

CHEM 12A Course Outline as of Fall 2000**CATALOG INFORMATION**

Dept and Nbr: CHEM 12A Title: ORGANIC CHEMISTRY

Full Title: Organic Chemistry

Last Reviewed: 2/10/2020

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	5.00	Lab Scheduled	6.00	17.5	Lab Scheduled	105.00
		Contact DHR	0		Contact DHR	0
		Contact Total	9.00		Contact Total	157.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00

Total Student Learning Hours: 262.50

Title 5 Category: AA Degree Applicable

Grading: Grade Only

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly:

Catalog Description:

For students majoring in chemistry, biochemistry, chemical engineering, or a closely related field such as molecular and cell biology. The first semester of an intensive one-year program based upon modern theoretical concepts of organic chemistry. All aspects of fundamental organic chemistry are studied, including nomenclature, chemical and physical properties, reactions and synthesis. The study includes theoretical aspects, reaction mechanisms, and multistep synthesis. The laboratory includes methods of purifying solids and liquids, determination of physical properties of organic compounds, isolation of natural products, synthetic reactions, chromatographic separations, and structure determination using infrared and nuclear magnetic resonance spectroscopy, and gas chromatography/mass spectrometry. Chem 12A-12B is equivalent to Chem 112A-112B at University of California, Berkeley or Chem 128A, 128B, 128C, 129A, 129B, 129C at University of California, Davis. Transfer students are expected to complete this sequence prior to their junior year.

Prerequisites/Corequisites:

Chem 4B or Chem 5.

Recommended Preparation:**Limits on Enrollment:**

Schedule of Classes Information:

Description: The first semester of an intensive one-year program based upon modern theoretical concepts of organic chemistry. Emphasis is placed on aliphatic and aromatic hydrocarbons, nucleophilic substitution and elimination reactions, alcohols, ethers, stereochemistry, nuclear magnetic resonance spectroscopy, and infrared spectroscopy. (Grade Only)

Prerequisites/Corequisites: Chem 4B or Chem 5.

Recommended:

Limits on Enrollment:

Transfer Credit: CSU;UC.

Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	Area	Effective:	Inactive:
CSU GE:	Transfer Area	Effective:	Inactive:
	B1	Physical Science	Spring 2000
	B3	Laboratory Activity	

IGETC:	Transfer Area	Effective:	Inactive:
	5A	Physical Sciences	Spring 2007
	5C	Fulfills Lab Requirement	

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
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UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:
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CID:

CID Descriptor:CHEM 150	Organic Chemistry for Science Majors I, with Lab
SRJC Equivalent Course(s):	CHEM12A

CID Descriptor:CHEM 160S	Organic Chemistry for Science Majors Sequence A
SRJC Equivalent Course(s):	CHEM12A AND CHEM12B

Certificate/Major Applicable:

Not Certificate/Major Applicable

COURSE CONTENT

Outcomes and Objectives:

A successful student in Chemistry 12A should be able to:

1. apply bonding theory to predict and explain the bonding and three dimensional structure of organic compounds.
2. apply simple molecular orbital theory to predict the bonding and chemical reactivity of organic compounds.
3. use intermolecular attractive forces to predict and explain physical properties of organic compounds.
4. apply resonance theory to organic compounds.
5. apply acid-base theory to organic compounds.
6. apply the concepts of kinetics to organic reactions.
7. apply the concepts of thermodynamics to organic reactions.
8. name simple organic compounds using the IUPAC system of nomenclature.

