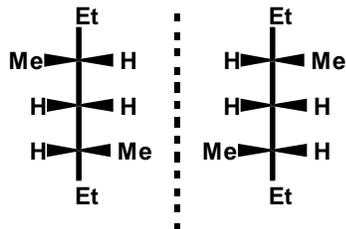
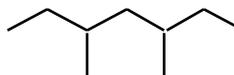


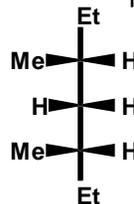
Text Related to Segment 6.05 ©2002 Claude E. Wintner

The concept of stereotopism allows a useful new perspective for understanding a somewhat complex issue of previous interest to us (segment 4.06): the question of stereogenicity at C-4 in molecules having the constitution 3,4,5-trimethylheptane. We examine first the configurational isomers having the constitution 3,5-dimethylheptane, in which there is no methyl group at C-4. Just as for 3,4-dimethylhexane, the conclusion is that the configurational stereoisomers consist of a single enantiomeric pair and its achiral diastereoisomer. If we analyze the methylene hydrogen atoms at C-4 in the 3,5-dimethylheptane stereoisomers as regards their stereotopism, we find that, for each of the enantiomers of the chiral form, the hydrogen atoms at C-4 are homotopic. For the achiral form, the C-4 hydrogen atoms are diastereotopic:

stereoisomers of 3,5-dimethylheptane:

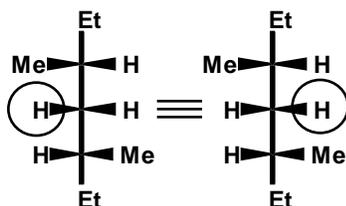


enantiomeric pair



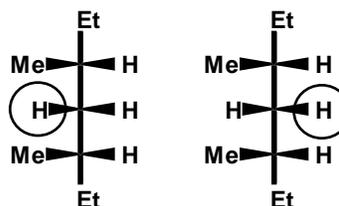
achiral diastereoisomer

Test the H atoms at C-4
(of a single enantiomer):



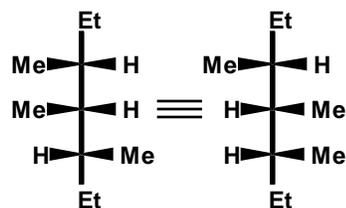
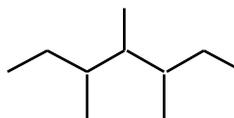
conclusion:
homotopic hydrogen atoms

Test the H atoms at C-4:

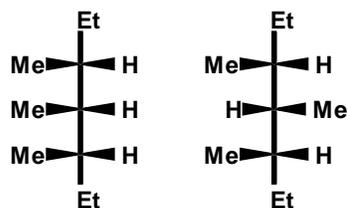


conclusion:
diastereotopic hydrogen atoms

Now apply to 3,4,5-trimethylheptane,
by replacing each circled hydrogen
atom with a methyl group:



Since the hydrogen atoms at C-4 in (either enantiomer of) the chiral stereoisomer of 3,5-dimethylheptane are homotopic, it follows that C-4 in (either enantiomer of) the chiral stereoisomer of 3,4,5-trimethylheptane cannot be stereogenic.



Since the hydrogen atoms at C-4 in the achiral stereoisomer of 3,5-dimethylheptane are diastereotopic, it follows that C-4 in the achiral stereoisomers of 3,4,5-trimethylheptane must be stereogenic.

topicity at C-4 in 3,5-dimethylheptane stereoisomers determines stereogenicity at C-4 in 3,4,5-dimethylheptane stereoisomers

Now, if we replace each topologically distinct hydrogen atom at C-4 by a methyl group, we are assured of discovering all stereoisomers in the 3,4,5-trimethylheptane manifold: the enantiomeric pair, and its two achiral diastereoisomers, as the figure makes clear. Furthermore, we immediately can apprehend that — since the hydrogen atoms at C-4 in (either enantiomer of) the chiral form of 3,5-dimethylheptane are homotopic — C-4 in (either enantiomer of) the chiral form of 3,4,5-trimethylheptane *cannot be* stereogenic. By similar reasoning, since the hydrogen atoms at C-4 in the achiral stereoisomer of 3,5-dimethylheptane are diastereotopic, it follows that C-4 in *each* of the two achiral stereoisomers of 3,4,5-trimethylheptane *must be* stereogenic.

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