



TEXAS TECH UNIVERSITY

Department of Chemistry & Biochemistry



Four Year Guaranteed PhD Support

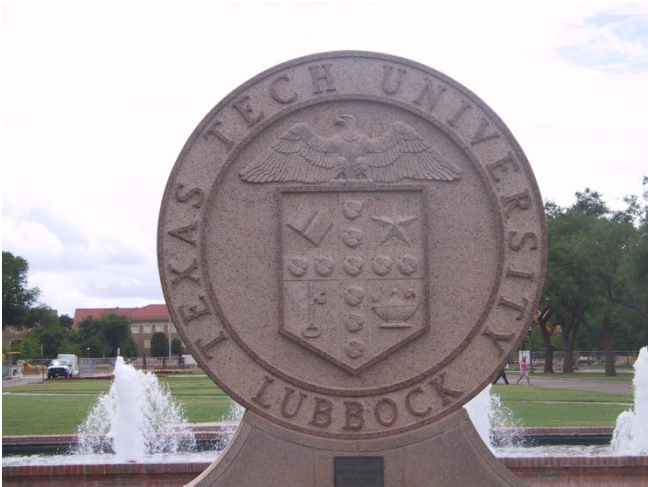
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The University and Surrounding Region

The University

Texas Tech University is one of the five major state-supported, multi-disciplinary universities in Texas with current enrollment of 37,000 students. Texas Tech is a coeducational institution consisting of seven colleges: Agricultural Sciences and Natural Resources, Architecture, Arts & Sciences, Business, Education, Engineering, Honors, Human Sciences, Mass Communications, University College, and Visual and Performing Arts as well as the Graduate School. The University itself is part of a greater complex which also includes the School of Law and the Texas Tech University Health Sciences Center with Schools of Medicine, Nursing, and Allied Health.



A number of special facilities at Texas Tech complement this massive educational complex. The International Center for Arid & Semi-Arid Land Studies (ICASALS) provides symposia, public service programs and information exchange about lands and their inhabitants. The International Center for Textile Research and Development houses a physical measurements laboratory, a structures laboratory and a chemical processes laboratory to aid in fiber and textile research. The Museum of Texas Tech University, which includes the Ranching Heritage Center, maintains active research programs in anthropology, art, biology, geosciences and history.

Currently there are over 200 buildings situated on the 1,839-acre main campus in Lubbock. An active building program is in progress to meet the growing demands of the University. Graduate students numbering over 5600 are involved in over 100 master's programs and almost 60 doctoral programs available at TTU.

The City of Lubbock

The moderate climate, quality community services, K-12 education, low cost of living, and eminent health care facilities make Lubbock a very enjoyable place to live.

Lubbock is the center of a metropolitan area with a population of approximately 256,000 in the heart of one of the world's richest agricultural regions, the West Texas High Plains. At an elevation of 3,250 ft., the High Plains area has a dry, invigorating climate. Winters are dry and moderate while the summer heat is tempered by low humidity (average annual rainfall is 18 inches). An average annual temperature of 60°F combines with the average noon humidity of 46% to make Lubbock comfortable year round.



Lubbock residents enjoy outstanding community services. The public school system includes 37 elementary, 11 junior high, 4 high and 10 alternative/special campuses. Seven hospitals serve the city and specialized medical services have earned local medical personnel a high reputation. An international airport and an interstate highway as well as local bus lines serve the transportation needs of the area.

The cost of living in Lubbock is among the lowest to be found for major cities in the United States. Housing, utility, transportation, and health service expenses in Lubbock are significantly below the national average.



