

# CHEMISTRY AND BIOCHEMISTRY

The department of Chemistry and Biochemistry at Baylor University offers a variety of degree options and programs to suit the needs of students with a wide range of career goals. Fully accredited by the American Chemical Society (<https://www.acs.org/content/acs/en.html>), the department offers a certified bachelor's degree in chemistry as well as several others. We have research programs in the core areas of chemistry (analytical, inorganic, physical, organic, and biochemistry) along with more interdisciplinary programs in chemical biology and biomedical research

## Program Requirements

Freshmen who wish to be chemistry or biochemistry majors are strongly advised to enroll in CHE 1301 Basic Principles of Modern Chemistry I in the freshman year in order to keep as many options open as possible.

Current Baylor students must have a minimum 3.5 GPA and 12 hours in residence to request to change to BA or BS majors in chemistry or biochemistry. Transfer students desiring to enter Baylor and major in chemistry or biochemistry (BA or BS) must have a minimum 3.5 GPA.

## Programs

- Chemistry, B.A. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/chemistry-ba/>)
- Chemistry (American Chemical Society Certified), B.S. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/chemistry-bs/>)
- Chemistry, B.S. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/chemistry-with-concentration-subdiscipline-bs/>)
- Chemistry - Secondary Major (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/chemistry-secondary-major/>)
- Chemistry Minor (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/chemistry-minor/>)
- Biochemistry, B.A. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/biochemistry-ba/>)
- Biochemistry, B.S. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/biochemistry-bs/>)
- Biochemistry - Secondary Major (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/biochemistry-secondary-major/>)
- Biochemistry Minor (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/biochemistry-minor/>)
- Accelerated Bachelor of Arts in Biochemistry/Master of Arts in Teaching (<https://nextcatalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/joint-bachelor-arts-biochemistry-master-arts-teaching/>)
- Accelerated Bachelor of Arts in Chemistry/Master of Arts in Teaching (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/joint-bachelor-arts-master-arts-teaching/>)

- Accelerated Bachelor of Science in Biochemistry/Master of Arts in Teaching (<https://nextcatalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/joint-bachelor-science-biochemistry-master-arts-teaching/>)
- Accelerated Bachelor of Science in Chemistry/Master of Arts in Teaching (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/chemistry-biochemistry/joint-bachelor-science-master-arts-teaching/>)

## Chemistry (CHE)

### CHE 1100 Introductory Chemistry Laboratory (1)

Pre-requisite(s): Credit or concurrent registration in CHE 1300  
Laboratory investigations of chemical reactions and properties of common, everyday materials.

### CHE 1101 General Chemistry Laboratory I (1)

Pre-requisite(s): Credit or concurrent registration in CHE 1301  
An introductory laboratory course that illustrates topics covered in CHE 1301, including chemical reactions, the mole concept, properties of gases and solutions, thermochemistry, and molecular bonding.

### CHE 1102 General Chemistry Laboratory II (1)

Pre-requisite(s): CHE 1101 and credit or concurrent registration in CHE 1302  
An introductory laboratory course that illustrates topics covered in CHE 1302, including properties of solutions, kinetics, equilibrium, thermodynamics, electrochemistry, and chemical analysis.

### CHE 1146 Introductory Organic Biochemistry Laboratory (1)

Pre-requisite(s): Credit or concurrent registration in CHE 1341  
Laboratory experiments illustrating principles of organic chemistry and biochemistry.

### CHE 1300 Introductory Chemistry (3)

No previous knowledge of chemistry required. A one-semester course in general inorganic chemistry, covering atomic structure, bonding, nomenclature, chemical equations, and a problem-solving approach to stoichiometry, gases, solutions, acids and bases, chemical equilibrium and oxidation-reduction. Note: Students may apply either CHE 1300-1100, 1405, 1341-1146, or 1301 and 1100 in fulfillment of a science requirement for a (non-chemistry) B.A. degree. However, CHE 1405 is strongly advised for the meeting of this requirement.

