSE INFORMATION

CHEM 3240-301, 302 (Lab)
Lab: 3240.301 – Wednesday, 6:00 – 8:50 pm, CHEM 280
3240.302 – Thursday, 2:00 – 4:50 pm, CHEM 280

INSTRUCTIONAL TEAM

Dr. Rebecca Weber
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Office: CHEM 261
Phone: 940-369-8433
Drop-in Hours: Mondays, Wednesdays, 1:00 – 1:50pm; Fridays, 10:00am – 10:50am
If you need to meet with me outside of normal office hours, please make an appointment.

TEACHING ASSISTANTS

Name: Teresa Shah
Email: teresashah@my.unt.edu
Office: CHEM 226
Office Hours: Wednesdays, 3:00 – 4:00pm

Name: Oriana Silva Belisario
Email: orianasilvabelisario@my.unt.edu
Office: CHEM 262D
Office Hours: Thursdays, 1:00 – 2:00pm

Prerequisites: CHEM 3520 (or concurrent enrollment) and its prerequisites: CHEM 1420/1422/1423; MATH 1720 (2730 is recommended); PHYS 1520/2220; CHEM 3510/3230

NOTE: This course assumes prior knowledge of Calculus I and II, as well as Mechanics and Electromagnetism.

COURSE DESCRIPTION

Collection and treatment of experimental data within the subjects of electronic, vibronic, and rovibronic spectroscopy, kinetics, and computational chemistry.

OBJECTIVES

Physical Measurements is part of a two-course sequence designed to provide students with a fundamental understanding of the techniques used to collect and analyze experimental data within the field of spectroscopy.

EXPECTED LEARNING OUTCOMES

Using hands-on experiences develop a deep understanding of fundamental physical chemistry principles, which include the following:

1. Utilize physical chemistry techniques to analyze, evaluate, and synthesize information.
2. Develop, interpret, and express physical chemical ideas through written communication.
3. Manipulate numerical data to form conclusions.

REQUIRED TEXTS AND MATERIALS

- Scientific calculator that is unable to connect to the internet
- Department approved safety glasses or goggles
- *Physical Chemistry*, Atkins, any edition (recommended)
- *Physical Chemistry Lab Manual*, Marshall. Made available through Canvas.

Schedule of Experiments (Schedule subject to change if necessary; updates will be posted on Canvas)

Week	Date	Experiments
1	1/12	No Lab class meeting
2	1/19	Complete lab safety module
3	1/26	Review Pre-Lab Instructions, Expt 1 and 2
	1/28, 1/29	Group A: Expt 1; Group B: Expt 2
4	2/2	Review Pre-Lab Instructions, Expt 1 and 2
	2/4, 2/5	Group A: Expt 2; Group B: Expt 1
5	2/9	Review Pre-Lab Instructions, Expt 3 and 4
	2/11, 2/12	Group A: Expt 4; Group B: Expt 3
6	2/16	Review Pre-Lab Instructions, Expt 3 and 4
	2/18, 2/19	Group A: Expt 3; Group B: Expt 4
7	2/23	Lab report #1 writeup and peer review
	2/27	Completed lab report due to TA
8	**3/4, 3/5**	**Lab quiz #1 – complete through Canvas – no labs**
9	**3/9 – 3/13**	**Spring Break – University Closed**
10	3/16	Review Pre-Lab Instructions, Expt 5 and 6
	3/18, 3/19	Group A: Expt 5; Group B: Expt 6
11	3/23	Review Pre-Lab Instructions, Expt 5 and 6
	3/25, 3/26	Group A: Expt 6; Group B: Expt 5
12	3/30	Review Pre-Lab Instructions, Expt 7 and 8
	4/1, 4/2	Group A: Expt 8; Group B: Expt 7
13	4/6	Review Pre-Lab Instructions, Expt 7 and 8
	4/8, 4/9	Group A: Expt 7; Group B: Expt 8
14	4/13	Lab report #2 writeup and peer review
	4/17	Completed lab report due to TA
15	**4/22, 4/23**	**Lab quiz #2 – complete through Canvas – no labs**

Check http://calendar.unt.edu/event-calendar/Academics for other important class dates!

