

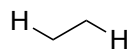
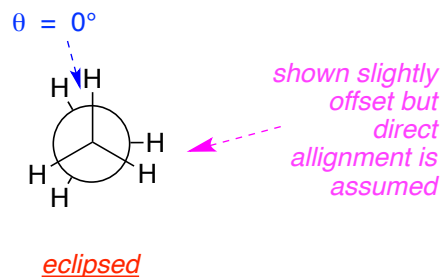
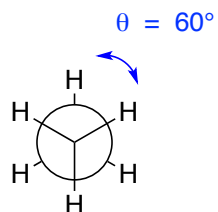
# Saturated Acyclic Hydrocarbons

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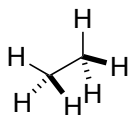
## A. Introduction

## B. Conformations Of Acyclic Hydrocarbons

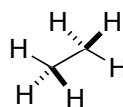
### Ethane



staggered



eclipsed

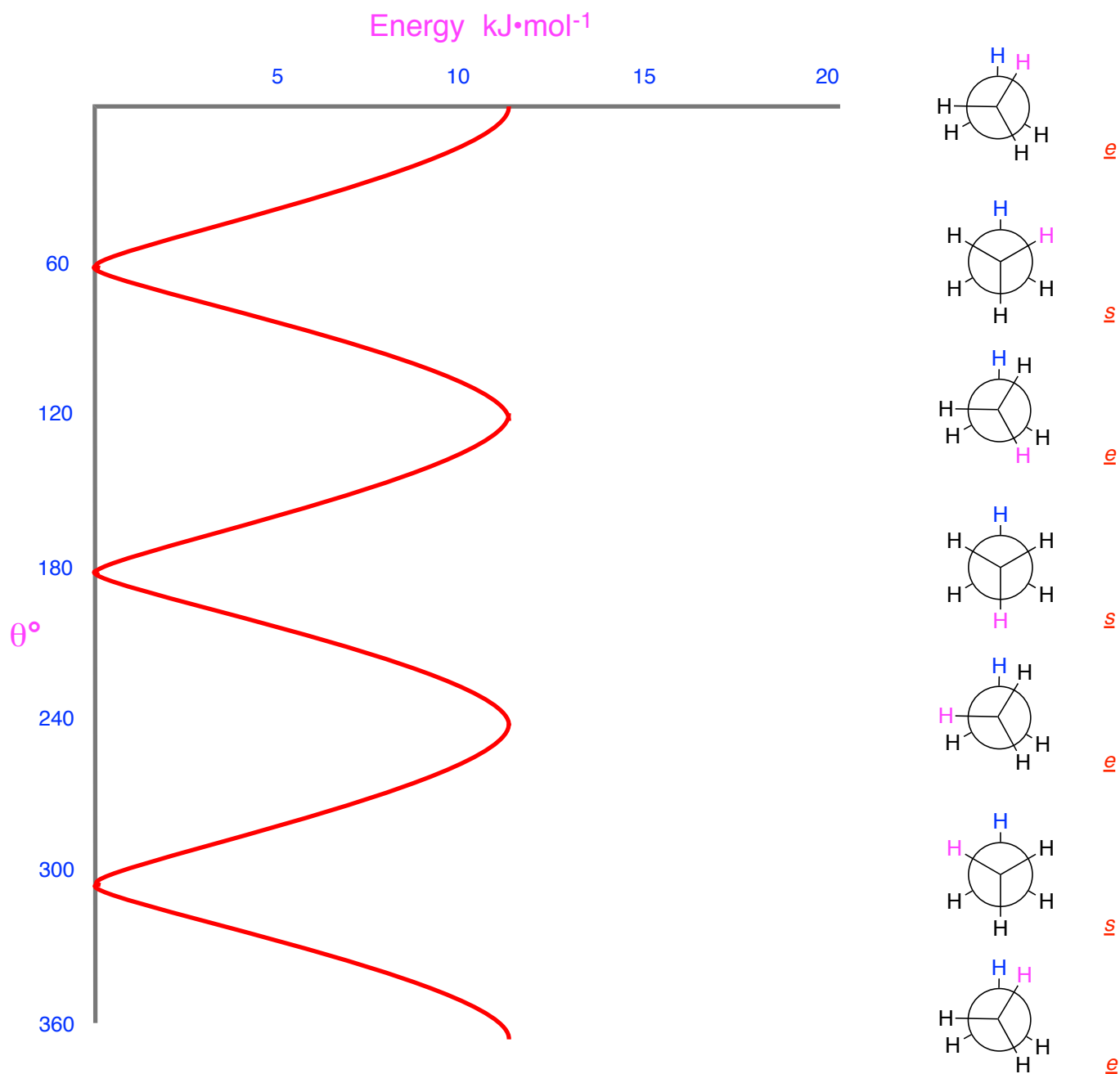


staggered



eclipsed

The staggered ethane conformer is more stable



called torsional strain.

