CHEM M07B: ORGANIC CHEMISTRY II

Originator
csjoiner

Co-Contributor(s)

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College
Moorpark College

Attach Support Documentation (as needed)
December_2021_C-ID_Newsletter (4).pdf
Chem 160S.pdf

Discipline (CB01A)
CHEM - Chemistry

Course Number (CB01B)
M07B

Course Title (CB02)
Organic Chemistry II

Banner/Short Title
Organic Chemistry II

Credit Type
Credit

Start Term
Summer 2022

Catalog Course Description
Continues the study of functional groups such as carboxylic acids and their derivatives, other carbonyl-containing compounds, amines and aromatics. Emphasizes reaction mechanisms, synthesis, and structure determination using nuclear magnetic resonance and infrared spectroscopy. Introduces aspects of biochemistry including the study of proteins, carbohydrates, and nucleic acids. Involves, through hands-on laboratory work, multi-step synthetic routes, chromatography, and applications of basic techniques.

Additional Catalog Notes
Course requires a lab coat and goggles.

Taxonomy of Programs (TOP) Code (CB03)
1905.00 - Chemistry, General

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
Will not be required

Grading method
(L) Letter Graded

Alternate grading methods
(O) Student Option- Letter/Pass
(P) Pass/No Pass Grading

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
52.5
Maximum Contact/In-Class Lecture Hours
52.5

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
105
Maximum Contact/In-Class Laboratory Hours
105

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
157.5
Total Maximum Contact/In-Class Hours
157.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
105
Maximum Outside-of-Class Hours
105

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
262.5
Total Maximum Student Learning Hours
262.5

Minimum Units (CB07)
5
Maximum Units (CB06)
5

Prerequisites
CHEM M07A or equivalent

Entrance Skills

Entrance Skills
CHEM M07A

Prerequisite Course Objectives
CHEM M07A-describe how various organic molecules are used in medicine, industry, and the household and how their use impacts daily life and draw correct Lewis structures for a wide variety of main-group compounds, identify hybrid and molecular orbitals utilized in bonding, and convert formulas into various three dimensional structural representations including skeletal (bond-line) structures and resonance hybrids.
CHEM M07A-name cyclic and acyclic compounds containing alcohols, halides, alkenes and alkynes using the International Union of Pure and Applied Chemistry system (IUPAC), name small compounds using common (e.g., iso, sec-, tert-) prefixes, identify and name

