



CHEM 243 Organic Chemistry I
Bridgewater State University
July 11 – August 5
Summer 2022

Instructor: TBA

Location: Online

Credit: 3

All emails from your instructor will be directed to your BSU email.

We are using two course sites, Blackboard for worksheets, labs, and narrated PowerPoints and WileyPLUS for the electronic text and online homework. There is a pdf flyer and word document that describes these resources. Our course section ID is **A27264** for WileyPLUS. You should purchase access to the WileyPLUS resource before the course gets underway.

A blackboard site will be used for lab handouts, posting class assignments, and other resources. All emails from your instructor will be directed to your BSU email.

Course Grading: In the case of a missed exam, lab session, worksheet, or lab report; a zero will be recorded for that assignment. There are no late submissions or make-ups.

Class Attendance & Participation = 5%

Worksheets = 25%

WileyPLUS Homework = 25%

Laboratory = 20%

Final Exam = 25%

What are the course goals?

Students will recognize the fundamental properties, terminology, and models that organic chemists use to predict chemical reactions. Students will experiment and evaluate data in the laboratory to gain deeper knowledge. Students will deconstruct and solve challenging problems using course concepts, logical reasoning, and critical thinking. Students will use the language of organic chemistry to explain content they encounter in advanced biology and chemistry courses. Students will re-examine the world around them including the biochemistry that occurs in living organisms and developments in drug discovery.

How do I achieve these goals? Organic chemistry has the reputation of being a dense and difficult to master subject. Do not let this deter you from believing that you can succeed in this course. In the past, students have overall performed well by working purposefully to meet the course goals. Students should spend 3 focused hours studying for every 1 hour of class to keep pace. Although there is a great deal of content covered, you must learn to break down and categorize the material into smaller manageable portions. This is a skill you will develop during the year long course. In light of this, students should be willing to pursue their learning with confidence, dedicate a persistent effort, and develop effective strategies for learning. For most students, this includes, reading the chapters and tackling the daily assignments in pace with the course schedule and engaging regularly in classroom discussions. Persistence is important! You

will experience a deeper level of learning in less time if you are willing to struggle with the material and involve others in your learning process.

“In the middle of difficulty lies opportunity”

“If you can’t explain it simply, then you don’t understand it well enough”

Albert Einstein

Attendance in Virtual Class Sessions: Each week, students will attend virtual class sessions using zoom on M,W,Th mornings at 8 am (sessions are synchronous – link will be provided). Prior to the class sessions, students should download and watch the scheduled chapter PowerPoints. This will prepare you to complete a worksheet for each chapter. You are permitted one absence after which you will start to lose points for missing sessions.

Worksheets: The worksheets (posted on Blackboard) are based upon the narrated PowerPoints and textbook sections. These will provide students with a basic background of the material covered and are due each week by Friday at 10 pm by email to swaratuke@bridgew.edu

Online Homework: The WileyPLUS homework should be completed after we have covered each chapter in the virtual class sessions. The problems are of varied complexity and style. They cover the material in the chapter and the narrated PowerPoints. Students have more than one attempt. However, you will lose points (up to 20%) on incorrect answers. You will be shown the correct answer after your second attempt. You will need to enter this correct answer as your third and final attempt for credit on a problem. Homework deadlines are Saturday at 10pm.

Academic Integrity: Students must adhere to the honor code outlined in the BSU catalogue and realize cheating or plagiarism are unacceptable. Written work on any assignment from class or the laboratory should be unique. All online homework must be performed independently. A first offense will result in a zero grade for all involved. You are not permitted to work together on any assignments or exams with other students in the course.

Final Exam: This will be a take-home exam. You will be required to work on the exam independently, but you will be able to use your class and online text resources.

Laboratory Component: Lab reports are 20% of your overall grade. If any student misses two or more lab sessions or does not submit two or more report forms, an F grade will be assigned for the course. You will receive a separate syllabus for information about the laboratory. The lab component will involve students downloading a narrated PowerPoint prior to the lab session, attendance at a virtual laboratory session through zoom, and a Lab Report Form must be completed the same day as the lab session.