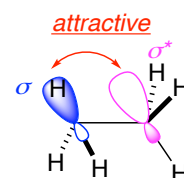
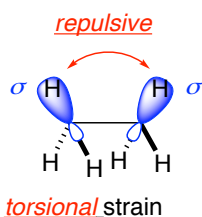
indicate *destabilizing* interactions

*stabilizing* interactions between empty and filled orbitals in staggered conformations.

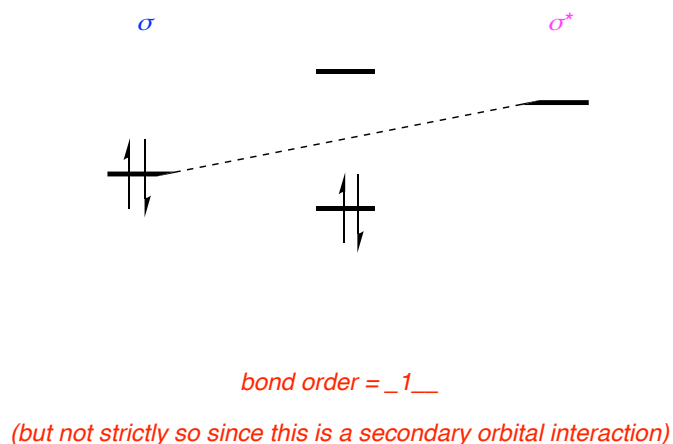
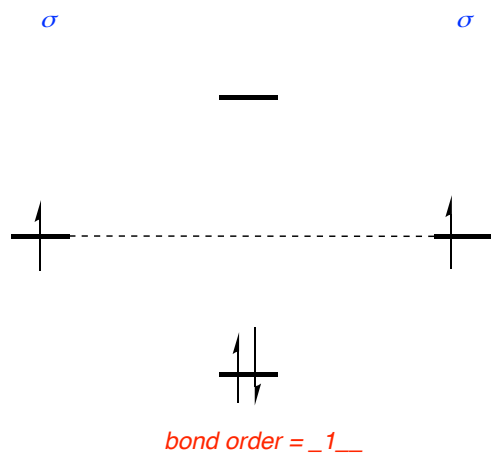
if both the highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital are filled, this is slightly *destabilizing*.

contributes 2 e

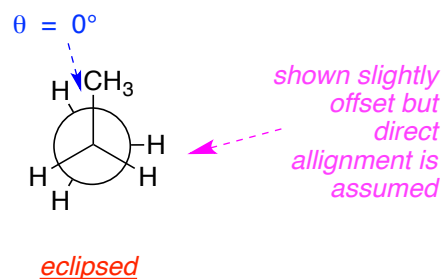
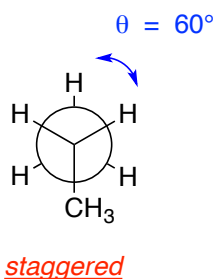
empty one donates 0 e.