compounds containing common functional groups such as halides, alkenes, alkynes, carbonyl groups, alcohols, amines, aromatic rings and ethers.
CHEM M07A-identify conformational isomers, draw Newman projections and cyclohexane chair forms that accurately portray axial and equatorial groups, and predict which Newman projection and chair form will be most stable and least stable.
CHEM M07A-identify stereoisomers, label a stereocenter using the Cahn-Ingold-Prelog rules, distinguish between and define the terms enantiomer, diastereomer, meso, chiral and achiral, and provide examples of chiral molecules without stereocenters.
CHEM M07A-predict both the magnitude and direction of the polarity of organic molecules, identify intermolecular forces between organic molecules, and understand how intermolecular forces influence boiling point, solubility, nucleophilicity, and reactivity of organic compounds.
CHEM M07A-predict the course of any acid-base reaction based on p K a values and organic structures, rank common functional groups in order of their p K a values, draw “electron arrows” to indicate the flow of electrons in Lewis acid-base reactions, and identify various reagents that will quantitatively deprotonate an alcohol and an alkyne.
CHEM M07A-draw the mechanism and predict the products of inter- and intramolecular nucleophilic substitution (S N) reactions, including stereocenter inversion during an S N 2 reaction, racemization of stereochemistry during an S N 1 reaction, and carbocation rearrangements. Students should be able to rank carbocations in the correct order of stability and list various groups in order of their nucleophilicity and use these skills to rank the rate of similar S N reactions that vary in the nature of the substrate.
CHEM M07A-use Zaitsev’s rule to predict which alkenes will be most stable, label alkenes as E or Z using the Cahn-Ingold-Prelog rules, predict whether a given nucleophile will give predominately elimination or substitution in a reaction, draw the mechanisms of E2 and E1 reactions, and use this information to predict the major and minor products of substitution and elimination reactions of electrophiles bearing a leaving group.
CHEM M07A-draw the mechanism and predict the products of addition reactions to alkenes and alkynes including reactions that demonstrate the stereochemical ramifications of the addition of halogens and hydrohalogens (in the presence and absence of water), the difference between acid-catalyzed hydration and hydroboration as methods of adding hydroxy groups, and the consequences of tautomerization to the enol products formed during hydration of alkynes.
CHEM M07A-draw the mechanism and predict the products of redox reactions of alkenes and alkynes, including epoxidation, stereoselective dihydroxylation, ozonolysis, catalytic hydrogenation, and stereoselective reduction of alkynes to cis and trans alkenes. Also, plan synthetic strategies using alkynyl nucleophiles.
CHEM M07A-draw the mechanism and predict the products of substitution, elimination, and redox reactions of alcohols, ethers, and epoxides, including the Williamson ether synthesis, dehydration reactions catalyzed by acids and other reagents, conversions of alcohols to alkyl halides using hydrohalogens and other reagents, tosylate formation, oxidations of alcohols to form aldehydes, carboxylic acids, and ketones, acid-catalyzed decomposition of ethers, and the stereochemical ramifications of epoxide-opening reactions in the presence and absence of acid catalysts.
CHEM M07A-rank radicals in the correct order of stability, demonstrate (using bond energy tables) which free-radical halogenations are endothermic and exothermic, write out initiation, propagation, and termination steps that occur in a free-radical reaction, and predict which hydrogen is most likely to be substituted in an alkane given the structure and nature of the halide involved.
CHEM M07A-predict properties of ultraviolet-visible (UV-Vis) spectra of conjugated dienes, explain how conjugation affects molecular orbitals and bond lengths in polyenes, and predict the strength of participation of dienes and dienophiles in Diels-Alder reactions based on molecular structure.
CHEM M07A-explain the use of infrared spectroscopy and mass spectrometry in the determination of organic chemical structure, identify specific functional groups from infrared (IR) spectral data, and use IR and mass spectra (MS) data to make determinations about organic structures.
CHEM M07A-identify the causes and origins of the nuclear magnetic resonance (NMR) effect, correlate chemical shifts in NMR spectra with structure and predict the integrations, positions and peak splitting of signals in proton spectroscopy, and be able to both predict the NMR spectra given structure of compounds and to deduce their structure based on spectral data.
CHEM M07A-separate and purify compounds using recrystallizations, simple, fractional, and steam distillations, extractions (including acid-base extractions), filtrations, and chromatography (including gas chromatography (GC), and thin layer chromatography (TLC), and determine purity and identity of samples through the use of melting point, infrared spectroscopy, and NMR spectroscopy.
CHEM M07A-demonstrate safe laboratory practice while synthesizing organic compounds by refluxing reactants, isolate these compounds, qualitatively and quantitatively determine the success of the reaction, record results in a properly formatted laboratory notebook, and report results.

Requisite Justification

Requisite Type
Prerequisite

Requisite
CHEM M07A or equivalent

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Required by 4 year institution

