(30) **Today**

Arrow Pushing Practice
Section 6.4: An Example of a Polar Reaction: Addition of HBr to Ethylene
7.3 Naming Alkenes
7.4 Cis–Trans Isomerism in Alkenes
7.5 Alkene Stereochemistry and the E,Z Designation
Skipping 7.6 for now
7.7 Electrophilic Addition Reactions of Alkenes

**Next Class** (31)

7.7 Electrophilic Addition Reactions of Alkenes
7.8 Orientation of Electrophilic Additions: Markovnikov's Rule (Regioselectivity)
7.9 Carbocation Structure and Stability
7.10 The Hammond Postulate
Drawing a transition state
7.11 Evidence for the Mechanism of Electrophilic Additions: Carbocation Rearrangements

(32) **Second Class from Today**

Practice Predicting Outcome of H+ Initiated Electrophilic Addition Reactions
8.2 Halogenation of Alkenes: Addition of X2
8.3 Halohydrins from Alkenes: Addition of HO-X

**Third Class from Today** (33)

Test 3 on Chap 5, 6 and Chap 7.3 – 7.5

**Chap 7 Appropriate Problems**

7.2 Calculating the Degree of Unsaturation
Calculate degrees of unsaturation 7-1 through 7-3, 7-34, 7-35, 7-67

7.3 Naming Alkenes
Naming and drawing structures 7-4 through 7-7, 7-22, 7-37 through 7-44

7.4 Cis–Trans Isomerism in Alkenes
Naming and drawing cis/trans alkenes 7-8 through 7-10

7.5 Alkene Stereochemistry and the E,Z Designation
Assigning priorities 7-11 and 7-12
Determining configuration and drawing alkenes 7-13 and 7-14, 7-23, 7-45 through 7-47, 7-53, 7-63, 7-65

7.7 Electrophilic Addition Reactions of Alkenes

7.8 Orientation of Electrophilic Additions: Markovnikov's Rule (Regioselectivity)
Predict the outcome 7-16 and 7-17, 7-57 through 7-59

7.9 Carbocation Structure and Stability
Predict C+ 7-18 and Draw C+ 7-19, 7-25, 7-54, 7-56

7.10 The Hammond Postulate
Drawing a transition state 7-20, 7-55

7.11 Evidence for the Mechanism of Electrophilic Additions: Carbocation Rearrangements
Mechanism for 7-21, 7-26 through 7-33 7-28 and 7-29 (consider the resonance contributor of the intermediate), 7-60, 7-66, 7-70

Uncategorized
7-61, 7-68, 7-69

~~Use **degrees of unsaturation** to determine number of π-bonds or rings in a molecule~~

Use IUPAC nomenclature to **name alkenes**

**Use** *cis/trans* and ***Z/E*** designations where appropriate to indicate the configurations of **alkene stereoisomers**

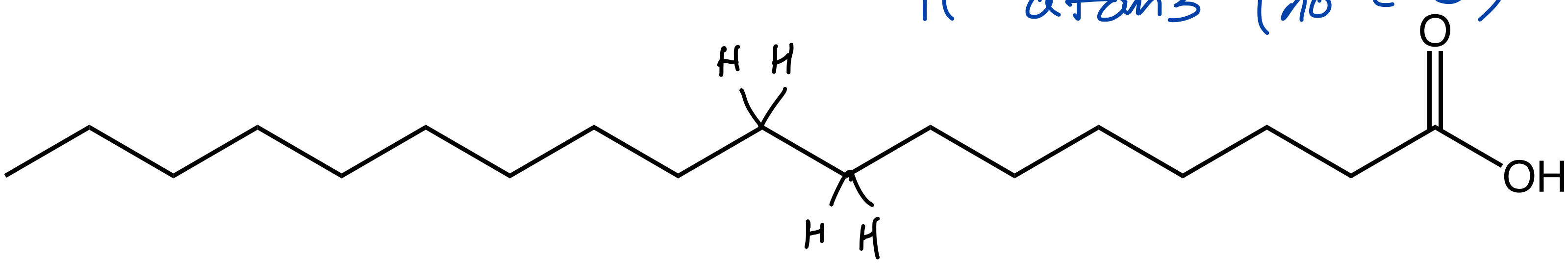
**Explain** the structure and reactivity of alkenes