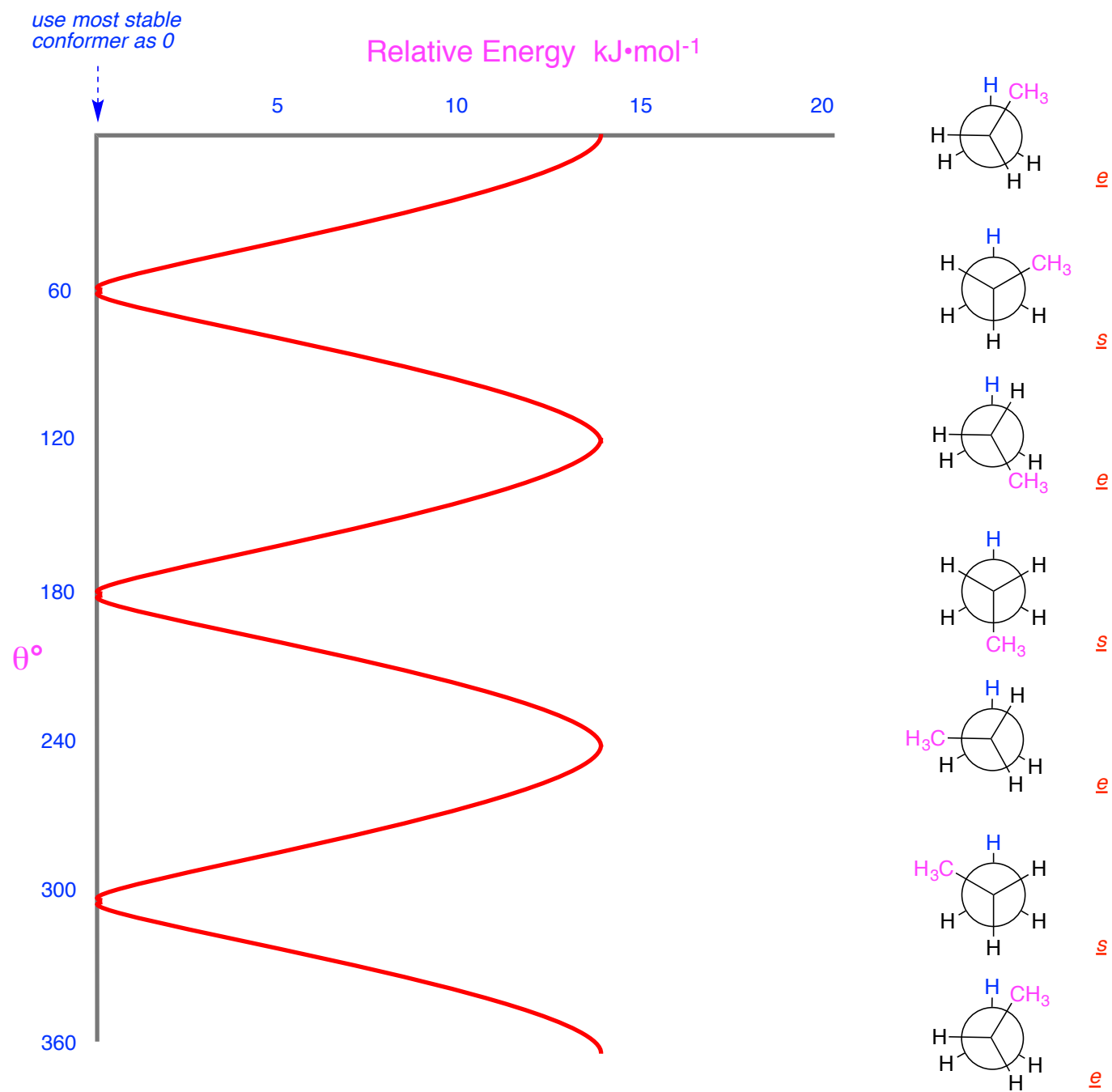


add electrons to the diagrams below and indicate bond orders:

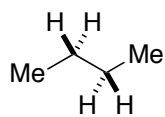


## Propane



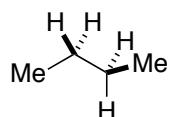


## Butane



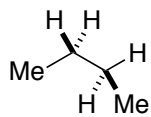
very low

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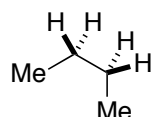
high

