



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

**ORGANIC CHEMISTRY I  
CHM 4250 5 Credit Hours**

**Student Level:**

This course is open to students on the college level in the sophomore year.

**Catalog Description:**

**CHM4250 - ORGANIC CHEMISTRY I (N) (5 hrs)**

A study of the general principles, nomenclature, structure, and reactivity of organic aliphatic and aromatic compounds. First course in a two-semester sequence. Fulfills the requirements of students who need only one semester of organic chemistry. Includes laboratory experimentation.

**Prerequisites:**

CHM 4230 Chemistry II and basic computer skills.

**Controlling Purpose:**

This course is designed to help the student to prepare for professional applications in a science such as chemistry or biology, and medicine and other pre-professional fields.

**Learner Outcomes:**

Upon completion of the course, the student will have the conceptual tools to understand and apply the relationship between the structures of organic compounds and their properties.

**Units Outcomes and Criterion Based Evaluation Key for Core Content:**

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

**Evaluation Key:**

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.

- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

### UNIT 1: STRUCTURE AND BONDING

Outcomes: Upon completion of this unit, the student will be able to facilitate with quantum chemistry, resonance, molecular geometry and general bonding for organic molecules will be developed for applications to structural and mechanistic development throughout the course.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Understand and apply Lewis type structures and resonance structures for organic molecules.
						Show understanding of molecular hybridization and molecular geometry for organic molecules.
						Draw and comprehend structural drawings of organic molecules in both Lewis and line sketches.

### UNIT 2: COMPOUNDS

Outcomes: Upon completion of this unit, the student will have gained a general background knowledge of representative organic compounds for structurally relevant details and significance of characteristic functional groups.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Understand the structurally important aspects of various organic class of compounds including the importance of functional groups for alkanes, alkenes, alkynes, alcohols, alkyl halides, ethers, amines and carbonyl compounds.
						Understand and apply molecular mechanical concepts of structural components to organic structure.
						Relate structural details of organic families to physical properties of compounds.

**UNIT 3: REACTIONS AS ACIDS AND BASES**

Outcomes: Upon completion of this unit, the student will understand fundamental organic reaction mechanisms in acid-base reactions for physical relationships and probable synthetic products.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Recognize and understand acid base reactions in organic molecules.
						Understand the $K_a$ and $pK_a$ designations and calculations for organic acid base reactants.
						Understand and predict the effects of structure and solvents on organic acidity.
						Understand the acidity of carboxylic acids.
						Understand the organic bases.

**UNIT 4: ALKANE AND CYCLOALKANES, MOMENCLATURE**

Outcomes: Upon completion of this unit, the student will be able to understand the conformational structure of alkane and cycloalkane organic molecules as well as synthetic planning for organic molecules of this category.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Be conversant in the IUPAC nomenclature of organic chemistry.
						Understand conformational analysis techniques for alkanes and cycloalkanes and the stabilities of ring structures.
						Understand synthetic planning of organic molecules.

## UNIT 5: STEROCHEMISTRY

Outcomes: Upon completion of this unit, the student will be able to understand the relevance of stereochemistry to organic reactants and products as well as the physical techniques for determining and separating stereochemical products.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand the history, biological importance, and differentiation of stereochemicals.
						Be conversant in the nomenclature of stereochemistry and the structural forms for representing stereochemicals.

## UNIT 6: ALKENES AND ALKYNES

Outcomes: Upon completion of this unit, the student will understand nomenclature, physical properties, and reactions of alkenes and alkynes.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Be conversant in the nomenclature of alkenes and alkynes and have knowledge of the physical properties of these compounds.
						Understand hydrogenation mechanisms, carbocation stability and intermediate mechanism, and methods of preparation of alkenes and alkynes.
						Understand the mechanism for Markovnikov addition reactions, stereochemical properties of addition products, and oxidation products.

## UNIT 7: RADICAL REACTIONS

Outcomes: Upon completion of this unit, the student will understand radical formation and reactions with halogens, polymerization, and structural changes and stereochemistry of products of radical reactions for applications to synthesis.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand the properties, stability, and mechanism or reactions of radicals.
						Understand chain reaction mechanisms and polymerization, geometry of products and energetic of reaction mechanisms.
						Understand anti-Markovnikov radical addition to alkenes.

**UNIT 8: ALCOHOLS AND ETHERS**

Outcomes: Upon completion of this unit, the student will have had an overview of alcohols, ethers and carbonyls and their properties; nomenclature and reactivity of alcohols, ethers, and carbonyl compounds.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand the physical properties, nomenclature and reactivity of alcohols, ethers, and carbonyl compounds.
						Understand synthesis techniques of the oxygen containing compounds.
						Understand alkyl halide synthesis, and the use of alkyl compounds in synthesis pathways.
						Understand the utility of epoxides, oxidations, and organometallic synthesis pathways with alcohols, ethers, and carbonyls.

**UNIT 9: CONJUGATED UNSATURATED SYSTEMS**

Outcomes: Upon completion of this unit, the student will gain knowledge of conjugated polyenes and general unsaturated systems.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand the stability and resonance of unsaturated systems.
						Understand the reactivity of unsaturated systems, the Diels-Alder addition, and other electrophilic reaction mechanisms.

**UNIT 10: SPECTROSCOPIC METHODS OF STRUCTURE DETERMINATION**

Outcomes: Upon completion of this unit, the student will understand fundamental organic reaction mechanisms in acid-base reactions for physical relationships and probable synthetic products.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand Visible, UV, and infrared spectroscopic methods and analysis techniques.
						Understand and apply Nuclear Magnetic Resonance techniques of structural determination in organic compounds.

**Projects Required:**

Laboratory Notebook

**Textbook:**

Contact Bookstore for current textbook.

**References:**

MSDS Catalogue, CRC handbook of Chemistry and Physics, the Merck Index

**Materials/Equipment Required:**

Organic lab glassware, Gas Chromatograph, PC computers, Fume hood, Organic molecular model kits, Mel-temps.

**Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

**Late Daily Work:**

Do not hand in late assignments in class. Bring the paper to the instructor's office for evaluation (during office hours, or make a special appointment; also see policy below for grading daily work).

**Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

**Maximum class size:**

Based on classroom occupancy

**Course Timeframe:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability, which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.