**Predict** the **outcome** of $H^+$ initiated electrophilic addition reactions

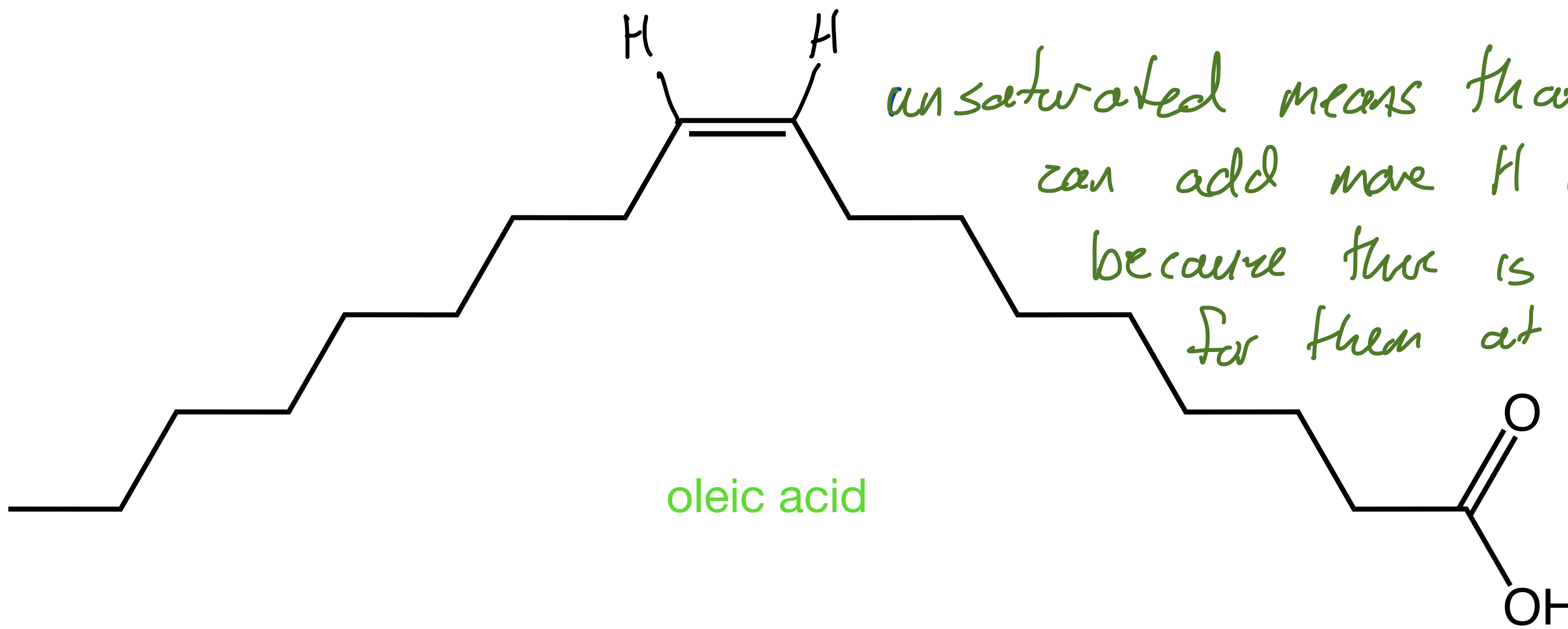
not on test 3

Knowing the "degrees of unsaturation" can help a chemist determine the structure of an unknown compound.