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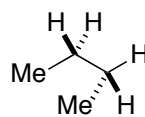
low

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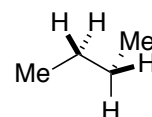
very high

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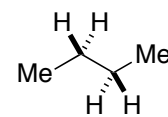
low

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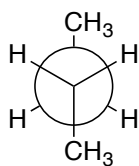
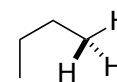
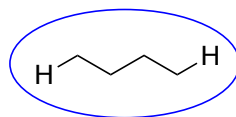
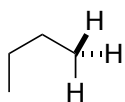
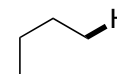
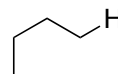
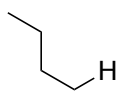
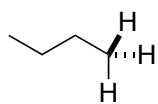
high

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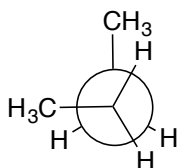
very low

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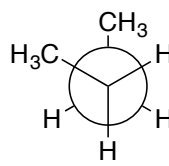
a

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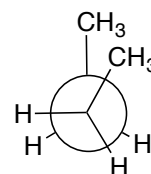
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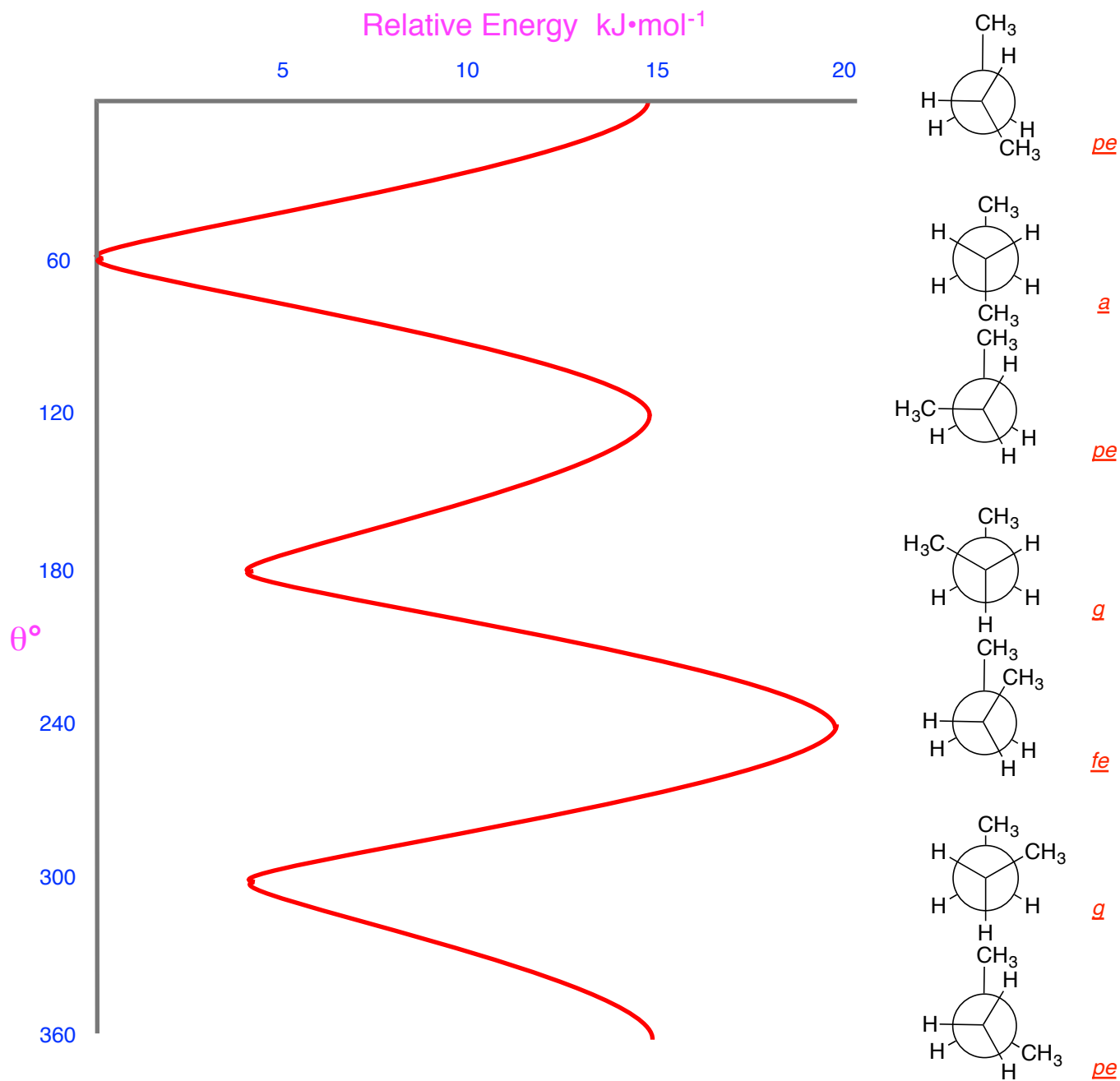
g

