Course Chem 343 Lecturer Gellman 11AM
Day Wednesday Date 9-21-2011
Notes Taken By Derek Salter Total # of Pages 6

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"In the news"
→ very long C-C bond (1.70 Å). See website

H_3C-CH_3 1.54 Å (typical)

Recall: Relationships between molecular structure & Brønsted acidity

1) Periodic Trends

(a) Acidity increases in a row from left to right.

Acidity

$CH_4 < NH_3 < H_2O < HF$

Consider conjugate bases:

$:\overset{\ominus}{C}H_3$ vs. $:\ddot{\overset{\ominus}{O}}H$

↑ negative charge on not very electronegative atom

↑ negative charge on very electronegative atom

(b) Down a column - acidity increases

Ex:		pKa
	HO-H	16
	HS-H	7

See text for rationale.

2) Charge effects - cationic species more acidic than neutral analogues.

$H_3\overset{\oplus}{N}-H$ vs. $H_2\ddot{N}-H$

pka ~ 9 pka ~ 35

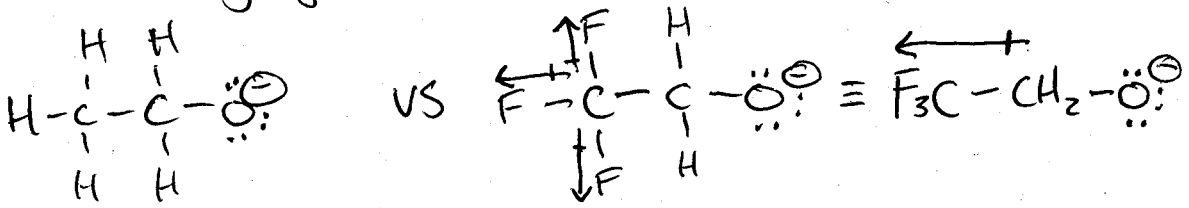
3) Polar substituents - generally electronegative atoms (rel. to carbon)

- draw $e^{\ominus}$ density away - stabilize conjugate base form - increase acidity.

CH_3CH_2O-H vs. CF_3CH_2O-H

pka ~ 16 pka ~ 12

Consider conjugate bases



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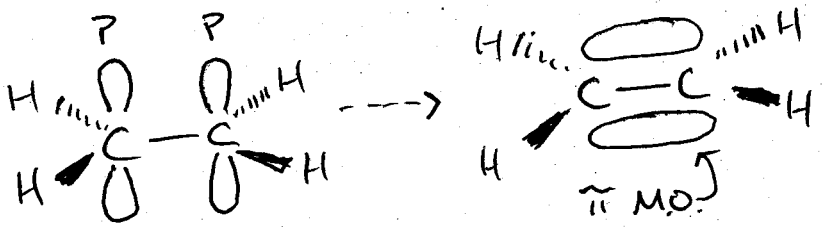
Ch. 4 - Alkenes - contain at least one C=C (double bond)

Rec. problems: 1, 2, 5-10, 12-26, 29-37, 39, 40, 41-43
46-53, 55-58, 60-66, 68 (39, 40: structures NOT names)

Simplest case: $H_2C=CH_2$ (ethene or ethylene)

Recall: double bond has σ & π components - focus on π!

short-hand "π-centric" view.



- π-e⊖s less tightly held than σ-e⊖s, thus π bonds are often sites of reaction. consider bond energies. (cost of breaking bond)

typical alkane: C-C σ bond ≈ 90 $\frac{kcal}{mol}$

C-C π bond ≈ 58 $\frac{kcal}{mol}$

Less energy required to break bond.

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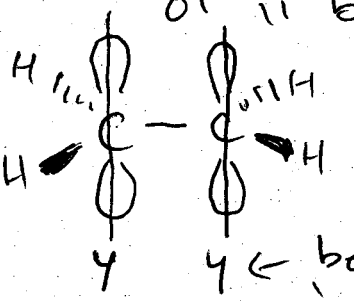
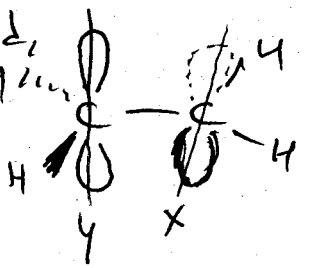
Alkenes can form stable geometric isomers because rotation about C=C bond does not occur. (would require temporary breaking of π bond).



