



**CHEM 208(Organic Chemistry I)**

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**CHEM 208 COURSE SYLLABUS**

**KASKASKIA COLLEGE**

**NAME** \_\_\_\_\_

**TERM** \_\_\_\_\_

**YEAR** \_\_\_\_\_

TEXT: Organic Chemistry(3rd Edn)

By Janice Gorzynski Smith

Lab: Microscale and Miniscale

ORGANIC CHEMISTRY: Laboratory Experiments by

Schoffstall, Barbara and Melvin(2nd Edn)

**Learning Objectives:** *The principal objective of this course is to get familiar with the C compounds, their nomenclature, functional groups, structures, stereochemistry, their syntheses and reactions. The C compounds include both aliphatic and aromatic. The understanding of the organic reactions include the reaction mechanism and kinetics. The laboratory experiments in organic chemistry include the synthesis, purification, and characterization of various kinds of organic compounds by different methods.*

**Exams:** There will be total **5** exams. You cannot choose another date or time for your exam to be taken until any emergency arises. Proper documents must be **submitted** to prove your emergency. The Final exam will be **comprehensive**.

**Weekly Quiz:** Please find the schedule for the quiz on your blackboard (Assessment section)

**Attendance Policy:** The students are required to attend every class unless any emergency reason. Proper documents needed to prove the emergency occurrence. 3 regular absences in the whole semester will be accepted. Points will be taken off for each absence(30 points) after 3 regular absences if no proper documentation is submitted for emergency. Students coming to the class 10 minutes(or higher) late or leave the class earlier will be considered as late(L) in the grade book and each 3 lates will be equal to 1 full absence(a). Also, the student will miss the lecture comprehension quiz for making every absence.

**Inside the Class Room policy:**

**(1) Not talking in the class except class materials**

**(2) Not sleeping during the class time**

**(3) Seriously working in the class and in the lab**

**(4) Regular Note-keeping**

**(5) No cell phones, CD players, or other listening or recording or cameras are allowed in the class room. The violators might loose points from the total points.**

**(6) No eating food inside the class**

**(7) Must bring scientific calculators and books.**

**(8) The students must be seated separately enough during the quiz or exam period.**

**Class Environment:** Talking is completely prohibited except you ask any questions regarding the class materials or you are asked any questions by the Instructor. Private talking in the class will hurt your understanding and also will hurt others. No sleeping in the class room allowed. Also, you will miss bonus points if you do those.

**COURSE SYLLABUS:**

**Chapters 1:** Chemical bonding, hybridization, structures and shapes of C compounds, Lewis-dot structures, resonance and polarity of the molecules

1.41, 1.44, 1.48, 1.52, 1.62, 1.64, 1.69, and 1.83

**Chapter 2: Acids and Bases:**Bronsted-Lowry theories, pKa values, Inductive and Electromeric effects

2.34, 2.36, 2.39, 2.44, 2.49

**CHAPTER 4:** Carbon compounds, hydrocarbons, hybridization and shapes of organic molecules, alkanes, IUPAC naming of hydrocarbons, structural isomers, cycloalkanes.

Functional groups. Conformations of alkanes and cycloalkanes, conformational analysis, inversion of rings, Stability of conformations, enthalpy, free energy, and equilibrium constant, polycyclic and heterocyclic compounds.

4.40, 4.42, 4.47, 4.50, 4.52, 4.61, and 4.62

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### EXAM 1: Sept 12, Wed

**Chapter 5: Stereochemistry:** Chirality, symmetry in achiral structures, optical activity, absolute and relative configurations, Cahn-Ingold-Prelog R-S Notational System, Fischer projections, enantiomers and diastereomers.

5.35, 5.36, 5.38, 5.44, 4.45, 5.39, 5.60

**Chapters 7:** Halocarbons or alkyl halides, IUPAC naming, reactions of alkenes, alcohols, naming, phenols, synthesis of alcohols, Potential energy diagrams, Nucleophilicity, SN1 and SN2 reaction mechanism, hydrogenation and halogenation reactions. Organic synthesis.

7.44, 7.45, 7.47, 7.48, 7.49, 7.55, 7.58, 7.61, 7.62, 7.63, 7.68, 7.70

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### EXAM II: Oct 10, Wed

**Chapter 8 :** Structure and preparation of alkenes, elimination reactions(E1 and E2) with their mechanisms, dehydrohalogenation reactions with mechanism.

