

IUPAC nomenclature of alkenes

E/Z nomenclature, Cahn-Ingold-Prelog priority rules

Determination of the Index of Hydrogen Deficiency

Common group names: vinyl, allyl, phenyl, benzyl

Order of alkene stability and reasons for it.

Determination of oxidation states.

Recognition of oxidation and reduction reactions and oxidizing and reducing agents.

Preparation of alkenes by elimination of HX(dehydrohalogenation) and H<sub>2</sub>O(dehydration), mechanisms.

Addition of Br<sub>2</sub> or Cl<sub>2</sub> to alkenes, stereochemistry, mechanism.

Addition of Br<sub>2</sub>/H<sub>2</sub>O or Cl<sub>2</sub>/H<sub>2</sub>O to alkenes, regiochemistry and stereochemistry, mechanism.

Acid catalyzed hydration of alkenes, reverse of elimination of H<sub>2</sub>O, regiochemistry, mechanism.

Electrophilic addition of hydrogen halides to alkenes: regiochemistry and mechanism, Markovnikov's rule.

Cation rearrangement.

Oxymercuration-demercuration, regiochemistry, mechanism.

Hydroboration-oxidation, regiochemistry, stereochemistry, mechanism.

Addition of HBr to alkenes in the presence of peroxides, regiochemistry, and mechanism.

Order of cation and radical stability and reasons for it.

Hydrogenation of alkenes, stereochemistry.

Hydroxylation of alkenes, intermediate, stereochemistry.

Ozonolysis of alkenes, intermediates, mechanism.

Oxidative cleavage of alkenes by KMnO<sub>4</sub>, intermediate.

Carbenes, structure, formation, reactivity, stereospecificity.

Simmons-Smith reaction, carbenoid, stereospecificity.

Nomenclature of alkynes.

Preparation of alkynes.

Reaction of a ketone with PCl<sub>5</sub>, mechanism.

Electrophilic addition to alkynes: HCl, HBr, HI, Cl<sub>2</sub>, Br<sub>2</sub>.

Stability and structure of vinyl cations.

Hydrogenation of alkynes: H<sub>2</sub>, Lindlar/Ni<sub>2</sub>B or Li, CH<sub>3</sub>CH<sub>2</sub>NH<sub>2</sub>, stereochemistry, intermediates and mechanism.

Acidity of acetylene and other hydrocarbons, explanation.

Ozonolysis and KMnO<sub>4</sub> oxidation of alkynes.

Multistep syntheses.

Difference between diastereomers and enantiomers.

Symmetry in molecules with stereogenic centers, meso compounds.

Definitions: chiral, stereogenic center, optically active, racemic.

Reactions involving chiral, nonoptically active compounds form enantiomers in equal amounts, diastereomers in unequal amounts.

Reactions involving optically active starting materials can give optically active compounds or racemic mixtures.

Bromination and chlorination of alkanes with heat and/or light, relative reactivity, selectivity, mechanism.

Calculation of  $\Delta H^\circ$  from bond energies  $DH^\circ$

Progress of Reaction vs. Energy diagram  $\Delta G^\circ$ ,  $\Delta G^\ddagger$  and transition state