Local and Regional Activities

Graduate students at Texas Tech can participate in a wide variety of recreational and cultural activities. Intramural baseball, volleyball, and basketball games are particularly popular. Facilities for individual sports including golf, tennis, handball, and swimming are available on and near campus. Particularly noteworthy is the Student Recreation and Aquatic Center which features outstanding facilities for handball, racquetball, aerobics and weight rooms, in addition to other activities. Numerous musical and dramatic productions are presented on campus each year. Cultural events, both local (e.g., the Lubbock Symphony Orchestra) and from national and international touring companies are also available. On the lighter side, Lubbock has an active night life with a number of night clubs covering the entire entertainment spectrum.

Lubbock's park system includes 52 beautifully landscaped city parks covering more than 2,850 acres. MacKenzie State Recreational Area, is located within the city limits. Within a few miles of Lubbock is Buffalo Springs Lake, which provides area residents with boating, picnicking, and fishing. White River Lake, 60 miles to the east, offers

camping areas, lakeside cabins, boating and fishing.



A broad spectrum of state and national parks can be found within a one day drive from Lubbock. Palo Duro Canyon State Park, a rugged area known for its spectacular geological formations, is just 100 miles north of Lubbock. The park has 15 miles of scenic drives, 20 miles of bridle paths, and 30 miles of hiking trails. Caprock Canyons State Park, 90 miles northeast of Lubbock offers additional opportunities for hiking, fishing and camping.

Nearby national parks include the Big Bend and Guadalupe Mountains National Park in southwest Texas and Carlsbad Caverns National Park in southeast New Mexico. All feature mountain and desert scenery and a variety of geological structures. The Sante Fe and Lincoln National Forests in New Mexico provide additional opportunities for camping, fishing, backpacking and skiing.



Graduate Research in the Chemical Sciences

The Department of Chemistry and Biochemistry at Texas Tech University is a vibrant community of truly integrated scholarship: research, teaching and service. Research programs span both traditional and nontraditional areas of the chemical sciences. The department's current complement of 29 faculty members are active in analytical, bioinorganic, environmental, inorganic, medicinal, organic, organometallic, physical, and theoretical chemistry research, as well as biochemistry, chemical biology, chemical education, chemical physics, nanomaterials, molecular and structural biology. These efforts are enhanced, by the contributions of over 100 graduate student researchers and post-doctoral fellows in the department.

Interdisciplinary research is at the forefront of the University's strategic goals. Thus, the Department maintains particularly close ties with the Chemical Engineering, Electrical Engineering, Geosciences and Physics Departments. The Department has two adjunct faculty members in Geosciences and a third in Chemical Engineering. The Department also has an adjunct faculty member in Texas Tech University/Health Sciences Center (TTU/HSC) and an adjunct faculty member in the School of Informatics and Computing at Indiana University. Active interdisciplinary programs in pulsed power research and in applied physics offer interested students opportunities to interact with faculty members in physics and electrical engineering. In addition, the Department takes an active role in the University sponsored Institute for Biotechnology.

The strength and vitality of the Department can be measured in a variety of ways. For instance, in a recent five-year period more than 500 research articles were published by the faculty in a wide variety of scientific journals. This strength is also reflected in the level of external research support provided to the Department. In 2017 the department enjoys more than \$7 million in active grants. In recent years these funds have been awarded from such prestigious agencies as the National Institutes of Health; the National Science Foundation; the Departments of

Agriculture, Energy, and Homeland Security; the Environmental Protection Agency; the Cancer

Prevention and Research Institute of Texas; the Research Corporation; the American Chemical Society Petroleum Research Fund; the Robert A Welch Foundation; and the State of Texas Higher Education Coordinating Board..



