

Chemistry (CHEM)

Courses

CHEM A054 Chemistry Skills and Problem Solving **3 Credits**

A preparatory chemistry course for students without high school chemistry or with limited mathematics background. Develops foundational problem-solving skills using basic models of chemistry. CHEM A054 is the preparatory course for CHEM A103 and CHEM A105.

Prerequisites: MATH A105 with a minimum grade of C or MATH A121 with a minimum grade of C or MATH A151 with a minimum grade of C or MATH A152 with a minimum grade of C or MATH A155 with a minimum grade of C or MATH A211 with a minimum grade of C or MATH A212 with a minimum grade of C or MATH A221 with a minimum grade of C or MATH A251 with a minimum grade of C or MATH A251F with a minimum grade of C or MATH A252 with a minimum grade of C or MATH A252F with a minimum grade of C or MATH A253 with a minimum grade of C or ALEKS Overall Test 1 with a score of 055 or ALEKS Overall Test 2 with a score of 055 or ALEKS Overall Test 3 with a score of 055 or ALEKS Overall Test 4 with a score of 055 or ALEKS Overall Test 5 with a score of 055.

CHEM A103 Introduction to General Chemistry **3 Credits**

Introductory chemistry survey course for health science majors and preparatory course for science majors. Topics include: measurement, energy and matter, periodic trends, chemical composition, chemical reactions, solutions, bond theory, phases, oxidation-reduction, nuclear chemistry, problem-solving (applied mathematics), and special topics. **Special Note:** This course assumes prior knowledge of algebra and high school chemistry.

Prerequisites: CHEM A054 with a minimum grade of P or MATH A121 with a minimum grade of C or MATH A151 with a minimum grade of C or MATH A152 with a minimum grade of C or MATH A155 with a minimum grade of C or MATH A251 with a minimum grade of C or MATH A251F with a minimum grade of C or ALEKS Overall Test 1 with a score of 065 or ALEKS Overall Test 2 with a score of 065 or ALEKS Overall Test 3 with a score of 065 or ALEKS Overall Test 4 with a score of 065 or ALEKS Overall Test 5 with a score of 065.

Attributes: UAA Natural Sciences GER.

CHEM A103L Introduction to General Chemistry Laboratory **1 Credit**

Introductory chemistry laboratory course with experiments designed to introduce students to the basics of laboratory equipment, experimental methodology, data collection, data analysis and reporting. This course illustrates, augments and applies concepts covered in CHEM A103.

Special Note: Students who do not meet the prerequisites for this course may be administratively dropped at the discretion of the faculty. Attendance is mandatory for all chemistry laboratory courses the first week of class. Unless prior arrangements are made with the instructor, any student who does not attend the first scheduled meeting for this lab may be administratively dropped and a student on a waiting list will be added in their place. Any fees resulting from either of these drop procedures or any late registration procedure will be the responsibility of the student.

Prerequisites: CHEM A103 with a minimum grade of C or concurrent enrollment.

Attributes: UAA Natural Sci Lab Only GER.

CHEM A104 Introduction to Organic and Biochemistry **3 Credits**

This is the second semester course in the sequence for health science majors and comprises a survey of the fundamentals of chemistry as applied to biological systems. Topics include: nomenclature of organic compounds, organic functional groups and reactions, biochemical processes and pathways, biological macromolecules, and metabolites.

Special Note: CHEM A104L is the lab component of this course and requires a separate registration.

Prerequisites: CHEM A103 with a minimum grade of C or CHEM A105 with a minimum grade of C.

Attributes: UAA Natural Sciences GER.

CHEM A104L Introduction to Organic and Biochemistry Laboratory **1 Credit**

Second semester introductory chemistry laboratory course with experiments designed to reinforce concepts, including the basics of laboratory equipment, experimental methodology, data collection, data analysis and reporting. This course illustrates, augments and applies concepts covered in CHEM A104.

Special Note: Students who do not meet the prerequisites for this course may be administratively dropped at the discretion of the faculty. Attendance is mandatory for all chemistry laboratory courses the first week of class. Unless prior arrangements are made with the instructor, any student who does not attend the first scheduled meeting for this lab may be administratively dropped and a student on a waiting list will be added in their place. Any fees resulting from either of these drop procedures or any late registration procedure will be the responsibility of the student. Pregnant students should be aware that they will be using chemicals in this course that are teratogenic and may cause harm to unborn children.

Prerequisites: CHEM A103L with a minimum grade of C and CHEM A104 with a minimum grade of C or concurrent enrollment.