saturated no room for more H atoms (no C=C)



palmitic acid

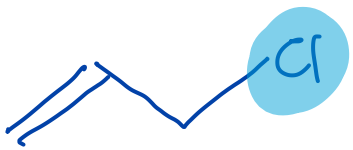


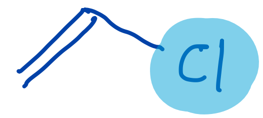
unsaturated means that we can add more H atoms because there is room for them at the db

oleic acid

A note on some special names

Allyl and Vinyl

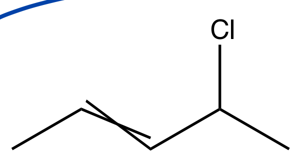


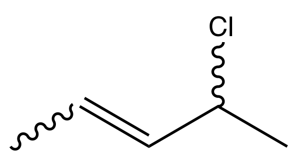




bonded to the position adjacent to db

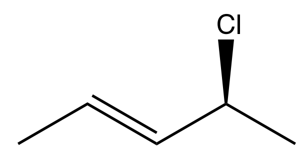
this Cl occupies a vinyl position it is directly bonded to C of db

A note on how structures are drawn



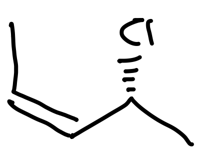




$CH_3-CH=CH-CHCl-CH_3$

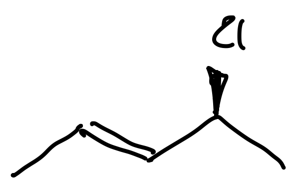


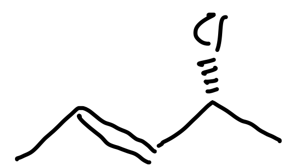

these drawings are meant to represent all possible stereoisomers

one specific stereoisomer

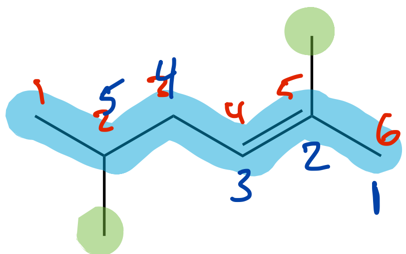






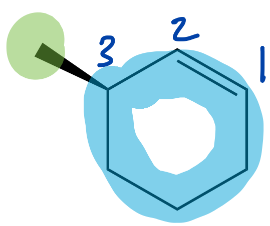

Same rules as alkanes except, alkenes are a functional group, so the position of the double bond gets the lowest number and "~~ane~~" ending of parent hydrocarbon is changed to "ene" and the double bond **must** be fully contained in the longest carbon chain.



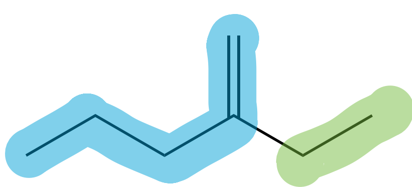
2,5-dimethyl-2-hexene

also

2,5-dimethylhex-2-ene



3-methyl-1-cyclohexene



2-ethylpent-1-ene

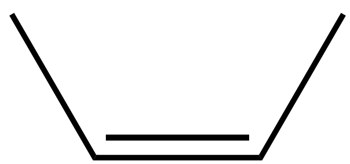
2-ethyl-1-pent~~ane~~ene

↑ starts at 1 + goes to 2

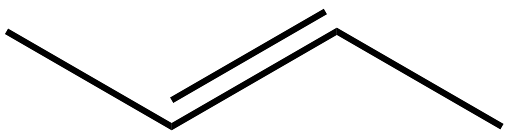
Convert $CH_3–CH=CH–CH_3$ to a skeletal structure