Research Facilities

The department is well equipped to support cutting-edge research. Major departmental equipment includes: two 400 MHz Jeol NMR spectrometers and one 500 MHz Varian Inova NMR spectrometer, two Agilent DD2 600 MHz NMR spectrometer equipped for state-of-the-art protein NMR; a suite of mass spectrometers including LC-MS, LCQ Fleet ion trap mass spectrometer, and GC-MS (ISQ quadrupole mass spectrometer) instrumentation; high-resolution mass spectrometry (HRMS, Exactive Orbi mass spectrometer). Also included: fully equipped X-ray diffraction center with an automated Bruker Smart Apex II single-crystal diffractometer with low-temperature capabilities for molecular structure determination complemented by a Rigaku Mini (benchtop) diffractometer, a Rigaku Ultima III X-ray diffractometer with high-temperature and low-angle scattering capabilities; a MALDI-TOF-MS for analysis of macromolecules; an X-band electron paramagnetic resonance (EPR) spectrometer; several Atomic Force microscopes and Scanning Tunneling microscopes; a BET pore size analyzer; a Shimadzu TGA-50 thermal gravimetric analyzer; a Shimadzu DSC50

differential scanning calorimeter; a large array of infrared, visible, ultraviolet, fluorescence and phosphorescence spectrophotometers; and HPLC systems equipped with variable wavelength detectors.

The Department also has a \$1.5M Theory and Computation Lab housed within the Chemistry building featuring a state-of-the-art NSF funded 1200+ core computing cluster, dedicated primarily to massively parallel applications for departmental users.

Additional facilities available on campus include the Texas Tech High Performance Computing Center and the Advanced Technology Learning Center (ATLC). ATLC houses a large number of microcomputers and laser printers. The cluster computers can be accessed from the Department by way of a campus-wide network system. Texas Tech University boasts the second largest state university library in Texas, with nearly two million volumes, and is particularly strong in the chemical sciences.



The Graduate Program

An advanced degree is an individual achievement. Therefore, it is primarily the student's responsibility to set up his or her specific program and carry it out. Naturally, the resulting program should reflect the student's individual needs and career objectives. Also, since a major facet of any advanced degree in the chemical sciences is the successful completion of one or more research projects, the program should place a strong emphasis on the development of the student's ability to initiate and conduct original research.

The selection of a research supervisor is one of the most important career decisions a graduate student may ever make. The supervisor is a

faculty member who will serve as the student's mentor during his or her tenure in the graduate program. Incoming graduate students are required to choose a research supervisor by the end of their first semester. Due to the importance of this decision, several divisions host a series of seminars by faculty members, acquainting new graduate students with general research areas and specific projects.

Upon admission to the graduate program, all students must demonstrate their working knowledge of basic chemical sciences in three fields. This is usually accomplished through a



series of diagnostic examinations, which are given by the department prior to registration each fall and spring semester.

Graduate courses, which cover a broad spectrum of subjects in the chemical sciences are offered regularly by the department. Graduate students can also find worthwhile graduate course offerings in a number of other departments, including biological sciences, computer science, chemical engineering, and physics.

The requirements for the M.S. degree include formal course work, a research presentation as a formal seminar, a research thesis and a final oral examination. For the Ph.D. degree, requirements include formal course work, research, successful completion of a series of cumulative examinations, presentation of one formal seminar, oral defense of an original research proposal, and a final oral examination.

A more complete description of the various requirements for the M.S. and Ph.D. degrees can be found elsewhere in this packet.

Requirements for Advanced Degrees

Diagnostic Examinations

Entering graduate students are required to take three written diagnostic examinations designed to evaluate their proficiency in the basic chemical sciences. Students achieving a GRE score of at least 1100 (verbal + quantitative) and an advanced chemistry GRE score in the 80th percentile are exempt from taking the diagnostic examinations. These examinations are given in August, January and May of each year. Students must pass one diagnostic examination in their area of specialization by their second opportunity. Failure to pass the examinations within the specified time frame results in the student's dismissal from the program.

Major and Minor

All graduate students in the Department of Chemistry and Biochemistry major in chemistry (CHEM). Each student selects a specialization from one of the following fields: analytical chemistry, biochemistry, chemical education, inorganic chemistry, organic chemistry, or theoretical chemistry. A minor is not required of chemistry graduate students.

Advisor and Committee

Graduate students pick a Research Advisor at the end of their first semester after interviewing at least 3 professors. The other committee are picked by the time the degree plan is filed.