Experiments

Experiment 1 – Visible Spectrum of the Hydrogen Atom
Experiment 2 – Spectrum of a Particle in a Box
Experiment 3 – Laser-Induced Luminescence and Quenching of the Uranyl Ion
Experiment 4 – Molecular Rotation and Vibration
Experiment 5 – The Vibration-Rotation Spectrum of Hydrogen Chloride
Experiment 6 – The Vibrational Spectra of Carbon Dioxide and Nitrous Oxide
Experiment 7 – Electronic Spectroscopy of Iodine
Experiment 8 – The Inversion of the Ammonia Molecule

GRADING CRITERIA

Assessment	Points per Assignment	% of Grade
Lab quizzes	2 x 100 pts each	20
Lab reports	7 x 50 pts each	60
Formal lab reports – initial draft	2 x 100 points each	5
Formal lab reports – final drafts	2 x 100 points each	15

A = 100.0% - 90.0%
B = 89.9% - 80.0%
C = 79.9% - 70.0%
D = 69.9% - 60.0%
F = below 59.9%

You are <u>required</u> to read through each Canvas module prior to each experiment that you conduct. The questions for the quizzes will still be pulled from the material emphasized in the lab lectures, which are intended to give you an overview of the theory and experimental procedure.

Lab Reports

The purpose of this class is to not only familiarize you with fundamental physical chemistry principles, but to prepare you for a future career as a scientist. Data may be collected and analyzed as a group, but your write-up will be your own work. After you complete each lab, you will turn in the write up to the TA. Ensure that your name is on your page, that your writing is clear and comprehensible, and that your recorded data and calculated information is easy to see and follow. One type of each calculation must be shown.

The lowest lab report grade will be dropped. If you miss a lab, this will be your dropped grade. Any subsequent missed labs will be marked as 0, except in the event of a university-approved excuse (travel on university-approved trips, well-documented illness, etc). If your absence is approved, you must make arrangements with the TAs to make up the lab during the make-up periods as soon as possible. <u>It is your responsibility to do so!</u>

Formal Lab Reports

The formal report is a typed, formal lab report that will be produced for TWO experiments of your choosing. You will choose one experiment from the first half of the semester (Expts. 1 – 4) and one from the second half of the semester (Expts. 5 – 8). It will include: a cover sheet with your name, group number, and experiment

title; Introduction, Procedure, Results, Discussion, and References (include section headers for clarity). Correct usage of the English language, including grammar and punctuation, will be expected in this lab report.

You will turn in a completed first draft of your lab report through Canvas. (Please note that, even though it is a first draft, this still means that all components of the report must be present!) The initial draft and peer review will be a part of your overall grade. After the first drafts have all been turned in, you will be randomly assigned a peer's lab report to review, using a rubric, and provide constructive feedback on how to improve the report. Once the peer reviews have taken place, you will revise your report based on the feedback given to you, and turn in a completed lab report, also through Canvas.

More information about this, including the rubrics and explanation of the report, will be provided on Canvas.

Regrade policy

Requests to have an assignment regraded must be made within 1 week of receiving the graded assignment. The request should be in the form of an email from your UNT email account to the TA that graded the assignment; the email should contain an explanation of how the problem was graded incorrectly.

Lab Safety

- Safety glasses or goggles MUST be work in the lab *at all times*.
- Closed-toed shoes must be work in the lab.
- Shorts are permitted, but are *highly* discouraged.
- On the first day in the lab, your TA or instructor will point out the safety devices in the lab.
- Do not work alone in the lab or without the supervision of the TA or the instructor.
- Do not perform unauthorized experiments.
- No eating or drinking is allowed in the lab.
- Please sign and return the page at the end of this syllabus that acknowledges that you have read these safety rules and agree to abide by them while in the lab.

I reserve the right to change or modify the syllabus at any time. If changes are made, students will be notified during scheduled class times and the revised syllabus will be made available on Canvas.

LEGAL NOTICE REGARDING NOTES

The information provided in Canvas in the form of PowerPoints, pre-recorded videos, lab manuals, and modules in Canvas are protected by state common law and federal copyright law. You are authorized to take notes in class thereby creating a derivative work from my lecture, but the authorization extends only to making one set of notes for your own personal use and no other use. You are not authorized to distribute any videos or material to anyone outside of UNT, to provide your notes to anyone else (hard copy or electronically), or to make any other use of them without express prior permission from me in writing.