### CHE 1301 Basic Principles of Modern Chemistry I (3)

Pre-requisite(s): A satisfactory score on the SAT math, ACT math, or participation in an online learning module and earning a minimum score at the conclusion of the module  
Completion of high school chemistry highly recommended. An introduction to chemical reactions; the mole concept; properties of gases, solids, liquids, and solutions; atomic structure; periodic properties; chemical bonding, and molecular structure.

### CHE 1302 Basic Principles of Modern Chemistry II (3)

Pre-requisite(s): CHE 1301 with a C or better  
A continuation of CHE 1301 with emphasis on chemical equilibrium, thermodynamics, electrochemistry, kinetics, and radiochemistry.

### CHE 1341 Introductory Organic Biochemistry (3)

Pre-requisite(s): CHE 1300 or 1301  
A one-semester introduction to organic chemistry and biochemistry. The structure and properties of different classes of organic compounds, enzymes, bioenergetics, intermediary metabolism, body fluids, and nutrition will be covered.

**CHE 1405 Chemistry and Society (4)**

The influence of chemistry on everyday life, including energy sources, agricultural chemicals, food and food additives, medicines, drugs, water, air, and pollution. Laboratory exercises involve the chemistry and physical properties of common materials.

**CHE 1V98 Special Research Problems (3)**

Pre-requisite(s): CHE 1302 and 2416; or permission of instructor

A research project conducted under the supervision of a Baylor Chemistry/Biochemistry Department faculty member. A minimum of three clock hours of work per week in the laboratory will be required for each semester hour of credit. This course may be repeated once if research continues. Departmental clearance is required before a grade can be assigned.

**CHE 1V9R Research (3)**

Pre-requisite(s): Consent of instructor

Undergraduate research undertaken under the supervision of a faculty member. May be taken for a maximum of 6 hours.

**CHE 2416 Laboratory Measurements and Techniques (4)**

Pre-requisite(s): CHE 1102 and 1302

An introductory laboratory course in quantitative analysis, including volumetric and gravimetric procedures with emphasis on developing the requisite laboratory technique for making high-quality analytical determinations.

**CHE 2V98 Extended Research Problems (3)**

Pre-requisite(s): Two semesters of CHE 1V98

A research project conducted under the supervision of a Baylor Chemistry/Biochemistry Department faculty member. A minimum of three clock hours of work per week in the laboratory will be required for each semester hour of credit. This course may be repeated once if research continues. Departmental clearance is required before a grade can be assigned.

**CHE 2V9R Research (3)**

Pre-requisite(s): Consent of instructor

Undergraduate research undertaken under the supervision of a faculty member. May be taken for a maximum of 6 hours.

**CHE 3238 Organic Chemistry Laboratory (2)**

Pre-requisite(s): CHE 1102, 3331, and credit or concurrent registration in CHE 3332

A laboratory course in organic chemistry including synthesis, purification, and analysis of organic compounds using a variety of techniques.

**CHE 3331 Organic Chemistry I (3)**

Pre-requisite(s): CHE 1302 with a grade of C or better

Chemistry of organic compounds which primarily contain the less polar functional groups. Topics include reaction mechanisms, stereochemistry and organic spectroscopy.

**CHE 3332 Organic Chemistry II (3)**

Pre-requisite(s): CHE 3331 with grade of C or better or consent of instructor

A continuation of CHE 3331 involving the chemistry of the more polar functional groups, including carbohydrates and amino acids. A nationally standardized comprehensive final examination covering both CHE 3331 and 3332 will be given.

**CHE 3341 Biochemistry of Nutrition (3)**

Pre-requisite(s): CHE 1302, CHE 1341, and BIO 1305, all with grades of C or better

The chemistry of dietary components, digestion, and biosynthesis, with emphasis on molecular structures, chemical properties, and metabolic relationships relevant to health. (This course does not count as an advanced course for chemistry majors.)