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	demonstrate a mastery of organic chemistry material at a level equal to or greater than the national average as determined by the nationally standardized Organic Chemistry exam developed by the American Chemical Society.
2	reproduce longer synthetic schemes, create plans for their own synthetic schemes and create complex molecules from simpler ones.
3	predict and categorize the reactions of organic molecules and to compare the similarities and differences of given reactions. Students will apply the rules and axioms of organic chemistry to create logical and realistic synthetic pathways of complex molecules.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	name aromatic compounds using both common names and IUPAC nomenclature system, generate Frost diagrams of molecular orbitals for ring systems, and use the latter to predict aromatic properties of these rings.
2	classify various functional groups as either electron-donating or withdrawing and predict their effects on the rates of electrophilic aromatic substitution (EAS) reactions, explain the factors that cause meta- versus ortho/para-substitution in EAS reactions, and predict the course of nucleophilic aromatic substitution (S N Ar) reactions based on mechanistic considerations.
3	name carbonyl-containing compounds using common and systematic naming schemes, utilize organometallic reagents and hydride reducing reagents in synthetic schemes with various carbonyl groups, and predict whether a carbonyl will undergo nucleophilic addition or nucleophilic acyl substitution based on the nature of the substrate.
4	predict the major organic product of nucleophilic addition reactions to aldehydes and ketones and contrast the mechanisms and products produced with the use of hydride reducing agents, organometallic reagents, Wittig reagents, primary and secondary amines, and alcohols as nucleophiles in these reactions. Students should also be able to explain the mechanism of mutarotation in carbohydrates and be able to use acetal protecting groups in organic synthesis schemes.
5	predict the major organic product of nucleophilic acyl substitution reactions of carboxylic acid derivatives and use a series of these reactions to interconvert between carboxylic acids, acid chlorides, anhydrides, esters, and amides.
6	utilize the mechanism of enolate formation to predict the products of reactions involving a -substitution of a carbonyl group and propose synthetic schemes that utilize a -substitution followed by subsequent decarboxylation (e.g., malonic ester synthesis, acetoacetic ester synthesis, etc).
7	predict the major organic products of aldol, crossed aldol, and intramolecular aldol reactions, identify the common problems of crossed aldol reactions and ways to alleviate them through the use of pre-formed enolates, and show the mechanistic similarities between various name reactions such as the Dieckmann cyclizations, Robinson annulations, Michael additions, Claisen condensations, and other enol-based condensations.
8	name amine-containing compounds utilizing common and systematic naming schemes, propose reaction pathways for synthesis of amines, give examples of the reactions of amines, and identify common, commercially important alkaloids.
9	predict the major products of modern carbon-carbon bond forming reactions including Grubb's metathesis, Suzuki and Heck couplings, and cyclopropanation reactions, and use these reactions in appropriate multi-step synthetic schemes.
10	predict which anomer of a carbohydrate is most stable, differentiate between reactions of anomeric alcohols and side chain alcohols, use Fischer projections and Haworth diagrams to indicate stereochemistry of saccharides, and indicate how the various anomeric linkages affect the structure and biochemistry of polysaccharides.
11	classify the amino acids by their acidity, by lipophilicity, identify isoelectronic points based on p K a 's, draw the zwitterionic forms of the amino acids, show how solid phase synthesis is used to assemble large peptide chains, demonstrate knowledge of currently used blocking and linking reagents, and identify the forces that affect the structure of enzymes and proteins.
12	identify and categorize (e.g., wax, triacylglycerol, phospholipid, eicosanoid, vitamin, terpene, steroid, etc.) lipids based on structure, identify isoprene units in terpenes, steroids and other natural products, and provide speculative pathways of biosynthesis.
13	demonstrate safe laboratory practice while synthesizing organic compounds by refluxing reactants, isolate these compounds using modern methods of purification, qualitatively and quantitatively determine the success of the reaction, record results in a properly formatted laboratory notebook, and report results.

14	utilize products synthesized and purified in a laboratory environment in multi-step reaction sequences to produce complex organic compounds from relatively simple starting materials, and utilize combined modern spectroscopic techniques to verify product identity and purity to determine the structure of unknown compounds.

Course Content

Lecture/Course Content

8.00% Aromaticity:
Nomenclature, origin of aromatic ring energy, molecular orbitals of aromatic systems, Frost diagrams, anti-aromatic systems, and physical properties of aromatic rings

12.00%
Electrophilic Aromatic Substitution:
Reactions of benzene with halogens, Friedel-Crafts reactions, nitrations and sulfonations, directing effects, rate effects, further reactions of sidechains, and nucleophilic aromatic substitution

12.00%
Introduction to Carbonyl Chemistry:
Nomenclature, nucleophilic addition versus nucleophilic acyl substitution of carbonyl compounds, relative reactivity of carbonyl compounds, organometallic compounds and metal hydrides as nucleophiles, use of protecting groups

8.00%
Nucleophilic Addition to Aldehydes and Ketones:
Nucleophilic addition of organometallic compounds, metal hydrides, cyanide, and primary and secondary amines, the Wittig reaction, (hemi)acetal formation, use of acetals as protecting groups, and mutarotation in carbohydrates

8.00%
Nucleophilic Acyl Substitution of Carboxylic Acid and Derivatives:
Single-step and multi-step intercoversion between carboxylic acids, acid chlorides, acid anhydrides, esters, and amides, along with reactions of nucleophiles with nitrile functional groups

12.00%
Substitution Reactions of Carbonyl Compounds at the Alpha-Carbon:
Formation and relative stability of enolates, halogenation and alkylation of enolate carbon, decarboxylation, malonic ester synthesis, and acetoacetic ester synthesis

12.00%
Carbonyl Condensation Reactions:
Aldol reaction, crossed aldol reaction, directed aldol reaction, intramolecular aldol reaction, Claisen reaction, crossed Claisen reaction, Dieckmann reaction, Michael reaction, and Robinson
Annulation

