

The final exam is cumulative. Much of the material studied before the midterm exam serves as prerequisite for the later part of the courses; therefore, review of the Quiz & Midterm checklist is strongly advised. This is not necessarily a comprehensive list; anything that was discussed in class might come up in the Final Exam.

Nucleophilic Substitution & Elimination

define/ describe S_N2 , S_N1 , $E1$, $E2$ rxns in terms of rate law, transition state, rxn diagram, rxn mechanism, effect on chirality
describe/ apply the effect of substrate structure, nucleophilicity, leaving group and solvent on the above rxn types
predict preferred reaction type and product if substrate and rxn conditions are given, incl. stereochemistry
determine product(s) if reaction type is given

Alkenes

unsaturated fats as example
degree of unsaturation, determine & apply concept
naming alkenes; incl. vinyl substituent
molecular features & *cis*, *trans* isomerism
E, Z designation, incl. naming
stability of substituted alkenes,
prep. of alkenes: cracking, dehydrohalogenation, dehydration, alkyne hydrogenation
electrophilic addition (E.A.) rxns, general principles
Mark. 's rule, carbocation stability & hyperconjugation
details of addition reactions
1. Given 2 of the following:
“substrate”, “reaction conditions” or “product”
find the third
2. Describe/ predict rxn mech., regiospecificity, stereospecificity and products of

- *Hydrohalogenation**
- *Halogenation**
- *halohydrin formation**
- *direct hydration*
- *oxymercuration*
- *hydroboration*
- *hydrogenation*
- *epoxidation*

* know detailed mech.

Ozonolysis
predict products
use in structure determination (potentially in combination w/ other info)

Alkynes

molecular features
naming
preparation (2 methods)
reactions
addition:
1 or 2 HX
1 or 2 X_2
 Hg^{2+} catalyzed hydration
hydroboration
hydrogenation:
w/ active cat.
w/ Lindlar cat.
 Li/NH_3 (or Na/NH_3) reduction
use hydrogenation data for structure determination
terminal alkyne acidity
 PK_a rankings
synthesis w/ alkynides
plan synthesis of org. cmpds using alkane, alkene and alkyne rxns (up to 3 steps)

Alcohols

General molecular features; occurrence
Systematic naming (incl. R, S, ‘undefined’ ...)
Preparation: acidic hydration, oxymercuration, hydroboration, nucleophilic substitution
Describe (& state consequences of) H-bonding, basicity, acidity
Reactions: alkoxide formation, reactions with nucleophilic and non-nucleophilic acids (active ester methods, minimal)
Detailed mechanisms for E & S rxns of alcohols

Ethers

General molecular features; occurrence
Selected common names.
Systematic naming
Prep. (3 methods): acid trtmt of alcohols, peracid trtmt of alkenes, Williamson synthesis
General acidic cleavage of ethers
Epoxide opening under basic and acidic conditions