Chapter 4. Alkenes and Alkynes

Learning objectives:

1. Describe the three-dimensional structure of an alkene and reason the structure with the overlapping of hybridized and non-hybridized atomic orbitals of carbons.
2. Name alkenes including \textit{cis-trans} and/or E-Z assignments when necessary.
3. Name alkynes.
4. Show the terpene units that can be fragmented from a naturally occurring compound.

Sections to be covered (in the order of delivery):

4.1 Introduction#
4.2 Structure
4.3 Nomenclature
4.4 Physical Properties
4.5 Naturally Occurring Alkenes: The Terpenes

* Sections that will be focused
# Sections that will be skipped

Recommended additional problems

4.7 – 4.33
4.2 Structure

A. Shapes of Alkenes

B. Orbital Overlap Model of a Carbon-Carbon Double Bond

C. Cis-Trans Isomerism in Alkenes
D. Shapes of Alkynes

\[ \text{H} - \text{C} = \text{C} - \text{H} \]

4.3 Nomenclature

A. IUPAC Names

\[
\begin{align*}
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H} \\
\text{H} & \quad \text{H} \\
\end{align*}
\]
B. Common Names

ethylene  propylene  acetylene

C. Systems for Designating Configuration in Alkenes

(i) The Cis-Trans System

(ii) The E,Z system
- higher atomic number, higher priority
- first difference in priority

Examples:
D. Cycloalkenes
E. Cis-Trans Isomerism in Cycloalkenes

F. Dienes, Trienes and Polyenes and G. Cis-Trans Isomerism in Dienes, Trienes and Polyenes
Vitamin A (retinal)

4.4 Physical Properties

4.5 Naturally Occurring Alkenes: The Terpenes

Farnesol