Literature Seminar

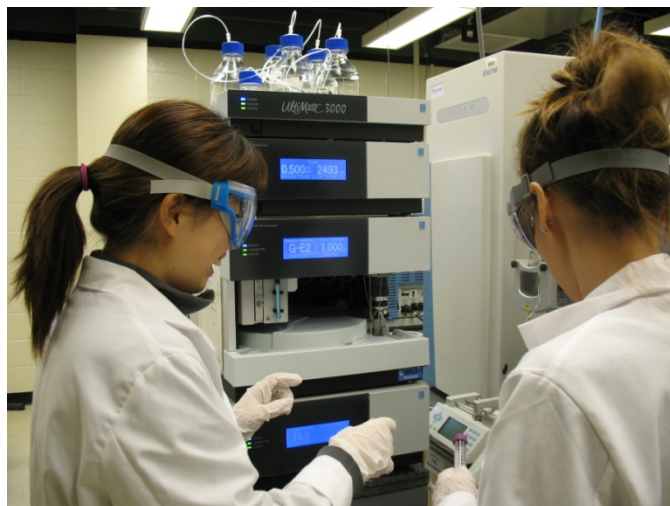
All graduate students must present a formal literature seminar to members of their division within the first four long semesters.

Cumulative Examinations (Ph.D. only)

Cumulative examinations are a series of tests in the student's area of specialization, which are designed to encourage an independent program of literature reading and study.

Performance on the cumulative examinations provides the Department with a mechanism to monitor the student's intellectual development in his/her chosen field.

Monthly cumulative examinations are given six times a year, October through April. Exams are given on Saturday mornings and last approximately three hours. Students are required to pass at least one exam during the first academic year of enrollment. A total of four examinations must be passed by the end of the second academic year.



Research and Future Work Examination (Ph.D. only)

By the end of a student's second calendar year as a graduate student in the department, the student must submit a written report of his/her research project to his/her advisory committee and meet with the committee to orally discuss the research project. It is common for this meeting to consist of the student giving a 30-45 minute presentation of his/her research project to the committee, followed by a question and answer session. Both written and oral components must include substantive discussion of both progress thus far, as well as proposed future work. However, the exact format of the research and future work examination (both written and oral parts) will be

determined by the student's Research Advisor. Therefore, students must enlist the aid of their research advisors during their preparation for the examination. Students are advised to submit progress reports to their committees at least once a year after passing the research exam.



Final Oral Examination

A final oral examination is required for both the Master of Science and Doctor of Philosophy degrees. This examination is conducted by the student's thesis or dissertation committee, and is the final measure of the student's suitability for an advanced degree.

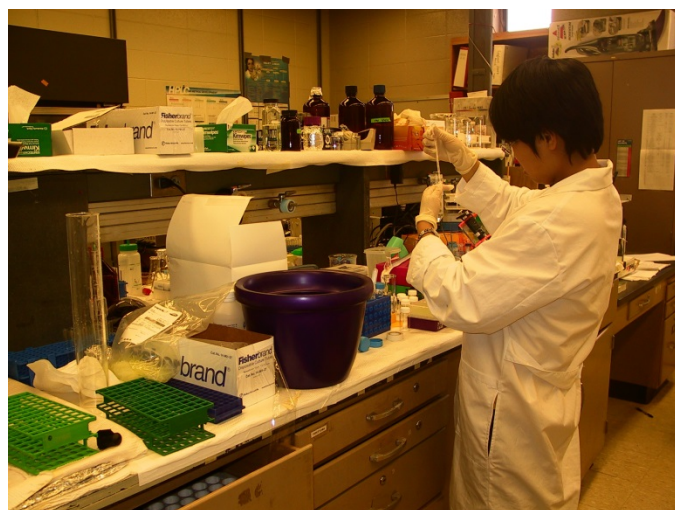
Courses in Chemistry and Biochemistry

The following courses are available (complete descriptions of the courses can be found in the Graduate Catalog):