9. predict and draw the possible conformations of alicyclic and cyclic organic compounds.
10. predict if a given organic structure is chiral and optically active.
11. determine the stereochemical relationship between pairs of compounds.
12. use Fischer projections to convey the stereochemical nature of a stereocenter.
13. suggest feasible methods of synthesis of organic compounds.
14. predict the products of reactions involving organic compounds.
15. predict the influence a change in structure will have on an organic reaction.
16. predict the influence a change in solvent will have on an organic reaction.
17. decide if a substitution reaction is occurring by SN1 or SN2 mechanism and predict the products.
18. decide if an elimination is occurring by E1 or E2 mechanism, and predict the products.
19. write a logical mechanism for an organic reaction.
20. apply oxidation-reduction theory to organic compounds.
21. apply the theory of aromaticity to predict and explain the reactivity of organic compounds.
22. explain the basic theory behind nuclear magnetic resonance spectroscopy.
23. determine structures of simple organic compounds based on molecular formulas and nmr spectra.
24. explain the theory behind infrared spectroscopy.
25. determine structures of simple organic compounds based on molecular formulas and ir spectra.
26. interpret simple nmr, ir, and mass spectra.
27. operate the nuclear magnetic resonance spectrometer.
28. operate the infrared spectrophotometer.
29. perform the following laboratory techniques: crystallization, melting point determination, extraction, simple distillation, fractional distillation, vacuum distillation, steam distillation, boiling point determination and chromatographic separations.
30. explain the theory behind the techniques of crystallization, melting point determination, extraction, simple distillation, fractional distillation, vacuum distillation, steam distillation, boiling point determination and chromatographic separations.
31. operate a gas chromatograph, and gas chromatograph equipped with mass spectrometer.
32. analyze a gas chromatogram.
33. keep a laboratory notebook according to the research standards.
34. effectively communicate observations and subsequent conclusions by means of written laboratory reports.
35. utilize reference books and/or online databases for the construction of laboratory reports.

Topics and Scope:

LECTURE MATERIAL

1. General chemical concepts of bonding and structure.
2. Structure of organic compounds.

3. Acid-base chemistry.
4. Alkanes and cycloalkanes.
5. Stereochemistry.
6. Nucleophilic substitution and elimination reactions.
7. Alkenes and alkynes.
8. Alcohols.
9. Dienes.
10. Radical reactions.
11. Aromaticity.
12. Spectroscopy: NMR and IR.

LABORATORY MATERIAL

1. Nuclear magnetic resonance spectroscopy.
2. Infrared spectroscopy.
3. Crystallization.
4. Melting point determinations.
5. Simple distillation.
6. Fractional distillation.
7. Vacuum distillation.
8. Steam distillation.
9. Gas chromatography/mass spectrometry.
10. Thin layer and column chromatography.
11. Polarimetry.
12. Isolation of organic compounds.
13. Synthesis of organic compounds.
14. Structure determination.

Assignment:

Assignments for Chemistry 12A includes:

1. Specific reading and study assignments (averaging 40-50 pages per week).
2. Completion of end-of-chapter exercises (averaging 25-30 problems per week).
3. Writing (on average) one laboratory report per week and previewing upcoming laboratory experiments and completion of the required pre-laboratory assignment.

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written homework, Lab reports, ESSAY EXAM QUESTIONS
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Writing 20 - 60%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, Lab reports, Exams

Problem solving 5 - 10%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

LAB SKILL EVAL, PARTICIPATION

Skill Demonstrations
1 - 5%

Exams: All forms of formal testing, other than skill performance exams.

PROBLEM SOLVING & SHORT ESSAY

Exams
30 - 60%

Other: Includes any assessment tools that do not logically fit into the above categories.

None

Other Category
0 - 0%

Representative Textbooks and Materials:

LECTURE:

ORGANIC CHEMISTRY, M. Jones Jr., N.W. Norton and Company, 1997

ORGANIC CHEMISTRY, 6th Edition, Solomons, Wiley, 1996.

INTRODUCTION TO ORGANIC CHEMISTRY, 4th Edition, Streitweiser, Heathcock, and Kosower, MacMillan, 1992.

ORGANIC CHEMISTRY, 4th Edition, Wade, Prentice Hall, 1999.

LABORATORY:

INTRODUCTIN TO ORGANIC LABORATORY TECHNIQUES: A MICROSCALE APPROACH, 3rd

Edition, Pavia, Lampman, Kriz, and Engel, Saunders, 1999.

EXPERIMENTAL ORGANIC CHEMISTRY: A MINISCALE APPROACH, Roberts, Gilbert, and Martin, Saunders, 1994.