

# CHEM 0012X - PROBLEM SOLVING FOR CHEMISTRY 12A

## Catalog Description

Corequisite: Concurrent enrollment in CHEM 12A

Hours: 18 lecture

Description: Optional problem solving course to accompany CHEM 12A. Students use critical thinking and problem solving strategies to solve organic chemistry problems in topics that include nomenclature, alkane, alkene, alcohols, stereochemistry, spectroscopy, and Newman projections. (CSU)

## Course Student Learning Outcomes

- CSLO #1: Critically applies the concepts learned with radical reactions with new organic structures with stereochemistry.
- CSLO #2: Develop strategies for problem solving new compounds to create an effective synthesis focusing on alkanes, alcohols, alkenes, and alkynes.
- CSLO #3: Create an outline retro synthetically then create a forward reaction scheme to produce the target molecule focusing on alkanes, alcohols, alkenes, and alkynes.
- CSLO #4: Predict stereochemical outcomes of molecules in SN1, SN2, E1, and E2 reactions and their isomers.
- CSLO #5: Given the structure of reactant molecules, predict and draw mechanisms leading to products. Focus on alkanes, alcohols, ethers, ketones, aldehydes and alkenes.
- CSLO #6: Use experimental data to derive the structure of molecules, draw them and predict how their structure will affect their reactivity. Focus on alkanes, alcohols, ethers, ketones, aldehydes and alkenes.

## Effective Term

Fall 2024

## Course Type

Credit - Degree-applicable

## Contact Hours

18

## Outside of Class Hours

36

## Total Student Learning Hours

54

## Course Objectives

1. Identify nucleophile, electrophile, leaving group, and solvent in a reaction system.
2. Apply concepts of SN1, SN2, E1, and E2 reactions to new compounds by drawing the curved arrow mechanisms

3. Build a conceptual road map to synthesize organic molecules using the reactions of alkanes, alcohols, alkenes, and alkynes.
4. Develop rules and strategies for problem solving that are effective in solving new sets of problems.
5. Determine the structure of unknown organic molecules given some or all of the spectra or data from the instruments of H-NMR, C-NMR, FT-IR, and MS.

## General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

## Articulation Information

- CSU Transferable

## Methods of Evaluation

- Classroom Discussions
  - Example: Students will be evaluated on their participation in classroom discussions and utilization of problem solving on the white boards. For example, "The compound pentane (a) Draw the bond line structure (b) Starting with the stable Newman projection, draw the rotational energy diagram of the compound. Look through C2 – C3 bond."
- Problem Solving Examinations
  - Example: Students will be evaluated throughout the semester on successful completion of problem-solving worksheets. For example, "Brominating 2-methylbutane. (a) Write the complete mechanism for the radical bromination of 2-methylbutane, showing all the relevant steps and intermediates. Be sure to indicate the initiation, propagation, and termination steps in the reaction. (b) Identify any stereoisomers that may be formed during this process and explain their formation."

## Repeatable

No

## Methods of Instruction

- Lecture/Discussion

Lecture:

1. In Class: A classroom review topic of alkene reactions is followed by a worksheet assignment that students will complete working in small groups while the instructor roams the room. Ideally, students would be working on the problems on the whiteboards so the professor can give guidance to facilitate the learning process. The students should be experiencing a confidence boosts and they attempt more and more of the problems, while the professor providing feedback on problem-solving strategies

## Typical Out of Class Assignments Reading Assignments

1. Read a section from the textbook. Be prepared to use the content to participate in the classroom and to complete assigned problems from

the textbook. For example: Read the section on stereochemistry from the textbook. Be prepared to use the content to participate in the classroom and to complete assigned problems from the textbook. 2. Read a sample problem from a handout.

## Writing, Problem Solving or Performance

1. Solve problems from a worksheet. 2. Solve problems from the textbook. For example: Tamoxifen, a drug used in the treatment of breast cancer, and clomiphene, a drug used in fertility treatment, have similar structures but very different effects. Assign E or Z configuration to the double bonds in both compounds.

## Other (Term projects, research papers, portfolios, etc.)

### Required Materials

- Organic Chemistry
  - Author: David R. Klein
  - Publisher: Wiley
  - Publication Date: January 20, 2021
  - Text Edition: 4th
  - Classic Textbook?: Yes
  - OER Link:
  - OER: No
- Organic Chemistry
  - Author: John McMurry
  - Publisher: OpenStax
  - Publication Date: Sep 20, 2023
  - Text Edition: 10th
  - Classic Textbook?: Yes
  - OER Link:
  - OER: Yes.

**Other materials and-or supplies required of students that contribute to the cost of the course.**