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Chemistry Program
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Chemistry Mission Statement.

Chemistry has justifiably been labeled 'The Central Science'. Training in this discipline is essential for all citizens of the modern world. Since there is no material in the universe not made up of chemicals, a knowledge of chemistry is indeed a knowledge of ourselves.

The objectives of the Chemistry program are to

1. To promote molecular literacy, i.e., the growing awareness of the importance of understanding physical, chemical and biological changes on the atomic and molecular scale;
2. To demonstrate hands-on laboratory skills utilizing modern instrumentation and techniques;
3. To offer science majors the opportunity to engage in an undergraduate research program;
4. To enable students in other disciplines to demonstrate their integrated knowledge of the world about them.

Chaminade offers a minor in chemistry. Students interested in a chemistry-intensive major should refer to the Biochemistry program section of this catalog.

Degree requirements for the minor in Chemistry.

Pre-minor requirements: CH 203/CH 203L, CH 204/CH 204L, MA 110.

Minor requirements: CH 360/CH 360L, CH 334/CH 334L and CH 490 or *one upper division elective chosen from* CH 403, CH 420, CH 430L .

Learning Outcomes for the Minor in Chemistry

Upon completion of the undergraduate minor in Chemistry, the student will demonstrate an understanding of:

1. The scientific method and its application in Chemistry
2. The different areas of research and practice in Chemistry
3. The general concepts and principles of Chemistry

Course Descriptions

CH 102 Chemistry for the Concerned World Citizen (3)

This is an introductory course presenting many different branches of chemistry. In contrast to other courses in the discipline, there is a significant qualitative component, where impact to environment, and how chemical knowledge can contribute to one's overall awareness are among the topics discussed. The quantitative part of the course is especially designed to be non-intimidating when covering concepts such as atomic theory, formulas, equations, thermochemistry, gases, and stoichiometry. Non-science majors, who wish to relate general principles of chemistry to socioeconomic and environmental issues, as well as science majors, who feel the need for a refresher course, are encouraged to enroll. Offered annually. *Concurrent registration in CH 102L required. Prerequisites: High school algebra recommended.*

CH 102L Chemistry for the Concerned World Citizen Laboratory (1)

The general theme for this lab course is to demonstrate that chemistry is everywhere. A great majority of the experiments will be carried out using household supplies and equipment. During the last few weeks a transition to using conventional lab equipment is aimed to help students understand the logic of experimental design. One three-hour laboratory period per week to accompany CH 102. *Concurrent registration in CH 102 required.* Offered annually.

CH 103 College Chemistry (3)

A one semester introduction to chemistry for students who wish to strengthen their understanding of basic concepts in chemistry before beginning the general chemistry sequence or for students working towards associate degrees. Emphasis will be placed on problem solving. Topics covered will include: chemical measurements, properties of atoms and molecules, chemical reactions, chemical calculations, acids and bases, properties of gases and thermochemistry. Offered annually. Concurrent registration in CH 103L required.

CH 103L College Chemistry Laboratory (1)

Laboratory experiments designed to reflect the topics presented in CH 103. Offered annually. *Concurrent registration in CH 103 required.*

CH 107 Marine Sciences: Chemical Perspectives (3)

This course acquaints the non-specialist with the multi-faceted marine environment. The topics covered range from wave action and reef eco-systems to marine invertebrates and drugs from the sea. Many unique features of the marine environment around the Hawaiian Islands are also covered. Offered annually. *Prerequisites: Concurrent registration in CH 107L and consent of instructor required.*

CH 107L Marine Sciences: Chemical Perspectives Laboratory (1)

Hands-on experience in data-collection and processing, observations of marine eco-systems, sample collecting, and isolation techniques are introduced through field trips and laboratory experiments. One three-hour laboratory period per week to accompany CH 107. Offered annually.

CH 201 General Chemistry for Nursing (3)

A one semester, general chemistry course with an emphasis for the nursing majors. The topics covered include the structure of matter, the properties of solutions and gases, radioactive isotopes and the chemistry of acids and bases. This course is not a substitute for CH 203/204 for the Biology or Forensic Sciences majors. This course may not be used to satisfy the Natural Science General Education requirement. *Offered annually. Prerequisites: BI 151 and BI 151L, BI 152 and BI 152L and MA 107 or equivalent with grade of C or better is required. Concurrent registration in CH 201L.*

CH 201L General Chemistry for Nursing Laboratory (1)

Laboratory to accompany CH 201 One three-hour laboratory per week will include introduction to the fundamental principles and models of chemistry and related exercises and experimentation. *Prerequisites: BI 151L and BI 152L. Concurrent registration in CH 201 required.*

CH 203 General Chemistry I (4)