Attributes: UAA Natural Sci Lab Only GER.

CHEM A105 General Chemistry I 3 Credits

Introduces general chemistry and explores topics to a much greater depth than preparatory courses. Topics include: measurement, energy and matter, periodic trends, chemical composition, chemical reactions, solutions, bond theory, gases, thermodynamics, problem-solving (applied mathematics) and special topics.

Special Note: Assumes prior knowledge of algebra and high school chemistry. CHEM A105L is the lab component of this course and requires a separate registration.

Prerequisites: CHEM A054 with a minimum grade of P or MATH A151 with a minimum grade of C or MATH A152 with a minimum grade of C or MATH A155 with a minimum grade of C or MATH A251 with a minimum grade of C or MATH A251F with a minimum grade of C or ALEKS Overall Test 1 with a score of 065 or ALEKS Overall Test 2 with a score of 065 or ALEKS Overall Test 3 with a score of 065 or ALEKS Overall Test 4 with a score of 065 or ALEKS Overall Test 5 with a score of 065.

Attributes: UAA Natural Sciences GER.

CHEM A105L General Chemistry I Laboratory 1 Credit

Introductory chemistry laboratory course with experiments designed to introduce students to the basics of laboratory equipment, experimental methodology, data collection, data analysis and reporting. This course illustrates, augments and applies concepts covered in CHEM A105.

Special Note: Students who do not meet the prerequisites for this course may be administratively dropped at the discretion of the faculty. Attendance is mandatory for all chemistry laboratory courses the first week of class. Unless prior arrangements are made with the instructor, any student who does not attend the first scheduled meeting for this lab may be administratively dropped and a student on a waiting list will be added in their place. Any fees resulting from either of these drop procedures or any late registration procedure will be the responsibility of the student.

Prerequisites: CHEM A105 with a minimum grade of C or concurrent enrollment.

Attributes: UAA Natural Sci Lab Only GER.

CHEM A106 General Chemistry II 3 Credits

The second semester in the general chemistry sequence. Topics include: kinetics, equilibrium chemistry (including acids and bases, solubility, and complex ion formation), nuclear chemistry, electrochemistry, thermodynamics and special topics.

Special Note: CHEM A106L is the laboratory component of this course and requires a separate registration.

Prerequisites: CHEM A105 with a minimum grade of C.

Attributes: UAA Natural Sciences GER.

CHEM A106L General Chemistry II Laboratory 1 Credit

Second semester introductory chemistry laboratory course with experiments designed to reinforce concepts, including the basics of laboratory equipment, experimental methodology, data collection, data analysis and reporting. This course illustrates, augments and applies concepts covered in CHEM A106.

Special Note: Students who do not meet the prerequisites for this course may be administratively dropped at the discretion of the faculty. Attendance is mandatory for all chemistry laboratory courses the first week of class. Unless prior arrangements are made with the instructor, any student who does not attend the first scheduled meeting for this lab may be administratively dropped and a student on a waiting list will be added in their place. Any fees resulting from either of these drop procedures or any late registration procedure will be the responsibility of the student.

Prerequisites: CHEM A105L with a minimum grade of C and CHEM A106 with a minimum grade of C or concurrent enrollment.

Attributes: UAA Natural Sci Lab Only GER.

CHEM A208 Principles of Bioinorganic Chemistry 3 Credits

Study of introductory inorganic chemistry concepts with a focus on biologically-active, organometallic compounds.

Prerequisites: CHEM A106 with a minimum grade of C.

CHEM A218 Experiential Learning: Quantitative Chemical Analysis 5 Credits

Introduces the foundational methods and theories associated with quantitative analysis of chemical substances. Learning activities present students with conceptual and chemical models followed by questions to guide them through the learning cycle of structured scientific evaluation of analytical data. Introduces the fundamentals of quantitative chemical analysis, including the basics of experimental design, analytical controls, statistical methods of data analysis, data presentation, and how to discriminate between sound and unsound data. Activities promote independent operations of solution preparation, titration, spectrophotometry and chromatography.

Special Note: Pregnant students should be aware that they will be using chemicals in this course that are teratogenic and may cause harm to unborn children.

Prerequisites: CHEM A106 with a minimum grade of C and CHEM A106L with a minimum grade of C.

CHEM A253 Principles of Inorganic Chemistry 3 Credits

Study of theoretical and practical aspects of chemical bonding, descriptive periodic trends, and molecular structure and symmetry of molecules. A special emphasis is given to the chemistry of the transition metals, including coordination and organometallic chemistry.