**CHE 3361 Forensic Analytical Chemistry (3)**

Pre-requisite(s): CHE 3332 and credit or concurrent enrollment in CHE 3238

Introduction to the theory and techniques of analytical chemistry as applied to forensic science.

**CHE 3V9R Research (3)**

Pre-requisite(s): Consent of instructor

Undergraduate research undertaken under the supervision of a faculty member. May be taken for a maximum of 6 hours.

**CHE 4001 Exit Examination (0)**

Pre-requisite(s): Senior standing

The only requirement for this course is completion of a comprehensive chemistry exit examination designated by the department. This examination may be written by the department's faculty or may be chosen from the GRE, ETS, or another similar examination.

**CHE 4141 Modern Biochemistry Laboratory (1)**

Pre-requisite(s): CHE 2416, 3238 and credit or concurrent enrollment in CHE 4341

Experiments illustrating isolation and identification of biomolecules with emphasis on chromatographic separations, centrifugation, electrophoresis, spectroscopic methods, kinetics, and analysis of experimental data.

**CHE 4142 Advanced Biochemistry Laboratory (1)**

Pre-requisite(s): CHE 4141 and credit or concurrent enrollment in CHE 4342

Experiments illustrating characterization of biomolecules with emphasis on advanced techniques in liquid chromatography, electrophoretic methods, ultracentrifugation, spectroscopic analysis, and molecular graphics and modeling.

**CHE 4151 Undergraduate Seminar I (1)**

Pre-requisite(s): CHE 3332 and senior standing

Presentation of a seminar derived from the recent literature in an area of chemistry designated by the instructor.

**CHE 4199 Senior Thesis (1)**

Pre-requisite(s): CHE 4V98 and consent of instructor

A final report in the form of a B.S. thesis and a public presentation on a research project conducted under the supervision of a Baylor Chemistry/Biochemistry Department faculty member. A copy of the thesis must be submitted to the advisor for B.S. chemistry majors before a grade can be assigned.

**CHE 4207 Preparative Inorganic Chemistry (2)**

Pre-requisite(s): CHE 3238 and 4302

A wide range of experimental techniques currently used in preparative inorganic chemistry research. Such techniques include dry bag, inert atmosphere, ion-exchange, and vacuum line manipulations; electrolytic, non-aqueous solvent, and tube furnace preparations. Emphasis will be given to both the preparation and characterization of compounds prepared in the laboratory.

**CHE 4217 Instrumental Analysis Laboratory (2)**

Pre-requisite(s): CHE 4225 or 4227, and either credit or concurrent registration in CHE 4316

Laboratory work in instrumental analysis with an emphasis on spectroscopy, separations, and electrochemical methods.

**CHE 4225 Biophysical Chemistry Laboratory (2)**

Pre-requisite(s): CHE 2416 and credit or concurrent enrollment in CHE 4327

Introduction to basic biophysical laboratory techniques. Emphasis is placed on the spectroscopy and calorimetry of macromolecules/ligand interactions. Instruction in effective report writing.

**CHE 4227 Physical Chemistry Laboratory I (2)**

Pre-requisite(s): CHE 2416 and credit or concurrent enrollment in CHE 4321

Techniques of physical property measurement, data analysis, and interpretation, with emphasis on thermodynamics, electrochemistry, surface chemistry, solutions, and kinetics. Instruction in effective report writing.

**CHE 4228 Physical Chemistry Laboratory II (2)**

Pre-requisite(s): CHE 4225 or 4227, and credit or concurrent enrollment in CHE 4322

Advanced work in measurement and data analysis techniques, with emphasis on lasers, molecular spectroscopy, and photochemistry. Instruction in effective report writing.

**CHE 4237 Advanced Organic Laboratory (2)**

Pre-requisite(s): CHE 3238 and 3332

Advanced organic synthesis, purification and analysis techniques, including the use of instrumental methods, such as inert atmosphere techniques and modern analytical and preparative chromatography.