ACADEMIC DISHONESTY

Students caught cheating or plagiarizing will receive a "0" for that particular assignment or exam. Additionally, the incident will be reported to the Dean of Students, who may impose further penalty. According to the UNT catalog, the term "cheating" includes, but is not limited to: a. use of any unauthorized assistance in taking quizzes, tests, or examinations; b. dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; c. the acquisition, without permission, of tests or other academic material belonging to a faculty or staff member of the university; d. dual submission of a paper or project, or resubmission of a paper or project to a different class without express permission from the instructor(s); or e. any other act designed to give a student an unfair advantage. The term "plagiarism" includes, but is not limited to: a. the knowing or negligent use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgment; and b. the knowing or negligent unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

ACCEPTABLE STUDENT BEHAVIOR

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The university's expectations for student conduct apply to all instructional forums, including university and electronic classroom, labs, discussion groups, field trips, etc. The Code of Student Conduct can be found at http://deanofstudents.unt.edu.

ADA STATEMENT

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the Office of Disability Accommodation website at http://disability.unt.edu. You may also contact them by phone at (940) 565-4323.

EMERGENCY NOTIFICATION & PROCEDURES

UNT uses a system called Eagle Alert to quickly notify you with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). The system sends voice messages (and text messages upon permission) to the phones of all active faculty staff, and students. Please make certain to update your phone numbers at http://www.my.unt.edu. Some helpful emergency preparedness actions include: 1) know the evacuation routes and severe weather shelter areas in the buildings where your classes are held, 2) determine how you will contact family and friends if phones are temporarily unavailable, and 3) identify where you will go if you need to evacuate the Denton area suddenly. In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

RETENTION OF STUDENT RECORDS

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. You have a right to view your individual record; however, information about your records will not be divulged to other individuals without the proper written consent. You are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the university's policy in accordance with those mandates at the following link: http://essc.unt.edu/registrar/ferpa.html

STUDENT PERCEPTION OF TEACHING (SPOT)

Student feedback is important and an essential part of participation in this course. The Student Perception of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available at the end of the semester to provide you with an opportunity to evaluate how this course is taught.

SUCCEED AT UNT

UNT endeavors to offer you a high-quality education and to provide a supportive environment to help you learn and grown. And, as a faculty member, I am committed to helping you be successful as a student. Here's how to succeed at UNT: **Show up. Find Support. Get advised. Be prepared. Get involved. Stay focused.** To learn more about campus resources and information on how you can achieve success, go to http://success.unt.edu/

Laboratory Safety Rules and Agreement

Chem 3240 Advanced Physical Measurements

1. Safety goggles or glass must be worn at all times while in the lab.
2. Closed-toed shoes are required for admittance into the lab.
3. Long pants are strongly suggested.
4. Long hair and loose clothing must be confined or tied back.
5. Food, drink, and gum are not allowed in the lab at any time.
6. Horse play, pranks, and other acts of mischief are strictly forbidden.
7. Casual visitors are not allowed in the labs. Only the instructors, stockroom personnel, students in the scheduled lab section, and other approved faculty or staff of the department are allowed in the lab.
8. Students are not allowed to conduct unauthorized experiments.
9. Know the locations of and proper use of all safety equipment in the lab.
10. Notify your TA or instructor immediately of any injury, spill, fire, or explosion. ALL INJURIES AND ACCIDENTS, REGARDLESS OF SEVERITY, MUST BE REPORTED. Clean up non-hazardous spills immediately. Never clean up a spill of hazardous material unless it can be done safely with assistance from your instructor.
11. In the event of a true emergency, call 911. Do not call 911 without consent from your TA or instructor. If your TA or instructor is injured and unable to consent, do not hesitate to call 911.
12. NEVER TASTE ANY LAB MATERIALS. SMELL MATERIALS ONLY IF INSTRUCTED TO DO SO.
13. Keep your lab space clean and organized.
14. NEVER LEAVE AN ONGOING EXPERIMENT UNATTENDED!
15. NEVER REMOVE CHEMICALS FROM THE LAB.
16. NEVER PIPETTE BY MOUTH.
17. Dispose of broken glassware and other materials as directed by the TA or instructor. Dispose of all chemical waste properly, as directed by the TA or instructor. Treat any chemical as if it were hazardous.
18. Listen to your TA an instructor at all times. Follow any other rules and guidelines as laid out by them.

Please sign and date below, indicating that you have read these rules and agree to follow them while enrolled in this course.

I, the undersigned, understand that participating in chemistry laboratory courses might expose me to potential hazards. I have read and understand the above safety rules and agree to abide by them and follow the directions of the TA, instructor, or other chemistry faculty and staff as appropriate. I agree to act responsibly and safely in the laboratory at all times.

Signature: _____ Date: _____

Printed Name: _____