stereoisomers

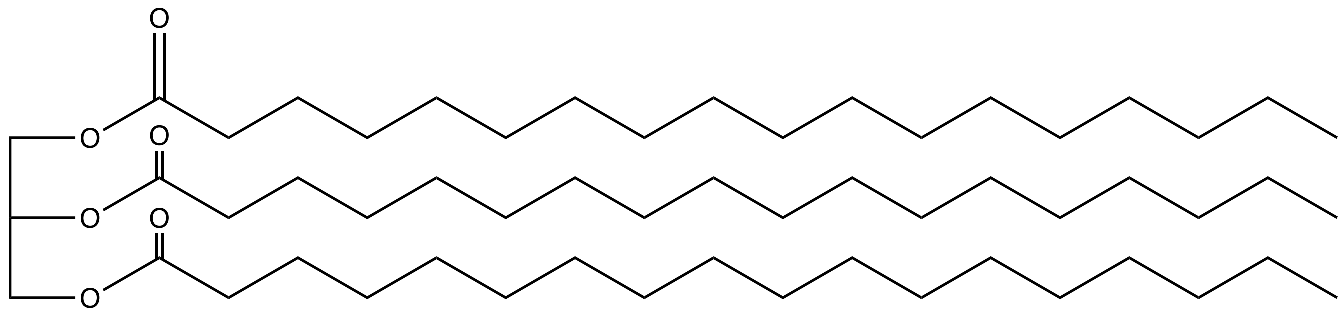
diastereomers

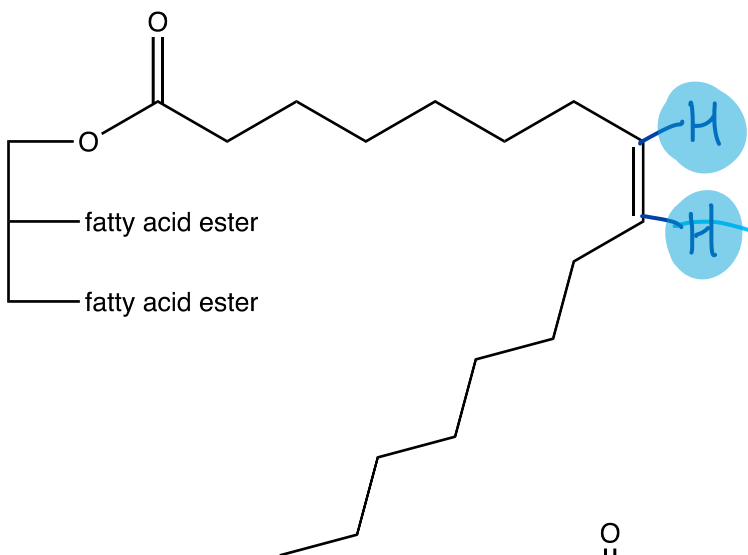


BP 3.7 °C
MP -139.0 °C



BP 1.0 °C
MP -105.0 °C

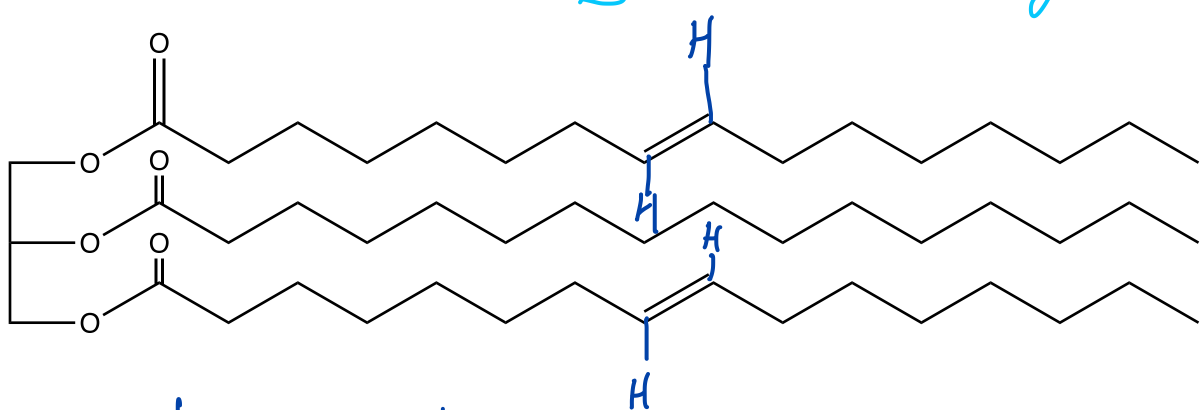





cis – H atoms same side

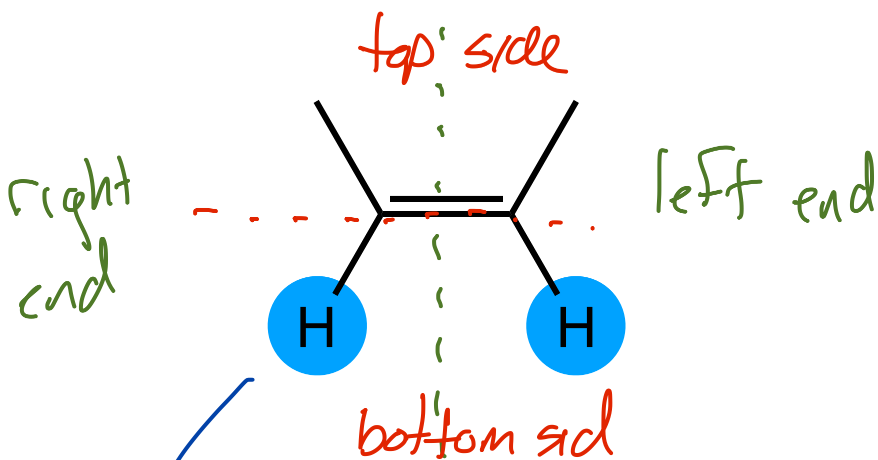
partially hydrogenate the db

except... process also causes db to change stereochemistry

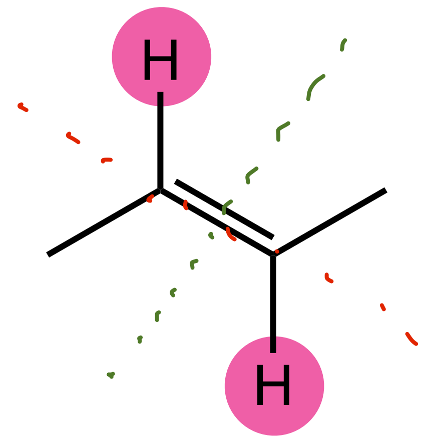



trans fat

Convert $CH_3–CH{=}CH–CH_3$ to a skeletal structure