Experiment

Lab Session # 1
Lab Session # 2
Lab Session # 3
Lab Session # 4
Lab Session # 5
Lab Session # 6
Lab Session # 7

Title of Experiment

Recrystallization - Part 1
Recrystallization - Part 2
Extraction of Benzoic Acid from a Mixture - Part 1
Extraction of Benzoic Acid from a Mixture - Part 2
Molecular Modeling
Synthesis of Acetaminophen
TLC Analysis of Analgesic Drugs

Virtual Class Session Monday July 11**Chapter 1 PowerPoint Part 1**

- 1.1 Atomic Structure
- 1.2 Chemical Bonds: The Octet Rule
- 1.3 How to Write Lewis Structures
- 1.4 Formal Charges and How to Calculate Them

Chapter 1 PowerPoint Part 2

- 1.5 Structural Isomers
- 1.6 How to Write and Interpret Structural Formulas
- 1.7 Resonance Theory

Virtual Lab Monday July 11 (Recrystallization - Part 1)**Virtual Class Session Wednesday July 13****Chapter 1 PowerPoint Part 3**

- 1.8 Quantum Mechanics & Atomic Structure
- 1.9 Atomic Orbitals and Electron Configuration
- 1.10 Molecular Orbitals
- 1.11 The Structure of Methane and Ethane: sp^3 Hybridization
- 1.12 The Structure of Ethene (Ethylene): sp^2 Hybridization

Chapter 1 PowerPoint Part 4

- 1.13 The Structure of Ethyne (Acetylene): sp Hybridization
- 1.14 A Summary of Concepts That Come from Quantum Mechanics
- 1.15 The Valence Shell Electron Pair Repulsion Model

Virtual Lab Wednesday July 13 (Recrystallization - Part 2)**Virtual Class Session Thursday July 14****Chapter 2 PowerPoint Part 1**

- 2.1 Hydrocarbons
- 2.2 Polar Covalent Bonds
- 2.3 Polar and Nonpolar Molecules
- 2.4 Functional Groups
- 2.5 Alkyl Halides or Haloalkanes
- 2.6 Alcohols and Phenols

Chapter 2 PowerPoint Part 2

- 2.7 Ethers
- 2.8 Amines
- 2.9 Aldehydes and Ketones
- 2.10 Carboxylic Acids, Esters, and Amides
- 2.11 Nitriles

WS # 1
Ch. 1 WileyPLUS

Due 10 pm Friday
Due 10 pm Saturday

Virtual Class Session Wednesday July 20

Chapter 2 PowerPoint Part 3

- 2.12 Summary of Important Families of Organic Compounds
- 2.13 Infrared Spectroscopy
- 2.14 Interpreting IR Spectra

Chapter 3 PowerPoint Part 1

- 3.1 Acid–Base Reactions
- 3.2 How to Use Curved Arrows in Illustrating Reactions
- 3.3 Lewis Acids and Bases
- 3.4 Heterolysis of Bonds to Carbon: Carbocations and Carbanions
- 3.5 The Strength of Brønsted–Lowry Acids and Bases: K_a and pK_a
- 3.6 How to Predict the Outcome of Acid–Base Reactions

Virtual Lab Wednesday July 20(Extraction of Benzoic Acid – Part 1)

Virtual Class Session Thursday July 21

Chapter 3 PowerPoint Part 2

- 3.7 Relationships between Structure and Acidity
- 3.8 Energy Changes
- 3.9 The Relationship between the K_{eq} and ΔG°
- 3.10 Acidity: Carboxylic Acids versus Alcohols

Chapter 3 PowerPoint Part 3

- 3.12 Organic Compounds as Bases
- 3.13 A Mechanism for an Organic Reaction
- 3.14 Acids and Bases in Nonaqueous Solutions

WS # 2 & 3
Ch. 2 & 3 WileyPLUS

Due 10 pm Friday
Due 10 pm Saturday

Virtual Class Session Monday July 25

Chapter 4 PowerPoint Part 1

- 4.1 Introduction to Alkanes and Cycloalkanes
- 4.2 Shapes of Alkanes
- 4.3 How to Name Alkanes, Alkyl Halides, and Alcohols: the IUPAC System
- 4.4 How to Name Cycloalkanes
- 4.5 How to Name Alkenes and Cycloalkenes
- 4.6 How to Name Alkynes

Chapter 4 PowerPoint Part 2

- 4.7 Physical Properties of Alkanes and Cycloalkanes
- 4.8 Sigma Bonds and Bond Rotation
- 4.9 Conformational Analysis of Butane
- 4.10 The Relative Stabilities of Cycloalkanes: Ring Strain

Virtual Lab Monday July 25 (Extraction of Benzoic Acid – Part 2)

Virtual Class Session Wednesday July 27

Chapter 4 PowerPoint Part 3

- 4.11 Conformations of Cyclohexane: The Chair and the Boat
- 4.12 Substituted Cyclohexanes: Axial and Equatorial Hydrogen Groups
- 4.13 Disubstituted Cycloalkanes: Cis–Trans Isomerism
- 4.17 How to Calculate the Index of Hydrogen Deficiency