Addition reactions, Markonikov's rule, mechanism of halogenation reactions, epoxidation and polymerization reactions, carbocation rearrangement reaction and its mechanism. Identification of S<sub>N</sub>1, S<sub>N</sub>2, E1 and E2 reactions

8.27, 8.28, 8.32, 8.34, 8.39, 8.42, 8.43 and 8.57.

### EXAM III: Sept 31, Wed

**Chapter 17:** Benzene and aromaticity, Kekule structure, Orbital hybridization and resonance structures, Nucleophilic and Electrophilic substitution reactions with mechanisms.

17.29, 17.30, 17.32, 17.34, 17.40, 17.44

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**Chapter 13 and 14:** Spectroscopic(Mass, IR, UV-VIS, 1H and C-13 NMR) Determination of Organic Structures

**Chapter 9:** Alcohols, diols, and thiols, synthesis, structures and naming.

### EXAM IV: Nov 28, Wed

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**Chapter 20:** Aldehydes and Ketones, structures and naming, carbonyl group, redox reactions of organic compounds, detection of aldehydes and ketones, addition reactions, uses of aldehydes and ketones, their reactions with mechanisms.

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## **FINAL EXAM: Comprehensive**

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### **The Laboratory Experiments for CHEM 208:**

Experiment 1: Cleaning glass wares(p-13)

Experiment 2: Determination of melting points, and boiling points(p-22)

Experiment 3: Crystallization and recrystallization of organic compounds(p-34)

Experiment 4: Distillation: Simple distillation and fractional distillation(p-52)

Experiment 5: Vacuum Distillation,Reflux and Sublimation

Experiment 6: Extraction and drying

Experiment 7: Gas-Liquid Chromatography(p-83)

Experiment 8: Thin-Layer Chromatography and Column Chromatography(p-92)

Experiment 9: Liquid Chromatography: HPLC(p-99)

Experiment 10: IR Spectroscopy(p-110)

Experiment 11: Nuclear Magnetic Resonance Spectroscopy(p-125)

Experiment 12: UV-visible and Mass Spectroscopy

Experiment 13: Molecular Mechanics: Modeling

Experiment 14: Purification and Analysis of a liquid mixture(p-216)

Experiment 15: Synthesis of Alkyl halide from an alcohol(p-221)

Experiment 16: Synthesis of Alkene by acid-catalyzed dehydration(p-229)

### **Learning outcomes of Organic Chemistry (CHEM 208)**

1. The students should be able to understand the structure and bonding of the organic compounds with special reference to their hybrid orbitals and unhybrid orbitals.
2. should be able to classify the organic compounds according to their functional groups.

3. should be able to understand the conformations of alkanes and configurational geometry of alkenes and their stability.
4. should be able to understand and identify the stability and formation of carbocations with mechanisms and stereochemical impact of carbocations in substitution reactions.
5. should be able to understand and memorize the mechanism of addition, elimination, substitution, and rearrangement reactions with examples.
6. should be able to understand aromaticity, Huckel's rule, and resonance stabilization. They should understand the mechanism of Friedel-Crafts reactions with their synthetic applications.
7. should be able to understand and describe the mechanism of nucleophilic substitution reactions ( $S_N1$  and  $S_N2$ ) with examples.
8. should be able to understand and describe with examples the mechanism of electrophilic substitution ( $E1$  and  $E2$ ) reactions.
9. should be able to understand and memorize the synthesis and reactions of alkyl halides.
10. should be able to distinguish between distillation, steam distillation, and vacuum distillation.
11. should be able to understand the principle of Thin-Layer Chromatography and its uses in organic chemistry. They should be able to build up a Column Chromatography to separate and purify organic compounds.
12. The students should be able to identify the differences between  $D$  and  $d$  configuration and  $L$  and  $l$  configurations of optically active compounds. They should be to draw the different types of configurations of optically active compounds of biological interest.

#### GRADING POLICY:

Quizzes and Homework	200 points
Laboratory	100
Exams	700
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Total	1000 point

**(EXAM 1 150 points**

**EXAM 2 100**

**EXAM 3 150**

**EXAM 4 100**

**FINAL 200)**

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TOTAL 1000

Scores Letter grade

900-1000 A

800-899 B

700-799 C

600-699 D

<600 F

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