Prerequisites: CHEM A106 with a minimum grade of C.

CHEM A312 Quantitative Analysis 5 Credits

General principles of chemical analysis, including introduction to volumetric, gravimetric and instrumental methods, theory, problems, and laboratory.

Special Note: Pregnant students should be aware that they will be using chemicals in this course that are teratogenic and may cause harm to unborn children.

Prerequisites: CHEM A106 with a minimum grade of C and CHEM A106L with a minimum grade of C.

CHEM A321 Organic Chemistry I 3 Credits

Investigates the chemistry of carbon compounds including alkanes, alkenes, alkynes, alkyl halides, and arenes. Discusses physical properties, nomenclature, synthesis, reactions, reaction mechanisms, and stereochemistry of these compounds.

Prerequisites: CHEM A106 with a minimum grade of C.

CHEM A322 Organic Chemistry II 3 Credits

Continuation of CHEM A321. Includes the study of spectroscopic properties, delocalized electron systems, aromatic reactions, carbonyl compound reactions and amines. Emphasizes nomenclature, physical properties, synthetic methods and reaction mechanisms.

Special Note: It is strongly recommended that students register in CHEM A322 within one year of completing CHEM A321.

Prerequisites: CHEM A321 with a minimum grade of C.

CHEM A323L Organic Chemistry Laboratory 2 Credits

A practical implementation of the theory learned in CHEM A321 and A322. Purification techniques, spectroscopic methods and synthetic methods of organic compounds will be taught.

Special Note: It is strongly recommended that students who wish to co-register in CHEM A322 and CHEM A323L complete CHEM A321 with a minimum grade of B. Students who complete CHEM A321 with a grade of C are strongly recommended to pass CHEM A322 prior to registering in CHEM A323L. Students who do not meet the prerequisites for this course may be administratively dropped at the discretion of the faculty. Attendance is mandatory for all chemistry laboratory courses the first week of class. Unless prior arrangements are made with the instructor, any student who does not attend the first scheduled meeting for this lab may be administratively dropped and a student on a wait list will be added in their place. Any fees resulting from either of these drop procedures or any late registration procedure will be the responsibility of the student. Pregnant students should be aware that they will be using chemicals in this course that are teratogenic and may cause harm to unborn children.

Prerequisites: CHEM A106L with a minimum grade of C and CHEM A321 with a minimum grade of C and CHEM A322 with a minimum grade of C or concurrent enrollment.

CHEM A411 Biophysical Chemistry 3 Credits

Study of principles of thermodynamics, equilibrium, and kinetics with a focus on biochemical systems.

May Be Stacked With: CHEM A611

Prerequisites: CHEM A106 with a minimum grade of C and (MATH A251 with a minimum grade of C or MATH A251F with a minimum grade of C) and PHYS A124 with a minimum grade of C.

CHEM A418 Experiential Learning: Chemical Instrumentation and Methods 5 Credits

An experiential learning course that includes discussion of theories and concepts, and extensive laboratory exercises in qualitative and quantitative analysis of chemical compounds, with applications to health sciences, biomedical sciences, environmental sciences and geosciences.

Prerequisites: CHEM A218 with a minimum grade of C and CHEM A321 with a minimum grade of C.

CHEM A441 Principles of Biochemistry I 3 Credits

A study of the structure and function of various biomolecules, including amino acids, proteins, carbohydrates, nucleic acids, lipids and membranes.

Special Note: Students who complete CHEM A441 as part of their undergraduate degree cannot receive credit toward their graduate degree from CHEM A641.

Registration Restrictions: Junior or senior standing

May Be Stacked With: CHEM A641

Prerequisites: BIOL A108 with a minimum grade of C and CHEM A321 with a minimum grade of C.

Attributes: UAA Integrative Capstone GER.

CHEM A442 Principles of Biochemistry II 3 Credits

A study of the bioenergetics and the metabolic pathways of amino acids, proteins, carbohydrates, nucleic acids and lipids.

Special Note: Students who complete CHEM A442 as part of their undergraduate degree cannot receive credit toward their graduate degree from CHEM A642.

Prerequisites: CHEM A441 with a minimum grade of C.

CHEM A443 Biochemistry Laboratory 2 Credits

Provides instruction in modern biochemical laboratory techniques.

Prerequisites: CHEM A441 with a minimum grade of C.

