



COURSE OUTLINE : CHEM 105

D Credit – Degree Applicable

COURSE ID 004013

Cyclical Review: October 2020

Revision: March 2021

COURSE DISCIPLINE : CHEM

COURSE NUMBER : 105

COURSE TITLE (FULL) : Organic Chemistry A

COURSE TITLE (SHORT) : Organic Chemistry A

CALIFORNIA STATE UNIVERSITY SYSTEM C-ID : CHEM 150 - Organic Chemistry for Science Majors I, with Lab

ACADEMIC SENATE DISCIPLINE: Chemistry

CATALOG DESCRIPTION

CHEM 105 is an introductory study of the compounds of carbon, including the preparation, properties, and reactions of both aliphatic and aromatic hydrocarbons, halogen derivatives, alcohols, and ethers. Methods of synthesis are stressed, and reaction mechanisms and modern structural principles are introduced.

CATALOG NOTES

Note: Required of pre-medical and pre-dental students, recommended for majors in chemistry, petroleum engineering, sanitary and municipal engineering, and pharmacy, and for certain home economics, public health and agriculture majors.

Total Lecture Units:3.00

Total Laboratory Units: 2.00

Total Course Units: 5.00

Total Lecture Hours:54.00

Total Laboratory Hours: 108.00

Total Laboratory Hours To Be Arranged: 0.00

Total Contact Hours: 162.00

Total Out-of-Class Hours: 108.00

Prerequisite: CHEM 102.



ENTRY STANDARDS

	Subject	Number	Title	Description	Include
1	CHEM	102	General Chemistry	describe the fundamental properties of solutions and apply theories of colligative properties;	Yes
2	CHEM	102	General Chemistry	apply principles of electron transfer to understand oxidation and reduction processes;	Yes
3	CHEM	102	General Chemistry	distinguish between the rate of a reaction and the potential for a reaction to occur;	Yes
4	CHEM	102	General Chemistry	apply the fundamentals of collision theory to the rate at which a reaction proceeds;	Yes
5	CHEM	102	General Chemistry	analyze the effects of changes in system conditions on the amount of reactants and products present in the system;	Yes
6	CHEM	102	General Chemistry	identify acids and bases, and evaluate the effects that they may have on the properties of a solution;	Yes
7	CHEM	102	General Chemistry	analyze the composition of solutions based on properties of the components, including solubility, complex ion formation and redox;	Yes
8	CHEM	102	General Chemistry	apply the laws of thermodynamics to chemical systems and predict the direction in which chemical reactions proceed;	Yes
9	CHEM	102	General Chemistry	evaluate the interactions by which coordination compounds are stabilized;	Yes
10	CHEM	102	General Chemistry	continue to demonstrate the proper use of laboratory equipment and the ability to handle chemicals safely.	Yes

EXIT STANDARDS

- 1 classify organic compounds by structure which is the framework of organic chemistry;
- 2 precisely describe the principles of organic chemical reactions through techniques of lecture, laboratory problem solving and computer-simulated experiments;
- 3 have a working knowledge of the laboratory methods and specialized instruments typically used in organic chemistry;
- 4 keep accurate laboratory records;
- 5 be prepared for pre-professional examinations that include organic chemistry, i.e. MCAT, DAT, pharmacy and dental hygiene aptitude examinations;
- 6 read and evaluate scientific material of significance to them as citizens.



STUDENT LEARNING OUTCOMES

- 1 write reasonable mechanistic descriptions (using the arrow notation) for organic chemical reactions
- 2 logically reason structure-reactivity relationships for organic molecules involved in chemical reactions
- 3 apply the knowledge of organic laboratory and spectroscopic techniques to experimental situations

COURSE CONTENT WITH INSTRUCTIONAL HOURS

	Description	Lecture	Lab	Total Hours
1	Introduction Definition and scope of organic chemistry Chemical Bonding Physical properties <ul style="list-style-type: none">• Melting point• Boiling point• Solubility Isomerism <ul style="list-style-type: none">• Elemental analysis• Empirical formula• Molecular weight determination• Stereochemistry and Enantiomers	16	0	16

2	Alkanes Methane Structure <ul style="list-style-type: none"> • Physical properties • Chemical properties Substitution reactions, mechanism Rate of reaction Higher alkanes; homologous series, isomers, nomenclature; preparation, reactions Analysis of alkanes	16	0	16
3	Alkenes <ul style="list-style-type: none"> • Structure - geometrical isomerism • Nomenclature • Preparation • Carbonium ion mechanism • Addition reactions • Dienes; 1,4-addition • Analysis of alkenes; determination of structure by degradation • Stereochemistry and diastereomers 	16	0	16
4	Alkynes <ul style="list-style-type: none"> • Structure - geometrical isomerism • Nomenclature • Importance of acetylene • Reactions of alkynes • Tautomerism • analysis of alkynes 	6	10	16

5	<p>Cyclic Aliphatic Hydrocarbons</p> <ul style="list-style-type: none"> • Structure - geometrical isomerism • Nomenclature • Reactions • Baeyer strain theory • Conformations • Stereoisomerism of cyclic compounds • Analysis of cyclic aliphatic hydrocarbons 	0	16	16
6	<p>Aromatic Hydrocarbons</p> <p>Structure of benzene; resonance</p> <p>Reactions of benzene; mechanism</p> <p>Ring isomerism</p> <p>Nomenclature of benzene derivatives</p> <p>Arenes</p> <ul style="list-style-type: none"> • Nomenclature • Preparation • Reactions <p>Reactivity and orientation in aromatic substitution</p> <p>Analysis of aromatic hydrocarbons</p>	0	16	16
7	<p>Spectroscopy</p> <ul style="list-style-type: none"> • Mass spectrum • Infrared spectrum • Ultraviolet spectrum • Nuclear magnetic resonance spectrum 	0	16	16

8	Alkyl Halides Structure Nomenclature Preparation Reactions <ul style="list-style-type: none"> • Kinetics • SN1 vs. SN2 mechanisms Analysis of alkyl halides	0	16	16
9	Alcohols <ul style="list-style-type: none"> • Structure, classification, nomenclature, physical properties • Preparation • Optical isomerism • Reactions • Analysis of alcohols 	0	16	16
10	Ethers <ul style="list-style-type: none"> • Structure • Nomenclature • Preparation • Reactions • Epoxides • Analysis of ethers 	0	18	18
				162

OUT OF CLASS ASSIGNMENTS

- 1 Data and observations are recorded in a laboratory notebook the majority of which should be written in essay format. These reports are turned in and graded during the semester.



METHODS OF EVALUATION

- 1 Four one-hour examinations
- 2 Final Examination of 2.5 hours.

METHODS OF INSTRUCTION

- Lecture
- Laboratory
- Studio
- Discussion
- Multimedia
- Tutorial
- Independent Study
- Collaboratory Learning
- Demonstration
- Field Activities (Trips)
- Guest Speakers
- Presentations

TEXTBOOKS

Title	Type	Publisher	Edition	Medium	Author	ISBN	Date
Organic Chemistry	Required	Pearson			Leroy G. Wade	0-321-97137-X	2017
Laboratory Techniques in Organic Chemistry	Required	W. H. Freeman			Jerry R. Mohrig	1-4641-3422-7	2014