← both p orbitals in y-axis - if ~~you~~ rotate around σ bond,

p-orbitals no longer in same plane. π-bond is broken.



Ex: Isomers of $H_3C-CH=CH-CH_3$

(2-butene)

- 2 → location of π bond
- but → 4 C's
- ene → double bond.

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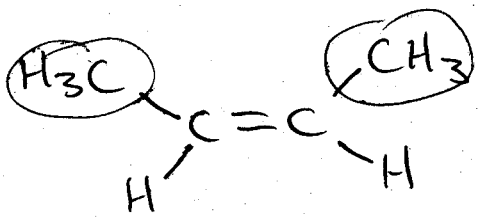
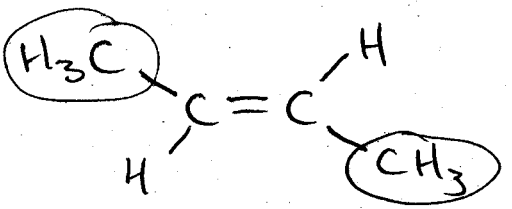
Isomers



vs.

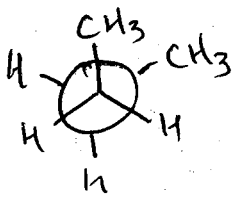


cis-2-butene
↓
same side

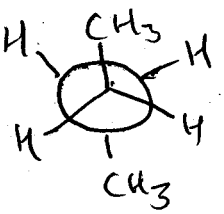
trans-2-butene
↓
opposite ~~side~~ sides

to convert cis to trans, must break π bond ($58 \frac{kcal}{mol}$).

Compare to butane



vs.



only ~5 $\frac{kcal}{mol}$ difference in energy between gauche & anti
- easy to interconvert

General nomenclature for geometric isomers (or "~~stereoisomers~~ stereoisomers") of alkenes

E vs. Z

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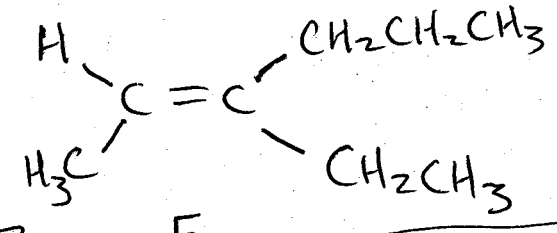
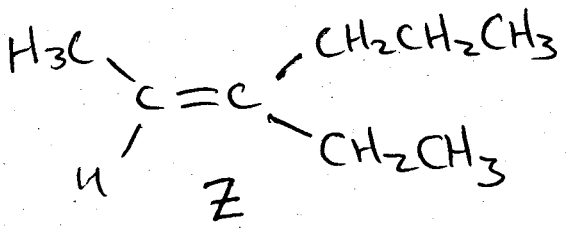
Ex:



E

vs.



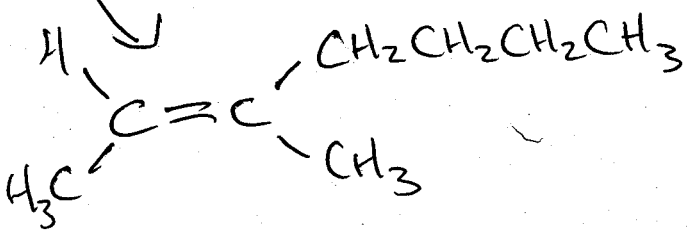
Z

No longer have the same group attached to double bonded C's

Note: Stereoisomers - differ only in spatial arrangements of atoms

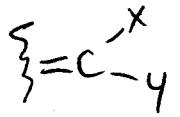
Contrast

Constitutional isomers - different bonding patterns.



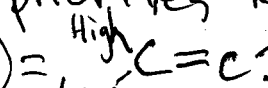
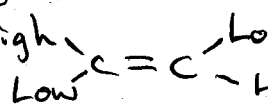
Assignment of E vs. Z →

focus on each alkene C separately to begin



Establish priority between X & Y

once priorities known for both alkene C's

(Z) =  vs.  = (E)