BP 3.7 °C
MP -139.0 °C




BP 1.0 °C
MP -105.0 °C

***cis** and **trans*** nomenclature can only be used when then there are hydrogen atoms at each end of the bond

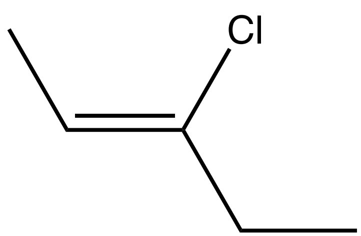
H atoms at either end are on the same side

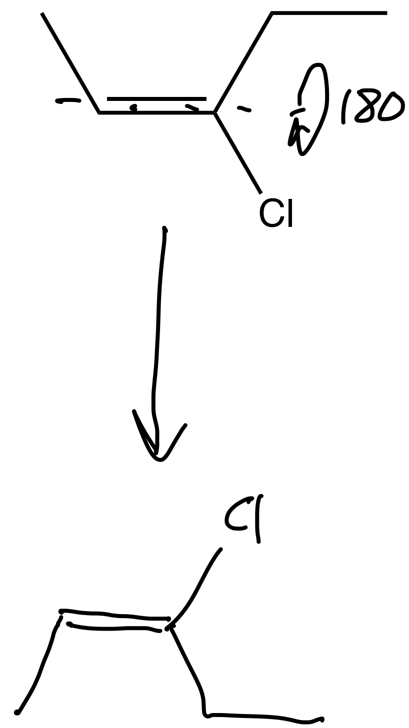
For alkenes to have a stereoisomer, both ends must have 2 dif groups

Stereoisomers in alkenes: *cis* and *trans* nomenclature doesn't work for all alkenes