CHEM A456 Nonlinear Dynamics and Chaos 3 Credits

Introduces nonlinear dynamics and chaos. Develops analytical methods and geometric intuition using concrete examples from physics, biology, chemistry, and engineering. Topics covered include phase plane analysis, iterated maps, fractals, and strange attractors.

Registration Restrictions: Completion of GER Tier 1 (basic college-level skills) courses and junior standing

Crosslisted With: BIOL A456 and PHYS A456

Prerequisites: MATH A253 with a minimum grade of C and (PHYS A124 with a minimum grade of C or PHYS A212 with a minimum grade of C).

Attributes: UAA Integrative Capstone GER.

CHEM A471 Immunology 3 Credits

Fundamental concepts of immunology including cells and tissues of the immune system, innate immunity, lymphocyte development, antigenicity, cytokine signaling, antibody responses, immunotherapies and vaccines. Discusses comparative immunological evolution of non-human species. Emphasizes immunological aspects of human disease including host-pathogen interactions, autoimmune diseases, immunodeficiencies and cancer.

Crosslisted With: BIOL A471.

Prerequisites: BIOL A242 with a minimum grade of C and BIOL A252 with a minimum grade of C.

CHEM A474 Ecotoxicology 3 Credits

Examines the chemical and ecological nature of pollution processes and the major classes and environmental fate of pollutants.

Crosslisted With: BIOL A474

Prerequisites: BIOL A271 with a minimum grade of C or CHEM A321 with a minimum grade of C.

Attributes: UAA Integrative Capstone GER.

CHEM A480 Molecular Spectroscopy and Structure 3 Credits

Introduction to determining constitutional and stereochemical structure of chemical compounds using spectroscopic methods (mass spectrometry, nuclear magnetic resonance, infrared, ultraviolet), with applications to health, biomedical and environmental sciences.

May Be Stacked With: CHEM A680

Prerequisites: CHEM A322 with a minimum grade of C.

CHEM A481 Experiential Learning: Undergraduate Seminar I 1 Credit

Introduction to the techniques and style of technical oral presentation generally accepted by professional chemists.

Registration Restrictions: Junior or senior standing and department approval

CHEM A482 Experiential Learning: Undergraduate Seminar II 2 Credits

Continuation of instruction on the techniques and style of technical oral presentation generally accepted by professional chemists.

Prerequisites: CHEM A481 with a minimum grade of C.

CHEM A495 Chemistry Internship 3 Credits

Work experience in an approved position with supervision and training in various agencies and businesses. Exposes student to work environment beyond the campus setting to acquire essential practical skills and enhance self-confidence and career direction.

Special Note: May be repeated once for credit.

Registration Restrictions: Junior or senior standing and department approval

CHEM A498 Individual Research 1-6 Credits

Discipline-specific research for undergraduate students. Topic of study to be approved and mentored by a faculty member.

Special Note: May be repeated for a maximum of 6 credits.

Registration Restrictions: Junior or senior standing and department approval

CHEM A611 Advanced Biophysical Chemistry 3 Credits

Advanced study of biophysical chemistry through the principles of thermodynamics, equilibrium and kinetics with a focus on biochemical systems. Introduction to computational techniques in physical chemistry. Examination of the current literature in biophysical chemistry.

Special Note: Not available for credit to students who have completed CHEM A411.

Registration Restrictions: Graduate standing and instructor approval

May Be Stacked With: CHEM A411

CHEM A641 Advanced Biochemistry I 3 Credits

In depth study of the structure and function of various biomolecules, including amino acids, proteins, carbohydrates, nucleic acids, lipids and membranes.

Special Note: Not available for credit to students who have taken CHEM A441.

Registration Restrictions: Graduate standing; a course in organic chemistry and a course in biology, or instructor permission.

May Be Stacked With: CHEM A441

CHEM A680 Advanced Molecular Spectroscopy and Structure 3 Credits

Discusses advanced molecular spectroscopy theory and principles for structural analysis. Reviews literature with regard to recent applications to health, biomedical and environmental sciences.

Registration Restrictions: Graduate standing and instructor approval

May Be Stacked With: CHEM A480

CHEM A698 Graduate Research 1-6 Credits

Discipline-specific research for graduate students. Topic of study to be approved and directed by a faculty member.

Special Note: May be repeated for a maximum of 12 credits.

Registration Restrictions: Graduate standing and permission of graduate advisor

CHEM A699 Graduate Thesis 1-6 Credits

Development, preparation, and completion of thesis at a graduate level.

May be repeated for a maximum of 6 credits.

Registration Restrictions: Graduate standing and instructor permission.