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fe

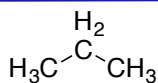
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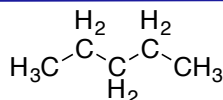
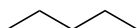
## C. Art In Organic Chemistry

represents  $\text{CH}_3$ , two bonds to an apex means it is a  $\text{CH}_2$ , and three bonds to a branch point represent  $\text{CH}$ . If there are four bonds to a central point, this means there are  $0$  hydrogen atoms on that carbon.

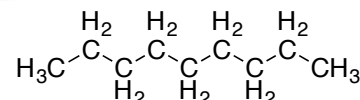
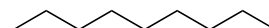
propane



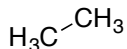
pentane



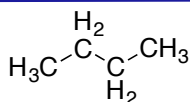
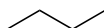
nonane



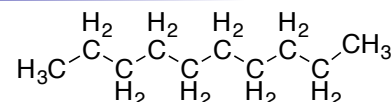
ethane



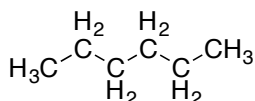
butane



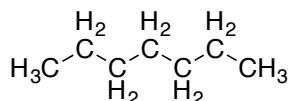
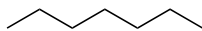
decane



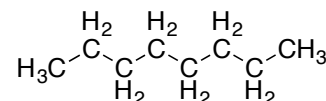
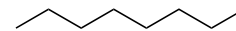
hexane



heptane



octane

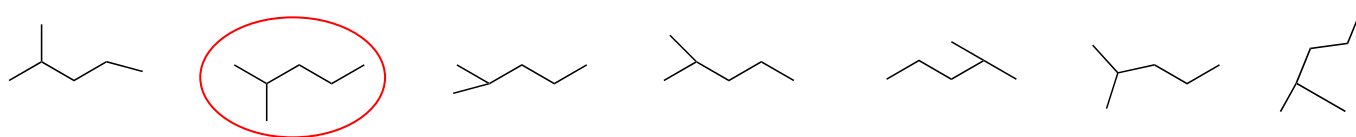




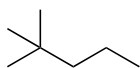
$sp^3$  hybridized carbons are 109°.  
 has 4 bonds to other atoms.  
 structures always have this number

never have five or more atoms attached to them.  
 $sp^3$  because they have 4 atoms attached.

tetrahedral shape  
 about 109°



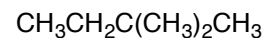
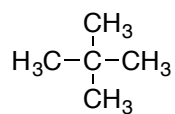
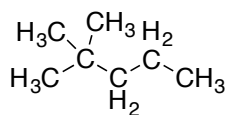
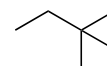
2,2-dimethylpentane