A study of the general concepts and basic principles of chemistry: properties of matter, atomic and molecular structure, theories of bonding, chemical reactions and stoichiometry, equilibria, and ions in aqueous solution. Offered annually. *Prerequisites: MA 103. Concurrent registration in CH 203L required. Cross-listed as BC 203.*

CH 203L General Chemistry Laboratory (1)

Inorganic qualitative and quantitative analysis with emphasis on gravimetric, volumetric, and spectrophotometric techniques. One three-hour laboratory period per week to accompany CH 203. Offered annually. *Concurrent registration in CH 203 required. Cross-listed as BC 203L.*

CH 204 General Chemistry II (4)

Continuation of CH 203. Acids and bases, thermodynamics, electrochemistry, additional aspects of chemical equilibria, descriptive chemistry. Offered annually. *Prerequisites: MA 110, and CH 203 or equivalent. Concurrent registration in CH 204L required. Cross-listed as BC 204.*

CH 204L General Chemistry Laboratory II (1)

One three-hour laboratory periods per week to accompany CH 204. Offered annually. *Concurrent registration in CH 204 required. Cross-listed as BC 204L.*

CH 254 Survey of Organic and Bioorganic Chemistry for Nursing (3)

An introductory course aiming at surveying what goes on within biological systems from a molecular point of view, with an emphasis on specific ecological interactions. Offered annually. *Prerequisites: CH 201 or consent of instructor, BI 151 and BI 151L, BI 152 and BI 152L and completion of MA 107 or equivalent with grade of C or better is required. Concurrent registration in CH 254L required.*

CH 254L Survey of Organic and Bioorganic Chemistry for Nursing Laboratory (1)

Laboratory to accompany CH 254. One three-hour laboratory per week will include introduction to the fundamental principles and models of chemistry and related exercises and experimentation. *Prerequisites: BI 151L and BI 152L. Concurrent registration in CH 254 required.*

English 102 and COM 101 are prerequisites for all upper division courses**CH 323 Organic Chemistry I (4)**

Chemistry of carbon compounds is investigated according to the functional group classification. A full understanding of organic reaction mechanisms is emphasized in order to guide the students through numerous reactions. Three-dimensionality of carbon compounds is introduced and referred to in the context of relevant reactions. Offered annually. *Prerequisites: CH 204 and CH 204L. Concurrent registration in CH 323L required. Cross-listed as BC 323.*

CH 323L Organic Chemistry Laboratory I (1)

Separation and purification techniques such as distillation, recrystallization, liquid-liquid extraction are introduced. Having performed several functional interconversion reactions, students are competent enough to carry out multi-step syntheses by the end of the semester. Offered annually. *Concurrent registration in CH 323 required. Materials intensive fee applies. Cross-listed as BC 323L.*

CH 324 Organic Chemistry II (4)

Spectroscopic methods such as IR, NMR, MS, and UV/VIS are introduced to solve structural identifications of the different classes of compounds studied in the first semester. The chemistry of carbonyl compounds is investigated in detail and principles of multi-step syntheses are introduced. Biologically relevant molecules such as saccharides, amino acids, peptides, and nucleic acids are studied with the strong implication that structural features and principal chemical behaviors of these molecules are related to their biological functions. Offered annually. *Prerequisites: CH 323. Concurrent registration in CH 324L required. Cross-listed as BC 324.*

CH 324L Organic Chemistry Laboratory II (1)

Students are trained to carry out more complex reactions using sensitive reagents. Most of the semester is used to learn to determine partial and full structures of organic compounds utilizing qualitative chemical and spectroscopic analyses. Hands-on training with the actual instruments and with computerized simulations is offered. Students are also introduced to microscale reaction techniques and apparatus. Offered annually. *Concurrent registration in CH 324 required. Materials intensive fee applies. Cross-listed as BC 324L.*

CH 334 Analytical Chemistry (3)

A one-semester course in analytical chemistry where separation techniques and quantitative identifications of chemical entities are discussed. The quantitative techniques include gravimetric, volumetric, and potentiometric analyses. Sampling techniques and the statistical treatment of data are also discussed. Offered annually. *Prerequisites: CH 204, and CH 323. Concurrent registration in CH 334L required. Cross-listed as BC 334.*

CH 334L Analytical Chemistry Laboratory (1)

One three-hour laboratory period per week to accompany CH 334. Offered annually. *Concurrent registration in CH 334 required. Cross-listed as BC 334L.*

CH 360 Biochemistry (3)

