Syllabus

CHEM 2320
Organic Chemistry I
Salt Lake Community College

Instructor **Office**

Phone: **email:**

Office Hours

Class Options

CHEM 2320-001 (CRN-402037) Monday & Wednesday
10:00 am - 11:50 am
SI 298 Redwood Campus

Problem Solving - Highly recommended for this class

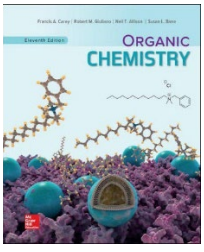
CHEM 2328-401 (CRN-**40205**) **F**
11:30 am - 12:20 pm SI 298 - Hybrid

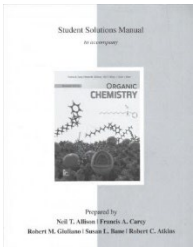
Textbook

Organic Chemistry, Francis A. Carey **11th edition**

Student Solutions Manual for Organic Chemistry,Francis A. Carey, **11th edition. The solutions manual is required for this class***

***Make sure your solutions manual edition matches the textbook edition.**





IMPORTANT DATES - Fall Semester 2024

August 20th (T) First Day of Class

August 28th (W) Last Day to Add Class

September 2nd (M) Labor Day**, No Class**

September 10th (T) Last Day to Drop Class, 100% refund

October 17th – 18th (H,F) Fall Break, No Class

October 22nd (T) Last Day to Withdraw from Class
***Please see me before withdrawing from class**

November 27th – 29th (W-F) Thanksgiving Holiday, No Class

December 5th (H), Last Day of Class

December 6th (F), Make-Up Exam Day

December 9th (M), In-Class Portion of SP Exam

Exams

We will have ten (10) chapter exams, each worth 90 points.

Make-up exams will be given to replace your lowest exam score or one missed exam. The make-up exam will be a composite exam that is scheduled on 12/6.

We will also have a Applied Organic Chemistry project worth 45 points.

Grading

Midterm Exams	900 points
Applied Organic Chemistry Project	45 points
Total Possible Points	945

100% - 94%	A
93% - 90%	A-
89% - 87%	B+
86% - 83%	B
82% - 80%	B-
79% - 77%	C+
76% - 73%	C

Homework

You cannot successfully learn organic chemistry without spending a considerable amount of time working end of chapter problems.

Homework will count for 20 point of each exam and will consist of working ALL the assigned end-of-chapter problems in the textbook and completing the ChemSketch assignments or Chapter Online Questions. Homework is due with each exam. **LATE HOMEWORK WILL NOT BE ACCEPTED.**

The Practice Exam is not part of the homework assignment.

Extra Credit

Students may earn up to 3% extra credit by participating with the ACS-Student Affiliates. More information will be given in class or can be found on the ACS TimeTree app:

Instructor reserves the right to change or modify any content in this syllabus or the course schedule.

Organic Chemistry 2320 Learning Objectives by Chapter Topics:

Chapter 12 - Arenes and Aromaticity
The Structure and Stability of Benzene
An Orbital Hybridization View of Bonding in Benzene
The pi Molecular Orbitals of Benzene
Substituted Derivatives of Benzene and Their Nomenclature
Polycyclic Aromatic Hydrocarbons
Physical Properties of Arenes - Carbon Clusters, Fullerenes, and Nanotubes
Reactions of Arenes
The Birch Reduction
Free-Radical Halogenation of Alkylbenzenes
The Mechanism of The Birch Reduction
Oxidation of Alkylbenzenes
SN1 & SN2 Reactions of Benzylic Halides
Preparation of Alkenylbenzenes
Addition Reactions of Alkenylbenzenes
Cyclobutadiene and Cyclooctatetraene
Hückel's Rule for Aromaticity
Annulenes
Aromatic Ions
Heterocyclic Aromatic Compounds and Hückel's Rule