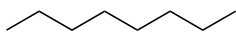


2,2-dimethylpropane



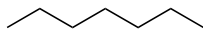
2,2-dimethylbutane





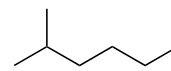

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*octane*




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*heptane*



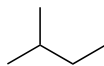

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*2-methylhexane*



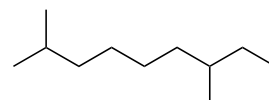

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*methylpropane*



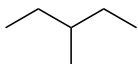

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*2-methylbutane*



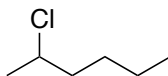

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*2,7-dimethylnonane*



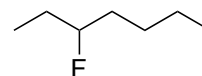

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*3-methylpentane*



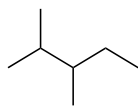

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*2-chlorohexane*



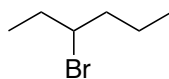

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*3-fluoroheptane*



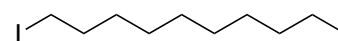

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*2,3-dimethylpentane*



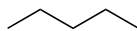

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*3-bromohexane*



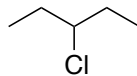

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*1-iododecane*



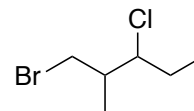

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*CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>*



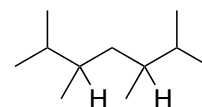
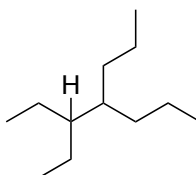
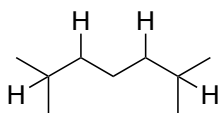
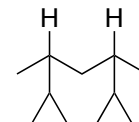
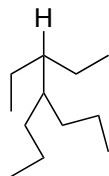
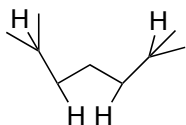
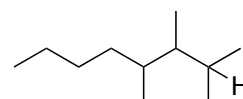
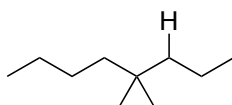
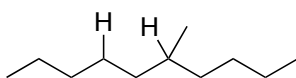
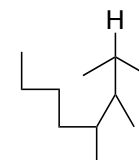
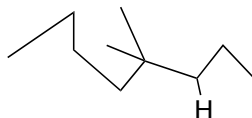
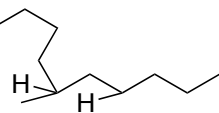
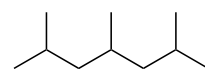
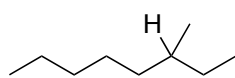
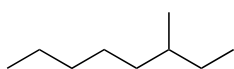
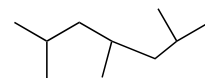
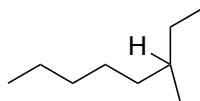
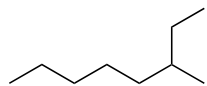
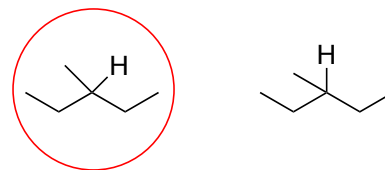
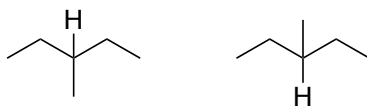

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*CH<sub>3</sub>CH<sub>2</sub>CHClCH<sub>2</sub>CH<sub>3</sub>*