Chapter 5 PowerPoint Part 1

- 5.1 Chirality and Stereochemistry
- 5.2 Isomerism: Constitutional Isomers and Stereoisomers
- 5.3 Enantiomers and Chiral Molecules
- 5.4 Molecules Having One Chirality Center Are Chiral
- 5.5 More about the Biological Importance of Chirality
- 5.6 How to Test for Chirality: Planes of Symmetry
- 5.7 Naming Enantiomers: The R,S-System

Virtual Lab Wednesday July 27 (Molecular Modeling)

Virtual Class Session Thursday July 28

Chapter 5 PowerPoint Part 2

- 5.8 Properties of Enantiomers: Optical Activity
- 5.9 The Origin of Optical Activity
- 5.10 The Synthesis of Chiral Molecules
- 5.11 Chiral Drugs
- 5.12 Molecules with More than One Chirality Center
- 5.13 Fischer Projection Formulas

WS # 4 & 5
Ch. 4 & 5 WileyPLUS

Due 10 pm Friday
Due 10 pm Saturday

Virtual Class Session Monday August 1

Chapter 6 PowerPoint Part 1

- 6.1 Alkyl Halides
- 6.2 Nucleophilic Substitution Reactions
- 6.3 Nucleophiles
- 6.4 Leaving Groups
- 6.5 Kinetics of a Nucleophilic Substitution Reaction: An S_N2 Reaction

Chapter 6 PowerPoint Part 2

- 6.6 A Mechanism for the S_N2 Reaction
- 6.7 Transition State Theory: Free-Energy Diagrams
- 6.8 The Stereochemistry of S_N2 Reactions

Chapter 6 PowerPoint Part 3

- 6.9 The Reaction of *tert*-Butyl Chloride with Water: An S_N1 Reaction
- 6.10 A Mechanism for the S_N1 Reaction
- 6.11 Carbocations
- 6.12 Stereochemistry of S_N1 Reactions
- 6.13 Factors Affecting the Rates of S_N1 and S_N2 Reactions
- 6.14 Functional Group Transformation Using S_N2 Reactions

Virtual Lab Monday August 1 (Synthesis of Acetaminophen)

Virtual Class Session Wednesday August 3

Chapter 7 PowerPoint Part 1

- 7.1 Introduction
- 7.2 The (E)-(Z) System for Designating Alkene Diastereomers
- 7.3 Relative Stabilities of Alkenes
- 7.4 Cycloalkenes
- 7.5 Synthesis of Alkenes: Elimination Reactions

Chapter 7 PowerPoint Part 2

- 7.6 Dehydrohalogenation
- 7.7 The E2 Reaction

Chapter 7 PowerPoint Part 3

- 7.8 The E1 Reaction
- 7.9 Elimination and Substitution Reactions Compete with Each Other
- 7.10 Elimination of Alcohols: Acid-Catalyzed Dehydration
- 7.11 Carbocation Stability and the Occurrence of Molecular Rearrangements

Virtual Lab Wednesday August 3 (TLC of Analgesics)

Virtual Class Session Thursday August 4

Chapter 8 PowerPoint Part 1

- 8.1 Addition Reactions of Alkenes
- 8.2 Electrophilic Addition of HX to Alkenes
- 8.3 Stereochemistry of the Ionic Addition to an Alkene
- 8.4 Addition of Water to Alkenes: Acid-Catalyzed Hydration

Chapter 8 PowerPoint Part 2

- 8.5 Alcohols from Alkenes through Oxymercuration–Demercuration
- 8.6 Alcohols from Alkenes through Hydroboration–Oxidation
- 8.7 Hydroboration: Synthesis of Alkylboranes
- 8.8 Oxidation and Hydrolysis of Alkylboranes
- 8.9 Summary of Alkene Hydration Methods

Chapter 8 PowerPoint Part 3

- 8.11 Electrophilic Addition of Bromine & Chlorine to Alkenes
- 8.12 Stereospecific Reactions
- 8.13 Halohydrin Formation

Virtual Lab Thursday August 4 (Bromination of Alkenes)

Virtual Class Session Friday August 5

Review & Explanation of the Final Exam

**WS # 6 & 7a & 8
Ch. 6 & 7a & 8 WileyPLUS
Final Exam**

**Due 10 pm Friday
Due 10 pm Saturday
Due 10 pm Sunday 8/7**