Course CH 343 Sec 003 Lecturer Sam Hellman

Day Monday 1:20 Date 9/12/11

Notes Taken By Alicia Phelps Total # of Pages 4

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Recall:
- Bonding in organic molecules
- Polar bonds & polarity of molecules
- Drawing conventions

Chapter 2 - alkanes

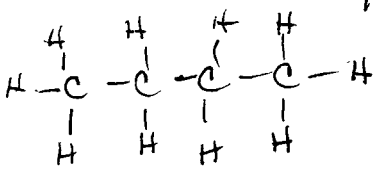
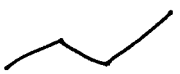
Rec. Problems: 1, 3-12, 14, 15, 23, 24, 26-28, 30, 31, 33-41, 44-48

• alkane: molecule composed of C+H, contains only single bonds

MEMORIZE: Names of linear alkanes, C_1-C_{10} (Table 2.1)

CH_4 = Methane
CH_3CH_3 = Ethane ...etc

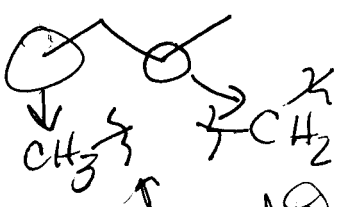
Graphical Conventions: Butane (C_4H_{10})

$CH_3CH_2CH_2CH_3$ or  or 

Interpreting ("skeletal drawing")

Skeletal drawings:

1) End of every line (including where 2 lines meet) = C
2) Every unspecified C valence is H



bonded to something unspecified

• Don't feel like you always need to use skeletal structures yet

Course CH 343 Sec 003 Lecturer Sam Gellman

Day Monday 1:20 Date 4/12/11

Notes Taken By Alicia Phelps Total # of Pages 4

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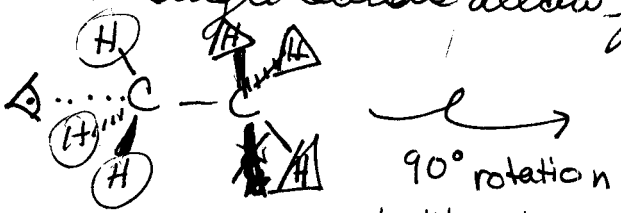
- These drawings only indicate bond connectivity, not 3D shape!

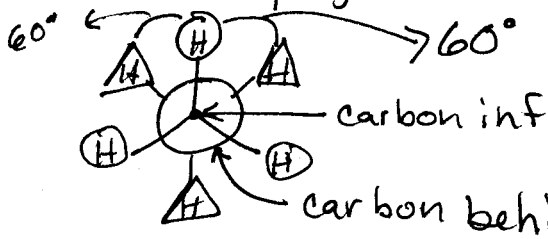
Alkane Shapes or Conformations

- C-C single bonds allow free rotation



90° rotation looking along c-c bond

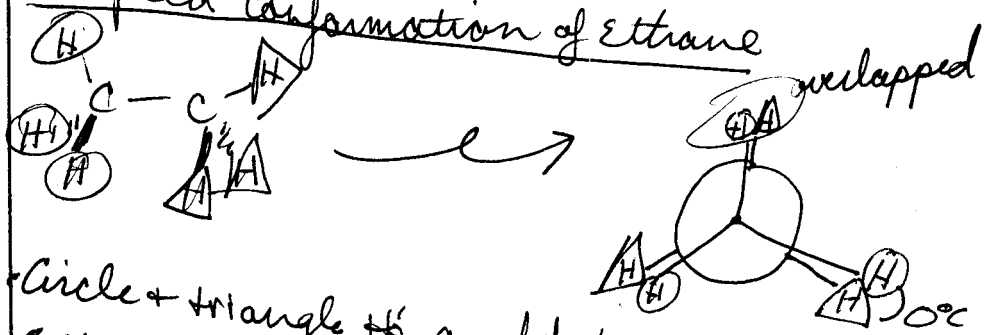
Newman projection



Staggered conformation of ethane

- Any 2 H's connected to the same C are 120° apart in the Newman projection — not the actual bond angle, just because of perspective
- all H's are equidistant

Eclipsed Conformation of Ethane



- Circle + triangle H's could have any degree of separation 0→60°C
- staggered + eclipsed are max/min cases
- These names apply to any alkane