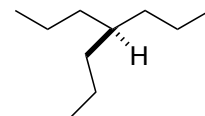
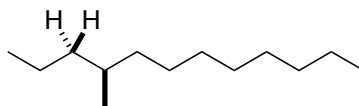
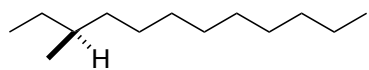
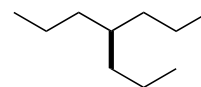
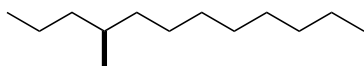
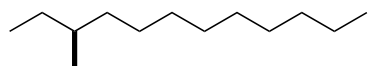
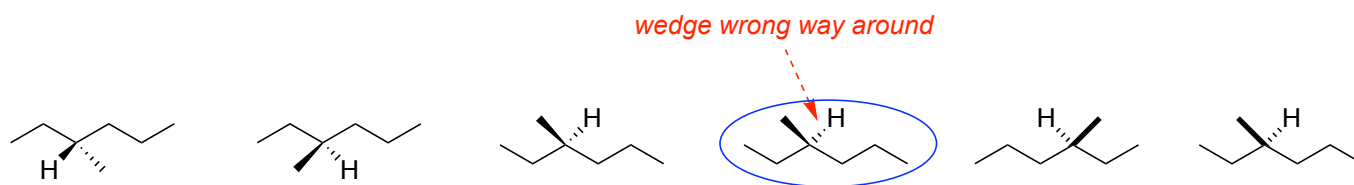
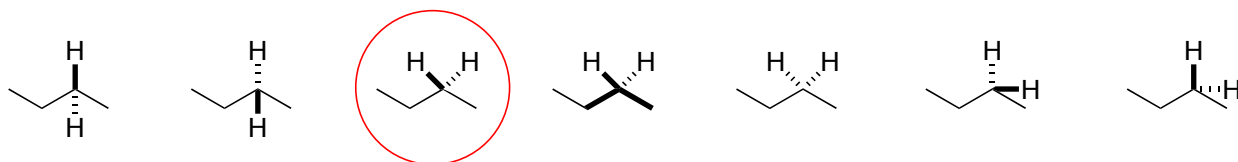



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*BrCH<sub>2</sub>CH(CH<sub>3</sub>)CHClCH<sub>2</sub>CH<sub>3</sub>*



## Three Dimensional Diagrams Of Organic Molecules




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.... the C<sup>3</sup> hydrogen

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.... both hydrogens on C<sup>3</sup>

---

.... the H on unique C

## Alkyl Fragments

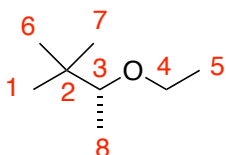
is called a methyl.

that have CH<sub>2</sub> connected to

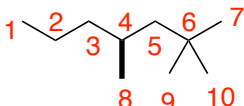
Methine is the name given to CH fragments.

is called a methyl.

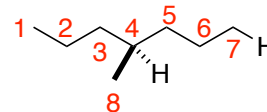
A quaternary C has 0 hydrogen atoms attached.



C1, C5, C6, C7, C8 methyl  
C2 quaternary  
C3 methine  
C4 methylene



C1, C7, C8, C9, C10 methyl  
C2, C3, C5 methylene  
C4 = methine  
C6 = quaternary



C1, C7, C8 methyl  
C2, C3, C6 methylene  
C4 = methine

ie substituted

CH<sub>3</sub>, Me

CH<sub>3</sub>CH<sub>2</sub>, Et (circle all correct).

cannot be isolated

is not a discrete compound,

is a molecular fragment.

A jagged line drawn perpendicularly across a bond means the fragment is / is not attached to something else.

2 types of hydrogen atoms

different outcomes.

Replacement of a hydrogen at the end of the chain gives a normal-propyl

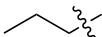
MeCH<sub>2</sub>CH<sub>2</sub>, EtCH<sub>2</sub>, <sup>n</sup>Pr (circle all correct).

Conversely, removal of a proton at C<sup>2</sup> gives a(n) iso-propyl

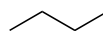
as <sup>i</sup>Pr, (CH<sub>3</sub>)<sub>2</sub>CH (circle all correct)



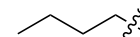
propane



n-propyl



butane



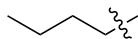
n-butyl

3 types of hydrogen atoms

gives a normal butyl group

as MeCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>, <sup>n</sup>PrCH<sub>2</sub>, CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>

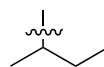
a sec-butyl group that can be represented as  $\text{CH}_3\text{CH}_2\text{CHCH}_3$   
isomer of butane: it has 2  
an *i*Bu group.  
something, ie a *i*Bu group.