4.00%
Amines:
Nomenclature, basicity, Gabriel synthesis, tetraalkylammonium salts, reactions of amines, Hofmann elimination

6.00%
Carbohydrates:
Carbohydrate nomenclature, Fischer projections, mutarotation of anomeric centers, polysaccharides, reactions of anomeric centers, reactions of side chains, biological consequences of saccharides

6.00%
Amino Acids, Peptides, and Proteins:
Structure and nomenclature of amino acids, synthesis and resolution of amino acids, structure of peptides, analysis of peptide sequences,
and biological properties of peptides and enzymes

4.00%
Lipids:
Waxes, fats, oils, vitamins, biosynthesis of terpenes, steroids, prostaglandins, and phospholipids

4.00%
Carbon-Carbon Bond Forming Reactions:
Grubb's metathesis, Suzuki and Heck couplings, cyclopropanation reactions

4.00%
Nucleophilic Aromatic Substitution:
Reactions of aromatic systems that have leaving groups, including halogen leaving groups and diazonium leaving groups, with nucleophiles

Laboratory or Activity Content

20% Spectroscopic Determination of Structure:
Use of modern instrumentation (^{1}H NMR, ^{13}C NMR, IR, MS, etc.) to determine structures of compounds synthesized in lab and given as challenge problems

50% Multi-Step Synthesis of Organic Compounds:
Synthesis of organic compounds with an emphasis placed on purity and yield of each reaction step so that student may carry the product forward to the next step of the reaction

30% Single-Step Synthesis of Organic Compounds:
“Standard-scale” and micro-scale synthesis, separation, purification, and characterization of organic compounds including these techniques: reflux, recrystallization, distillation, and chromatography. Keep lab notebooks, analyze and report results

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Written expression
Problem solving exercises
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
Essay exams
Group projects
Individual projects
Laboratory activities
Laboratory practical examinations
Laboratory reports
Objective exams
Oral presentations
Problem-solving exams
Problem-solving homework
Quizzes
Reports/papers
Research papers
Simulations
Skills demonstrations
Skills tests or practical examinations
Written analyses
Written compositions
Written homework
Other (specify)
Classroom Discussion
Projects
Participation
Reports/Papers/Journals

Other

Multi-week lab experiment with formal report
Multi-step synthesis and retrosynthesis problems

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
Class activities
Class discussions
Collaborative group work
Computer-aided presentations
Demonstrations
Distance Education
Field trips
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Internet research
Laboratory activities
Large group activities
Lecture
Modeling

Observation
One-on-one conference
Problem-solving examples
Small group activities
Web-based presentations
Other (specify)

Specify other method of instruction

Hands-on multi-step organic synthesis and purification reactions

Describe specific examples of the methods the instructor will use:

Chemical demonstrations performed by instructor.

Instructor will observe lab students to ensure proper hands-on multi-step organic synthesis and purification reactions.

Utilization of curved-arrow mechanisms during lecture to understand electronic requirements of various common organic reactions.

Representative Course Assignments

Writing Assignments

write the answers to concept questions from lectures. An example would be: Explain why *(1Z,3Z)*-cyclopenta-1,3-diene is more acidic than *(1Z,3Z)*-penta-1,3-diene.

write the background, procedure, results, and conclusions of an experiment conducted in the laboratory, utilizing the the format of a typical American Chemical Society journal article.

write analyses of popular articles about organic chemistry that appear in the general media.

Critical Thinking Assignments

develop synthetic schemes that will produce specific organic products as the major product without the production of harmful by-products. An example would be: Synthesize *o*-bromotoluene starting from benzene and any other substances that are commercially available from Sigma-Aldrich Chemicals.

propose chemical mechanisms for organic transformations that are grounded on precedent and good chemical logic.

examine spectroscopic data, for example an infrared spectrum, UV-Vis spectrum, and/or an NMR spectrum, to determine the structure of an unknown organic compound.

Reading Assignments

research relevant background material related to a reaction performed in the lab and use this to write an introduction to a laboratory report.

use the chemical literature to determine a method to synthesize an alcohol from an ketone and adapt this procedure in the laboratory to convert acetone to isopropanol.

Skills Demonstrations

demonstrate proper use of glassware and equipment while following the FDA-approved synthesis of Prozac®.

utilize infrared spectroscopy and ^{1}H NMR spectroscopy to characterize the product formed in the FDA-approved synthesis of Prozac®.