**CHE 4302 Modern Inorganic Chemistry I (3)**

Pre-requisite(s): CHE 1301 and CHE 1302

Modern inorganic chemistry, including principles of structure, bonding, and chemical reactivity with application to compounds of the main group and transition elements, with organometallic chemistry.

**CHE 4307 Modern Inorganic Chemistry II (3)**

Pre-requisite(s): CHE 4302

Advanced topics in inorganic chemistry; molecular symmetry with applications to electronic structure and spectroscopy; reaction kinetics and mechanisms; inorganic synthesis and catalysis; bioinorganic chemistry.

**CHE 4316 Instrumental Analysis (3)**

Pre-requisite(s): CHE 4321 or 4327

Introduction to instrumental methods of analysis including spectroscopy, separations, and electrochemical methods.

**CHE 4321 Physical Chemistry I (3)**

Pre-requisite(s): CHE 2416, MTH 2321, and PHY 1430; and CHE 3332 or consent of instructor

Gases, liquids and solids, phase changes, electrochemistry, and the principles of kinetics and thermodynamics. (Not applicable to a major in biochemistry.)

**CHE 4322 Physical Chemistry II (3)**

Pre-requisite(s): CHE 2416, MTH 2321, and PHY 1430; and CHE 3332 or consent of instructor

Postulates of quantum mechanics. Application of quantum theory to simple models: particle in a box, rigid rotor, and harmonic oscillator. Electronic, rotational, and vibrational motion in molecules. Molecular energy levels and spectra. Electronic structure of atoms and molecules. Basic concepts of statistical thermodynamics.

**CHE 4327 Physical Chemistry for the Life Sciences (3)**

Pre-requisite(s): CHE 2416, MTH 1322, PHY 1409 or 1430; and credit or concurrent enrollment in CHE 4341

Chemical thermodynamics, kinetics, and the basic principles of spectroscopy with applications to systems of biochemical interest. (Not applicable to a major in chemistry.)

**CHE 4332 Organic Chemistry III (3)**

Pre-requisite(s): CHE 3238 and 3332 with grades of B or above; or consent of instructor

Advanced aspects of organic chemistry, including synthetic strategies and techniques, reaction mechanisms, and an introduction to bio-organic chemistry.

**CHE 4334 Organic Spectroscopy (3)**

Pre-requisite(s): Either CHE 3238 and 3332 with grades of B or above; or CHE 3332 with a grade of B or above and credit or concurrent enrollment in CHE 4237

The most common spectroscopic methods including infrared, ultraviolet-visible, nuclear magnetic resonance and mass spectroscopies, with emphasis on the practical use of NMR and MS in structure determination problems.

**CHE 4341 General Biochemistry (3)**

Pre-requisite(s): CHE 3332 with a grade of C or better

Structure and dynamics of compounds of biological interest. (Students may not receive credit for both BIO 4307 and CHE 4341.)

**CHE 4342 Topics in Human Biochemistry (3)**

Pre-requisite(s): A grade of C or better in CHE 3332; and either a grade of C or better in CHE 4341 or a grade of B or better in BIO 4307

Topics in selected areas of human biochemistry such as hormone action, neurotransmission, vision, digestion, transport.

**CHE 4V60 Special Topics in Chemistry (1-4)**

Pre-requisite(s): CHE 3332 and consent of instructor

Topics in chemistry not covered in other chemistry courses. May be repeated once for credit if topic is different.

**CHE 4V98 Senior Research Problems (3)**

Pre-requisite(s): CHE 2V98, 3238, and 3332 and consent of instructor

A research project conducted under the supervision of a Baylor Chemistry/Biochemistry Department faculty member. A minimum of three clock hours of work per week in the laboratory will be required for each semester hour of credit. A written progress report will be submitted to the instructor at the end of each semester. This course may be repeated for a maximum of 6 total hours if research continues. Departmental clearance is required before a grade can be assigned.

**CHE 4V9R Research (3)**

Pre-requisite(s): Consent of instructor

Undergraduate research undertaken under the supervision of a faculty member. May be taken for a maximum of 6 hours.