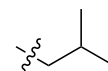
*n*-butyl



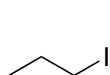
*tert*-butyl



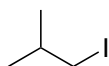
*sec*-butyl



*iso*-butyl



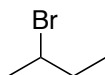
<sup>n</sup>PrI



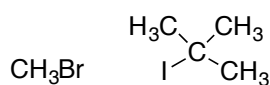
<sup>i</sup>BuI



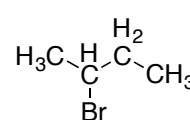
<sup>i</sup>PrCl



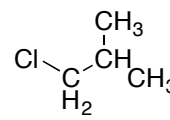
<sup>t</sup>BuBr



MeBr



<sup>t</sup>BuI

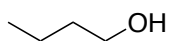


<sup>s</sup>BuBr

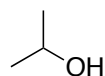
<sup>i</sup>BuCl



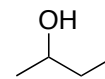
<sup>t</sup>BuOH



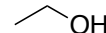
<sup>n</sup>BuOH



<sup>i</sup>PrOH



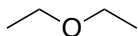
<sup>s</sup>BuOH



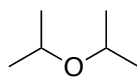
EtOH



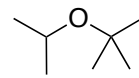
tBuOMe



EtOEt  
*an anesthetic*



iPrOiPr



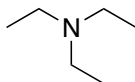
tBuOiPr



MeOMe



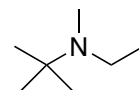
tBuNHMe



Et<sub>3</sub>N



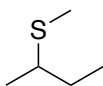
iPrNH<sub>2</sub>



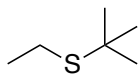
tBuNMeEt



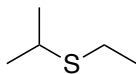
MeNH<sub>2</sub>



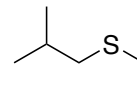
tBuSMe



EtS'tBu



iPrSEt

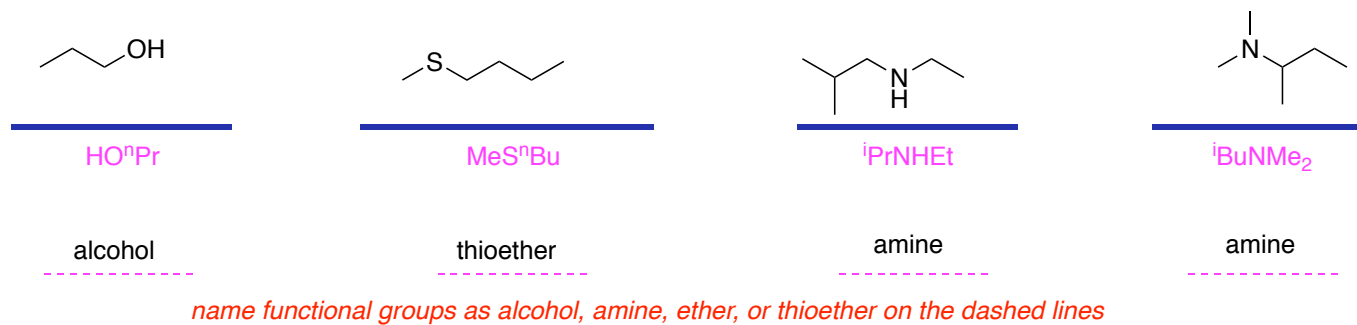


tBuSMe



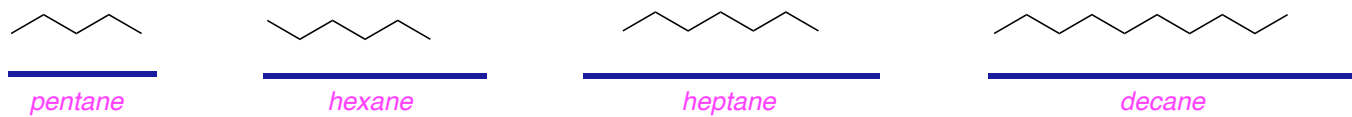
Me<sub>2</sub>S





## D. Conclusion

These *are* zig-zag conformations.



*can* be