Chapter 13 - Electrophilic and Nucleophilic Aromatic Substitution

Mechanistic Principles of Electrophilic Aromatic Substitution
Nitration of Benzene; Mechanism of Nitration of Benzene
Sulfonation of Benzene; Mechanism Sulfonation of Benzene
Halogenation of Benzene; Mechanism of Bromination of Benzene
Friedel-Crafts Alkylation of Benzene
Mechanism of Friedel–Crafts Alkylation
Friedel-Crafts Acylation of Benzene
The Mechanism of Friedel–Crafts Acylation
Synthesis of Alkylbenzenes by Acylation-Reduction
Rate and Regioselectivity in Electrophilic Aromation Substitution
Substituent Effects in Electrophilic Aromatic; Activating & Deactivating Substituents
Multiple Substituent Effects
Regioselective Synthesis of Disubstituted Aromatic Compounds
Substitution in Naphthalene & Heterocyclic Aromatic Compounds
Nucleophilic Aromatic Substitution
Nucleophilic Substitution in Nitro-Substituted Aryl Halides
The Addition-Elimination Mechanism of Nucleophilic Aromatic Substitution
Related Nucleophilic Aromatic Substitutions

Chapter 15 - Organometallic Compounds
Organometallic Nomenclature
Carbon-Metal Bonds in Organometallic Compounds
Preparation of Organolithium Compounds
Preparation of Organomagnesium Compounds; Grignard Reagents
Organolithium and Organomagnesium Compounds as Brønsted Bases
Synthesis of Alcohols Using Grignard Reagents
Organometallic Nomenclature
Carbon-Metal Bonds in Organometallic Compounds
Preparation of Organolithium Compounds
Preparation of Organomagnesium Compounds:
Grignard Reagents
Organolithium and Organomagnesium Compounds as Brønsted Bases
Synthesis of Alcohols Using Grignard Reagents
Synthesis of Acetylenic Alcohols
Retrosynthetic Analysis
Alkane Synthesis Using Organocopper Reagents
Formation of a Lithium Diaklycuprate (Gilman Reagent)
An Organozinc Reagent for Cyclopropane Synthesis
Carbenes and Carbenoids
Transition-Metal Organometallic Compounds
Olefin Metathesis

Chapter 16 - Alcohols, Diols, and Thiols

Sources and classifications of Alcohols
Preparation of Alcohols by Reduction of Aldehydes and Ketones
Preparation of Alcohols by Reduction of Carboxylic Acids
Preparation of Alcohols from Epoxides
Preparation of Diols
Conversion of Alcohols to Ethers
Fischer Esterification Reaction
Oxidation of Alcohols
Biological Oxidation of Alcohols
Formation of Diols
Oxidative Cleavage of Vicinal Diols
Thiols
Spectroscopic Analysis of Alcohols and Thiols

Chapter 17 - Ethers, Epoxides, and Sulfides
Nomenclature of Ethers, Epoxides, and Sulfides
Structure and Bonding in Ethers and Epoxides
Physical Properties of Ethers
Crown Ethers
Preparation of Ethers
The Williamson Ether Synthesis

Reactions of Ethers:
Acid-Catalyzed Cleavage of Ethers
Preparation of Epoxides:
Conversion of Vicinal Halohydrins to Epoxides
Reactions of Epoxides:
Nucleophilic Ring Opening of Epoxides
Acid-Catalyzed Ring Opening of Epoxides
Epoxides in Biological Processes
Preparation of Sulfides
Oxidation of Sulfides: Sulfoxides and Sulfones
Alkylation of Sulfides: Sulfonium Salts
Spectroscopic Analysis of Ethers, Epoxides, and Sulfides

