OUTCOMES BASED LEARNING MATRIX

Course Description: This is a continuation of the study of the main classes of organic compounds, including aldehydes, ketones, carboxylic acids, amines, and aromatics. The nomenclature, reaction mechanisms, synthesis, and general properties of these compounds will be discussed. The techniques of MS, NMR, and IR spectroscopy will be introduced. IR and NMR spectra will be run and interpreted where appropriate in the laboratory. The laboratory is both preparative and analytical using classical and instrumental experimental techniques. Lecture: 3 hours Laboratory: 4 hours Prerequisite: Organic Chemistry I (CHEM201) or Permission of Instructor

Course: Organic Chemistry II Department: Physical Science Revised: Fall 2009

At the end of the course, students will be able to: | **Students will participate in:** | **Faculty will evaluate:**

COURSE OUTCOMES	OUTCOME ACTIVITIES	Assessment Tools
Nuclear Magnetic Resonance (NMR), Infrared Spectroscopy (IR), and Mass Spectroscopy (MS) -describe and understand NMR, IR, and MS techniques -assign peaks in the spectra based on functional groups -determine unknown compounds based on peak assignments	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Alkynes -name and draw alkynes -discuss the physical properties -know the addition reaction of a hydrogen halide, water, and a halogen to an alkyne -know the hydroboration-oxidation reaction of alkynes	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)

	-organizing and documenting information in lab reports. (CT, W, QS)	
Radical Reaction -explain how a radical chain reaction -show the mechanism of a halogenations reaction -discuss chlorination vs. bromination -calculate heat of reactions	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Benzene and Aromaticity: -explain the concept of aromaticity. -illustrate how the chemical structure is related to the properties of these compounds. -determine if a compound is aromatic, anti-aromatic, or nonaromatic -explain Huckel's rule and apply it	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Electrophilic Aromatic Substitution -know the mechanism of halogenations, nitration, sulfonation, and Friedel-Crafts -explain how substituents can activate or deactivate the benzene ring -discuss the orientation effects of substituents -perform multistep synthesis	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Organometallic Reactions -describe oxidation and reduction reactions -explain the reduction and oxidation	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC)

reactions of aldehydes and ketones -describe how organometallic reagents are used -explain organometallic reactions	problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Lab reports (W, QS, CT)
Aldehydes and Ketones: -draw and name aldehydes and ketones. -relate structure to physical properties of aldehydes and ketones -propose mechanisms for the following addition reactions: Grignard, organolithium, HCN, alkynes, Wittig, acetal and hemiacetal, ammonia and its derivatives, -explain keto-enol tautomerism -illustrate oxidation and reduction reactions	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Carboxylic acids: - draw and name carboxylic acids -relate structure to physical properties of carboxylic acids - illustrate how chemical structure, hybridization, resonance and inductive effects affects acidity of carboxylic acids -describe how carboxylic acids can be prepared and reduced	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Carboxylic acid derivatives: - draw and name carboxylic acid derivatives: acid chlorides, acid anhydrides, esters, amines, and nitriles	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)

-relate structure to physical properties of carboxylic acid derivatives - propose mechanisms for the reactions with water, alcohols, amines, and organometallic compounds -explain reduction reactions of the derivatives	-experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	
Amines -name and draw amines -discuss the physical properties -describe how to prepare amines -explain the Hofmann elimination, nitrous acid reactions, and amines as nucleophiles	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -experiments during laboratory sessions. (CT, R, QS, TS) -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)