ORGANIC CHEMISTRY I 50:160:335

Rationale:
Chemistry is the molecular science. Chemists believe that the best understanding of the properties of matter comes from study at the molecular level.

For example, boiling points, acidity, chemical reactivity, taste, smell, drug efficacy, colour, toxicity, etc., can all be understood/predicted/explained by a consideration of the relevant atoms and bonds connecting them.

Organic chemistry provides the basic principles that govern the structure (and therefore the behavior and reactivity) of molecules.

Course Objective:
Upon successful completion, students will understand the direct connection between the properties and behavior of a substance, and its molecular structure.

Learning goals:
Students will be familiar with the following subject matter, and be able to apply these concepts and principles to any molecule or chemical process.

Chapter 1 deals with trends within the periodic table; electrons and electron configuration; the octet rule; ionic and covalent bonding; Lewis structures; electronegativity and polar covalent bonding; resonance structures; structural formulae; stick figure (line angle) diagrams; definitions of acids; pH, pKa; anion stability; Lewis acids and bases; nucleophiles, electrophiles and leaving groups.

Chapter 2 deals with electrons as waves; wavefunction and $\psi^2$; LCAO, $\sigma$ and $\sigma^*$; $\sigma$ and $\pi$ bonds; hybridization; geometry; bond rotation, isomers.

Chapter 3 deals with alkanes; IUPAC naming; different conformations; cycloalkanes; ring strain; chair and boat of cyclohexane; axial and equatorial positions; bicyclic alkanes.

Chapter 4 deals with the study of chemical reactions; the mechanism of free radical chain halogenation of alkanes; thermodynamics and the relationship between equilibrium constant and $\Delta G$; $\Delta G = \Delta H - T\Delta S$; kinetics and the relationship between rate of reaction and activation energy and temperature; transition states; energy level diagrams; rate determining steps; selectivity; the Hammond postulate; properties and stabilities of cations, radicals, anions and carbenes.

EXAMINATION 1 (usually after 5 weeks of the semester) (50pts)
Chapter 5 deals with Chirality; chiral centres, enantiomers, assignment of R and S; other types of chirality; Fischer projections; Diastereomers; 2 or more chiral centers, meso and dl Diastereomers; enantiomeric resolution, and stereochemical outcomes.

Chapter 6 deals with alkyl halides; IUPAC naming; preparation; nucleophilic substitution, the SN1 and SN2 reactions; eliminations; the E1 and E2 reactions; carbocation rearrangements; Zaitsev’s rule; elimination versus substitution.

Chapter 7 deals with alkenes; π bonds; unsaturation; IUPAC of alkenes; E and Z stereodescriptors; alkene stability; Bredt’s rule.

Chapter 8 deals with reactions of alkenes; electrophilic addition; Markovnikov and Anti-Markovnikov regiochemistry; syn and anti stereochemistry; reagents and mechanisms of electrophilic additions; carbene additions, epoxidation, oxidation and oxidative cleavage reactions.

EXAMINATION 2 (usually after 11 weeks of the semester) (50pts)

Chapter 9 deals with terminal and internal alkynes; the acidic C-H; addition reactions and oxidative cleavage.

Chapter 10 deals with the properties and preparation of alcohols; IUPAC naming; organometallic reactions with carbonyl compounds; hydride reductions; thiols.

Chapter 11 deals with reactions of alcohols; oxidation of primary, secondary and tertiary alcohols; conversion of poor leaving group OH to good leaving group, tosylates, protic and Lewis acids; bimolecular dehydration; formation of esters; Williamson ether synthesis.

EXAMINATION 3 (usually last day of classes, after 14 weeks of semester) (50pts)

FINAL CUMULATIVE EXAMINATION (150pts)

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https://ods.rutgers.edu/students/documentation-guidelines.

If the documentation supports your request for reasonable accommodations, your campus’s disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form at https://webapps.rutgers.edu/student-ods/forms/registration.

https://success.camden.rutgers.edu/disability-services