This is the first part of a year-long course where the vast knowledge of biochemistry is filtered through a rational perspective guided by general chemical and biological principles. Following a survey and review of common classes of biologically significant metabolites such as peptides, carbohydrates, lipids, nucleic acids, as well as equally important smaller molecules, the emphasis is shifted to biological thermodynamics and enzyme mechanisms. During the latter part of the course the broad spectrum of principles studied is utilized to cover individual metabolic pathways in detail. *Cross-listed as BI/BC 360. Prerequisites: BI 208/BI 208L, CH 204/204L. Concurrent registration in CH 360L required.*

CH 360L Biochemistry Laboratory (1)

Students gain experience in the isolation, purification, identification, and quantification of biologically important molecules. Spectroscopic, chromatographic, as well as chemical modification techniques are used in identifying peptides and proteins. Enzyme kinetic studies are carried out for quantification purposes. *Cross-listed as BI/BC 360L. Concurrent registration in CH 360 required. Materials intensive fee applies.*

CH 362 Biochemistry II (3)

This is the second part of the year-long biochemistry course, which starts with photosynthesis giving students a chance to review topics discussed during the previous semester such as oxidative phosphorylation and carbohydrate metabolisms. Continuing with individual metabolic pathways, lipids and amino acids are explored. The second half of the semester is mostly dedicated to nucleic acids, starting with nucleotide metabolism followed by a detailed study of information flow involving DNA and RNA. The course will conclude with a discussion of some contemporary techniques used in recombinant DNA technology. *Prerequisite: CH 360/CH 360L. Cross-listed as BC 362.*

CH 362L Biochemistry II Lab (1)

Contemporary experiments and simulations involving DNA and other nucleic acid metabolites. *Prerequisite: CH 360/CH 360L. Concurrent registration in CH 362 required. Cross-listed as BC 362L.*

CH 403 Inorganic chemistry (3)

Inorganic systems including bonding theories, structure, acid-base phenomena, and coordination compounds. *Prerequisite: CH 324*

CH 420 Physical Chemistry (3)

A one semester course covering thermodynamics, chemical equilibria and kinetics, quantum theory and applications to chemical bonding and spectroscopy. *Prerequisites: MA 211, CH 324, BC 360 and PHY 252. Cross-listed as BC 420.*

CH 430L Instrumental Analysis (2)

This is a lab course during which students are expected to get hands-on experience with modern instrumentation, including but not limited to UV/VIS, FT IR, LC-MS, GC-MS. Following a discussion on the basic principles of each instrument, students will perform specific experiments and gather data from each instrument. Experiments during part of the course designated for topics in NMR spectroscopy will mostly be simulated. *Prerequisites: CH 324/CH 324L, CH 334/CH 334L. Materials intensive fee applies. Cross-listed as BC 430L.*

CH 440 Natural Product Chemistry (3)

The vast number of naturally occurring substances will be classified in terms of the biosynthetic-biogenetic pathways of their production. Polyketides, terpenes, alkaloids, as well as compounds with other and mixed biogenetic origins will be studied using mechanistic predictions introduced at the beginning of the course rather than a traditional descriptive approach. Secondary metabolites that are not emphasized in biochemistry courses will be highlighted with a view to understand their ecological significance, particularly in the field of chemical communication. Some interesting novel molecules isolated from marine organisms will be discussed. *Prerequisite: CH 362/CH 362L. Concurrent registration in CH 440L required*

CH 440L Natural Product Chemistry Lab (1)

The emphasis in this lab course will be on isolation and identification methods. Students will be introduced to various chromatographic techniques, from manual to automated, which they will apply to separation of particular natural products out of a crude mixture. Experiments using different methods such as normal/reversed phase, size exclusion, will enable students to select the best route for any specific purpose. During the second half of the course each student will be assigned to a mini-project, where students will be expected to learn how to use advanced instruments, such LC-MS, and evaluate the data for structure determination purposes. *Prerequisite: CH 362/CH 362L. Concurrent registration in CH 440 required.*

CH 447 Pharmacology (3)

Therapeutic actions of drugs at the cellular, tissue and organism level are discussed in areas of cancer, inflammation, cardiovascular, and endocrine related diseases. Preclinical and clinical results of each drug or drug class are discussed with respect to therapeutic effectiveness. Included in the discussion are pharmacokinetics and toxicology. The course will be reading and writing intensive involving scientific literature research. The student will demonstrate an understanding of small and large molecule drug discovery and their therapeutics. *Prerequisites: BI 208/BI 208L, and CH 360/CH360L*

CH 480. Special Topics in Chemistry (1-3)

Advanced and specialized chemistry topics. Prerequisites: CH 324/CH 324L.

CH 490 Chemistry Seminar I (1-2)

Special topics in organic, inorganic, physical, analytical, or biochemistry. Reading and discussion of current topics as well as expertise in modern library searching and retrieval methods to obtain information. One oral presentation by each participant required. Prerequisites: CH 324/CH 324L.