

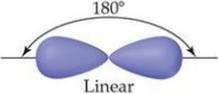
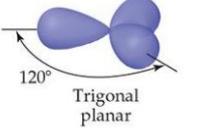
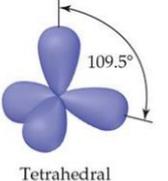
Lecture 5: Hybridisation of Orbitals

Hybrid orbitals

- The process of mixing orbitals as atoms approach each other is called hybridisation
- Mixed orbitals are called hybrid orbitals

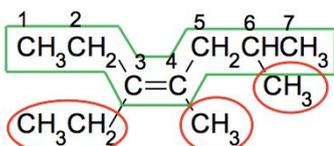
Sp hybrid orbitals

- Mixing the s and p orbitals yields two degenerate orbitals that are hybrids of the two orbitals.
- These sp hybrid orbitals have two lobes like a p orbital. One of the lobes is larger and more rounded as is the s orbital.

Atomic orbital set	Hybrid orbital set	Geometry
s,p	Two sp	 Linear
s,p,p	Three sp ²	 Trigonal planar
s,p,p,p	Four sp ³	 Tetrahedral

Alkene Naming

1. Find and name the longest chain containing C=C. Use "ene" suffix
2. Number the chain from the end closest to C=C
3. List alkene position(s) using the lower numbered C
4. List remaining substituents and positions



3-ethyl-4,6-dimethylhept-3-ene

3-ethyl-4,6-dimethyl-3-heptene

Cis/trans isomers

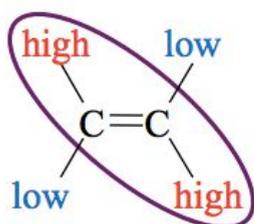
Cis → constituents on the same side

Trans → on different sides

- Any alkene containing different substituents on either side of the C=C can have stereoisomers (2 → cis and trans)
- HOWEVER this only works if there are 2 types of substituents

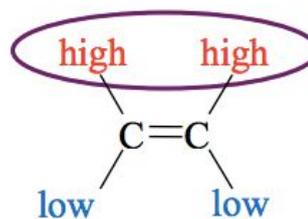
E/Z naming system

1. Rank the substituents (based on atomic number)
2. Assign E or Z based on the positions of the *two highest priority groups*. Draw a dotted line through the double bond to find out.
3. E → different sides Z → same side ("on the same side")



E (*entgegen*)

higher priority groups on **opposite** sides



Z (*zusammen*)

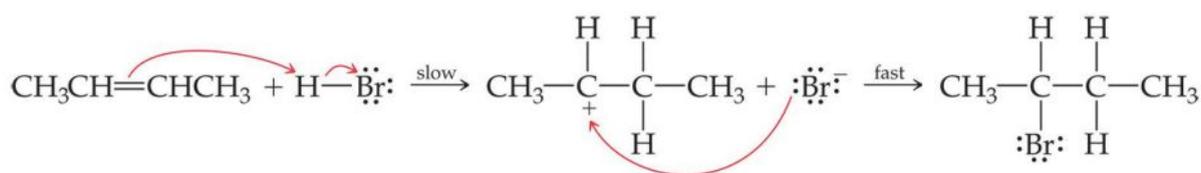
higher priority groups on **same** side

Assign E or Z based on the relative positions of the two highest priority groups

Lecture 6: Reactions of Alkenes

1. Hydrohalogenation

- It's a two step process
- Curved arrows represent the movement of electrons
- First step is the slow RATE DETERMINING STEP. Second step is faster



But... there are two possible places that H could stick to (because it's a double bond)

How we know: its a regioselective reaction

- The preference is a result of the stability of the intermediate carbocation Primary < Secondary < Tertiary. Tertiary is more favoured.

"In the addition of HX to an alkene, the hydrogen adds to the side of the double bond bearing the greater number of hydrogen atoms bonded to it" "The hydrogen goes with the crowd"

Example Q: What would you expect to be the major product in the reaction of propene with HBr?

2. Hydration: Addition of water to an alkene or alkane (with a strong catalyst) (Usually H₂SO₄)

- Creates a hydronium ion and an alcohol
- Because the reaction is at equilibrium, it can be reversed. Therefore an alcohol can be dehydrated to form an alkane or alkene...