Energy Diagram for Rotation about the C C bond

Course CH343 Sec 003 Lecturer Sam Gellman

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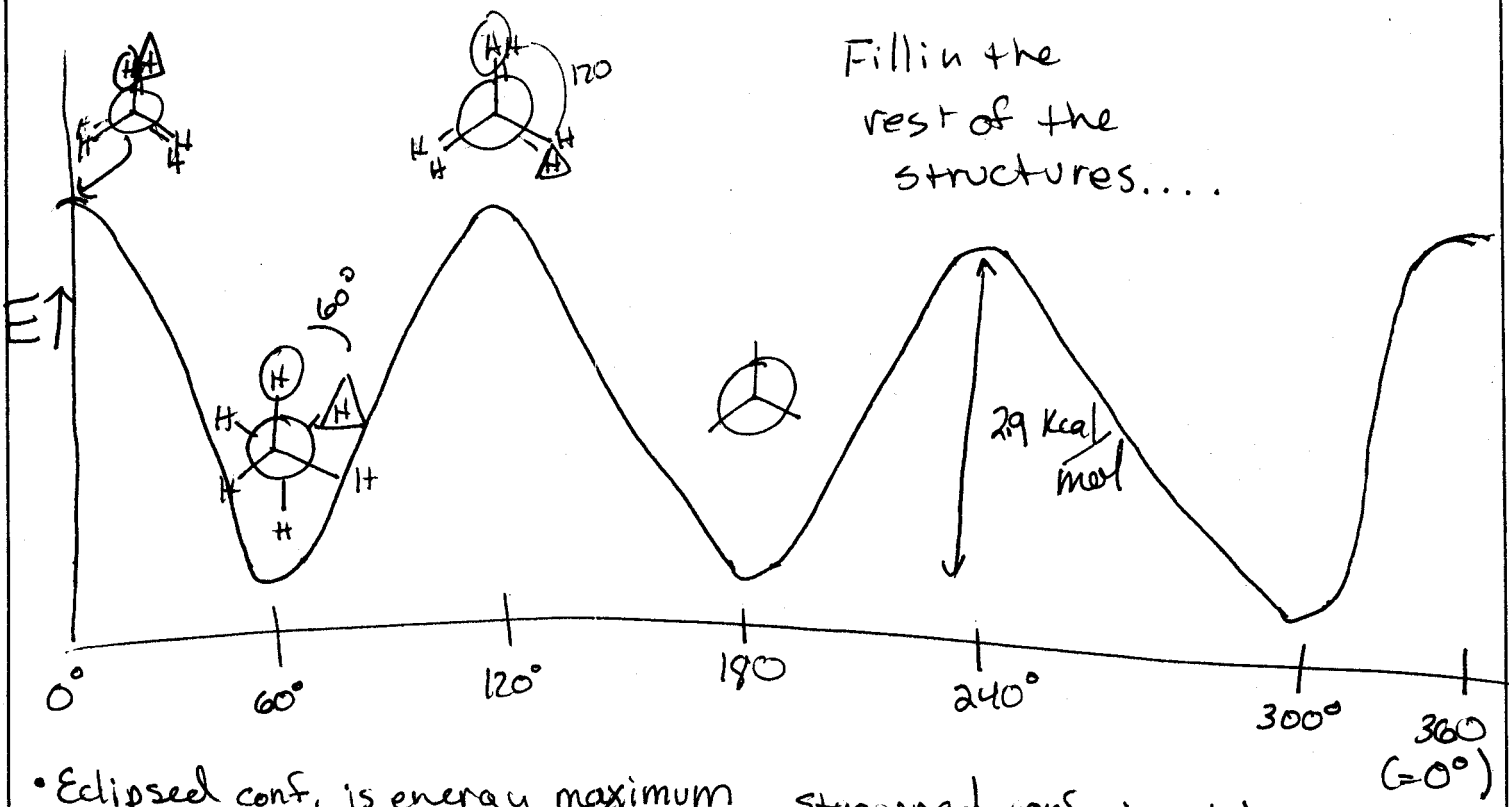
Energy Diagram



- Eclipseed conf. is energy maximum, staggered conf. is minimum

Note:

1) Eclipsed energy maximum. (pl=maxima) ...?
2) staggered E minimum (pl=minima :)

- Tells us eclipsed is least stable conf, staggered is most stable.
- Difference between eclipseed + staggered is ~2.9 Kcal/mol (~12KJ/mol)
  → Very small difference in energy

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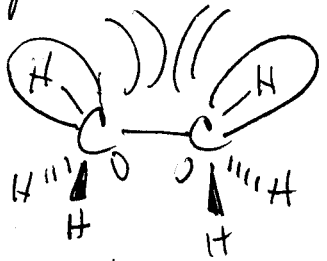
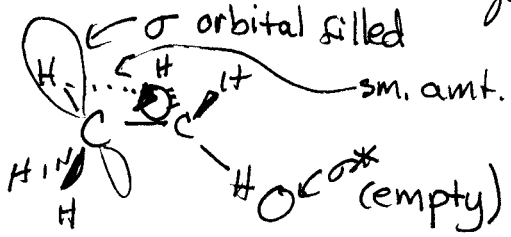
why is staggered more stable? 2 factors

1) Repulsion between pairs of C-H σ bond $e^{\ominus}$s in eclipsed



eclipsed

2) $\sigma \rightarrow \sigma^* e^{\ominus}$ delocalization (favored in staggered but not in eclipsed



- Some very sm amt of e⊖ repulsion in the bond → moving a little into σ* lowers energy by relieving this.