3-chloropent-2-ene



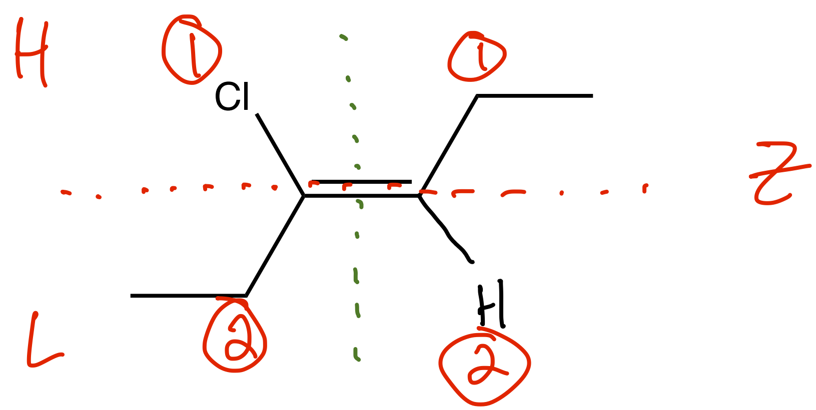




diastereomers

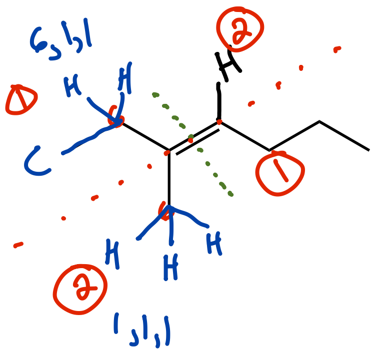
use Z/E

First: One end at a time, assign priority to groups at each end of double bond
- higher priority is given to the group with the higher atomic number for the atom directly bonded to the $sp^2$ carbon
- in a tie, consider the atomic numbers of the atoms attached to the atom that is attached to the $sp^2$ carbon (move one bond further out from the $sp^2$ hybridized C atom)
- if the atom that is attached to the $sp^2$ carbon has a doubly bonded or triply bonded atom attached to it the atom is treated like there are two or three atoms singly bonded to the atom that is bonded to the $sp^2$ carbon
- when comparing isotopes, the mass number is used (D vs H, $^{12}C$ vs $^{13}C$)

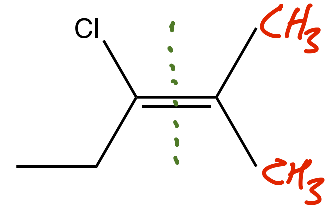
Second: If the high priority groups at each end of the double bond are on the **Zame Zide**, the proper designation is **Z**, if they are on **opposite** sides, then **E**.




https://www.westfield.ma.edu/PersonalPages/cmasi/Z,E_priority_worksheet.pdf

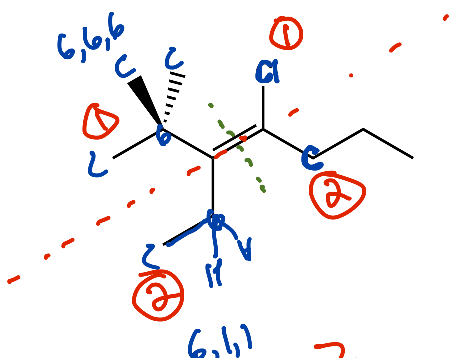



E

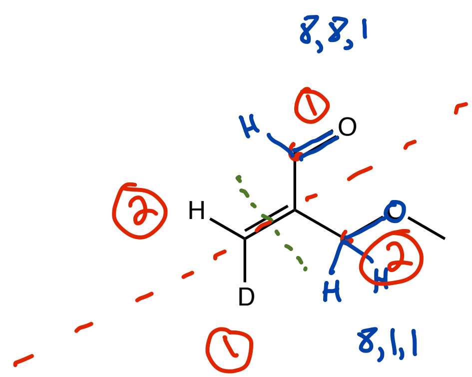



Z? E?

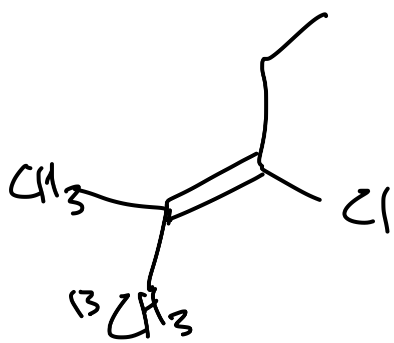
no stereoisomers




Z




E




$^{2}H = D$