Chapter 18 - Aldehydes and Ketones: Nucleophilic Addition to the Carbonyl Group
Nomenclature
Structure and Bonding: The Carbonyl Group
Physical Properties & Sources of Aldehydes and Ketones
Reactions of Aldehydes and Ketones
Nucleophilic Addition
Hydration of Aldehydes and Ketones with Mechanism
Cyanohydrin Formation
Acetal Formation
Acetals as Protecting Groups
Nucleophilic Addition Reaction with Primary Amines: Imines
Mechanism of Imine Formation
Imines in Biological Chemistry
Nucleophilic Addition Reaction with Secondary Amines: Enamines
The Wittig Reaction with Mechanism
Planning an Alkene Synthesis via the Wittig Reaction
Stereoselective Addition to Carbonyl Groups
Oxidation of Aldehydes
Spectroscopic Analysis of Aldehydes and Ketones
Chapter 19 - Carboxylic Acids
Carboxylic Acid Nomenclature
Structure, Bonding & Physical Properties of Carboxylic Acid
Acidity of Carboxylic Acids
Substituents and Acid Strength
Ionization of Substituted Benzoic Acids
Salts of Carboxylic Acids
Dicarboxylic Acids
Carbonic Acid
Sources of Carboxylic Acids
Synthesis of Carboxylic Acids by the Carboxylation of Grignard Reagents
Synthesis of Carboxylic Acids by the Preparation and Hydrolysis of Nitriles
Reactions of Carboxylic Acids

Acid-Catalyzed Esterification
Intramolecular Ester Formation: Lactones
Decarboxylation of Malonic Acid and Related Compounds
Spectroscopic Properties of Carboxylic Acids

Chapter 20 - Carboxylic Acid Derivatives
Nomenclature of Carboxylic Acid Derivatives
Structure and Reactivity of Carboxylic Acid Derivatives
General Mechanism for Nucleophilic Acyl Substitution
Nucleophilic Acyl Substitution in Acyl Chlorides with Mechanism (Tetrahedral Intermediates)
Nucleophilic Acyl Substitution in Acid Anhydrides with Mechanism
Sources & Physical Properties of Esters
Reactions of Esters: Acid-Catalyzed Ester Hydrolysis
Mechanism of Acid-Catalyzed Ester Hydrolysis
Ester Hydrolysis in Base: Saponification
Mechanism of Ester Hydrolysis in Basic Solution
Reaction of Esters with Ammonia and Amines
Reaction of Esters with Grignard Reagents: Synthesis of Tertiary Alcohols
Mechanism of an Ester with a Grignard Reagent
Reaction of Esters with Lithium Aluminum Hydride
Amides
Hydrolysis of Amides with Mechanisms
Lactams – Cyclic Amides
Preparation of Nitriles
Hydrolysis of Nitriles with Mechanism
Addition of Grignard Reagents to Nitriles
Spectroscopic Analysis of Carboxylic Acid Derivatives

Chapter 21 - Enols and Enolates
Aldehyde, Ketone, and Ester Enolates
Enolization and Enol Content
Enolate Regiochemistry
Aldol Addition & Condensation Reactions
The Aldol Condensation Mechanism
Mixed Aldol Condensations
The Claisen Condensation
Intramolecular Claisen Condensation: The Dieckmann Cyclization
Mixed Claisen Condensations
Acylation of Ketones with Esters
Alkylation of Enolates
The Acetoacetic Ester Synthesis
The Malonic Ester Synthesis
Alkyation of Chiral Enolates
Halogenation of Aldehydes and Ketones
Halogenation of Carboxylic Acids: The Hell-Volhard-Zelinsky Reaction

The Haloform Reaction
Effects of Conjugation in Unsaturated Aldehydes and Ketones
Conjugate Addition to Unsaturated Carbonyl Compounds
Addition of Carbanions to Unsaturated Ketones: The Michael Reaction
Conjugate Addition of Organocopper Reagents
Unsaturated Carbonyl Compounds

Chapter 22 - Amines
Amine Nomenclature
Structure, Bonding & Physical Properties
Basicity of Amines
Amines as Natural Products
Tetraalkylammonium Salts as Phase-Transfer Catalysts
Reactions That Form Amines
Preparation of Amines by Alkylation of Ammonia
The Gabriel Synthesis of Primary Alkylamines
Preparation of Amines by Reduction
Lithium Aluminum Hydride Reduction of an Amide with Mechanism
Reductive Amination
Reactions of Amines
Reaction of Amines with Alkyl Halides
The Hofmann Elimination
Electrophilic Aromatic Substitution in Arylamines
Nitrosation of Alkylamines
Nitrosation of Arylamines
Reactions of an Alkyl Diazonium Ion with Mechanism
Synthetic Transformations of Aryl Diazonium Salts
Azo Coupling
Spectroscopic Analysis of Amines