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Other assignments (if applicable)

determine the structure of an unknown organic molecule by observing its infrared, ^{1}H NMR, and mass spectra.

Outside Assignments

Representative Outside Assignments

work with other students in the class, propose a synthetic scheme that will produce a specific organic product and research the costs associated with the starting materials, solvents, and catalysts used in this specific scheme.

conduct library or Internet research to learn about specific name reactions and present the history, mechanism, and industrial uses of one of them to the class.

solve homework problems selected from the textbook or from an online homework system such as WileyPlus, Mastering Chemistry, or Sapling Learning.

Articulation

C-ID Descriptor Number
CHEM 160S (with CHEM M07A)

Status
Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU Long Beach	CHEM 220B & 223B	Organic Chemistry II & Lab	3+1
UCLA	CHEM 30B & 30BL & 30C & 30CL	Organic Chemistry II & III & Labs	4+3+4+4
UC Berkeley	CHEM 12B	Organic Chemistry	5

Comparable Courses within the VCCCD
CHEM V12B - General Organic Chemistry II
CHEM V12BL - General Organic Chemistry II Laboratory
CHEM R132 - Organic Chemistry II

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
Pierce College	Chem 212	Organic Chemistry II	5

Attach Syllabus
syllabus (2).pdf

District General Education

A. Natural Sciences

A2. Physical Science
Approved

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable
Yes

CSU Baccalaureate List effective term:
F1995

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

B1 Physical Science
Approved

B3 Laboratory Activity
Approved

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

Area F: Ethnic Studies

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

UC TCA

UC TCA
Approved

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 5A: Physical Science
Approved

Area 5C: Laboratory Science
Approved

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Description
Smith, Janice Gorzynski. *Organic Chemistry*. 6th ed., McGraw-Hill, 2020.

Resource Type
Textbook

Description
Klein, David. *Organic Chemistry*. 4th ed., Wiley, 2020.

Resource Type
Textbook

Description
Joiner, C. Steven. *Chemistry M07B Course Guide & Lab Manual.* V. 4.2, Xanedu Publishing, 2022.

Resource Type
Textbook

Description
Smith, Janice Gorzynski. *Student Study Guide/Solutions Manual to Accompany Organic Chemistry.* 6th ed., McGraw-Hill, 2020.

Resource Type
Other Resource Type

Description
Molecular Model Set for Organic Chemistry. 2nd ed., Pearson, 1983.

Library Resources

Assignments requiring library resources
Research using the library's print and online resources.

Sufficient Library Resources exist
Yes

Example of Assignments Requiring Library Resources
Use the Library's print and online resources to research and report on relevant reaction chemistry and background material in the introduction section of a written laboratory report about, for example, electrophilic aromatic substitution.

Distance Education Addendum

Definitions

Distance Education Modalities
Hybrid (1%–50% online)

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.
Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.
Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students may be required to post their ideas or solutions for class-related material on the course discussion boards. Students may also be required to comment on the posts of other students, including constructive criticism.
E-mail	The instructor may email students with announcements about the course or other college events and opportunities and answer student questions. Students may email questions and possibly assignments or projects, depending on the nature of the class, directly to the instructor.

Face to Face (by student request; cannot be required)	Students may have the option to visit the instructor in their office on campus for office hours or to discuss other class-related items.
Other DE (e.g., recorded lectures)	The instructor may use other instruction methods appropriate to the subject matter. For example, pre-recorded lectures may be posted perhaps leading to a class discussion on the discussion boards.
Synchronous Dialog (e.g., online chat)	The instructor may hold class in a regular schedule but in an online format using a program such as ConferZoom. Office hours may also be held in this manner or with an online chat tool.
Telephone	Students may have the option to call the instructor and/or the instructor may call students to facilitate office hours or to discuss other class-related items.
Video Conferencing	The Instructor may hold class in a regular schedule but in an online format using a program such as ConferZoom. Office hours may also be held in this manner.

Examinations

Hybrid (1%–50% online) Modality
On campus
Online

Primary Minimum Qualification
CHEMISTRY

Review and Approval Dates

Department Chair
03/25/2022

Dean
03/25/2022

Technical Review
04/21/2022

Curriculum Committee
5/4/2022

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
MM/DD/YYYY

Control Number
CCC000431491

DOE/accreditation approval date
MM/DD/YYYY