- 5010 Individual Studies in Chemistry
- 5101 Seminar (Fall Semester)
- 5102 Seminar (Spring Semester)
- 5301 Advanced Inorganic Chemistry I
- 5302 Advanced Inorganic Chemistry II
- 5304 Topics in Chemistry*
- 5310 Polymer Chemistry
- 5314 Advanced Analytical Chemistry

- 5315 Atmospheric Chemistry
- 5318 Analytical Separation Science and Technology
- 5319 Electrochemical Analysis
- 5320 Analytical Spectroscopy
- 5321 Advanced Organic Chemistry I
- 5322 Advanced Organic Chemistry II
- 5326 Organic Spectroscopic Analysis
- 5327 Physical Organic Chemistry I
- 5333 Proteins
- 5335 Physical Biochemistry
- 5336 Lipids
- 5337 Enzymes
- 5339 Nucleic Acids
- 5342 Introduction to Quantum Chemistry
- 5343 Quantum Chemistry
- 5344 Kinetics of Chemical Reactions
- 5345 Molecular Spectroscopy
- 5346 Statistical Mechanics and Thermodynamics
- 5349 Physical Chemistry Principles for Biological Sciences
- 5360 Conceptual Chemistry for Teachers I
- 5361 Conceptual Chemistry for Teachers II
- 6000 Master's Thesis
- 7000 Research
- 8000 Doctor's Dissertation

*Topics courses cover areas not commonly included in other courses. Because the contents of these courses vary, they may be repeated for additional credit.



Housing and Financial Aid

Housing

A wide range of housing options is available to students in Lubbock including TTU dormitories, rooms in private homes, apartments, and rental houses. Several dorm complexes are dedicated to upper level and graduate students. All dorms have Ethernet computer connections, basic cable TV, local phone service, laundry facilities, vending machines, and desk services. Students interested in living in a University residence can find more information at: housing.ttu.edu

Rental rates for one bedroom, one bath unfurnished apartments in Lubbock typically fall within the range of \$450 to \$650 per month. Rates for fully furnished units are a bit higher per month. There are also many newer apartments that are rented by the room that are within walking distance to Texas Tech. The Lubbock Apartment Directory Online webpage can be seen at: www.lubbockapartments.com.

Financial Assistance

New PhD graduate students are guaranteed support on assistantships (TA's or RA'S) for *forty-eight months (4 years)*. New Master's degree students are guaranteed for twelve-months. After this period, students are generally supported as either research assistants (RA's) or teaching assistants (TA's), at comparable or higher stipend levels. Assistantship stipends at Texas Tech are comparable to those offered by chemistry and biochemistry departments at other major universities when factoring in the low cost of living in Lubbock.

Summer research assistantships and fellowships supplement the academic year income of teaching assistants. Early applicants may be considered for several **graduate school fellowships** which can add up to \$4000 per year for 3-4 years.

Employment for Student Spouses

Available employment opportunities for the spouses of graduate students may be found at the TTU Personnel Office web page, <http://www.depts.ttu.edu/hr/workattexastech/>. There are many job sites on the internet to look for jobs in Lubbock and TTU. There is a demand for qualified nurses, laboratory and medical technicians in Lubbock's numerous hospitals and clinics. Students requiring child care services will find a large selection of day care facilities in Lubbock. Spouses with training as teachers may find openings in the Lubbock, Frenship and Cooper Independent School Districts.

Further Information

Application materials and information regarding admission procedures and financial assistance in the Department of Chemistry and Biochemistry may be obtained from our web page, chem.ttu.edu or by contacting the Graduate Advisor via email at chemgrad@ttu.edu.

Reprints of publications and additional information on specific research projects may be obtained by contacting individual faculty members. Individual faculty email addresses and other contact information can be found at the departmental web page given above.



