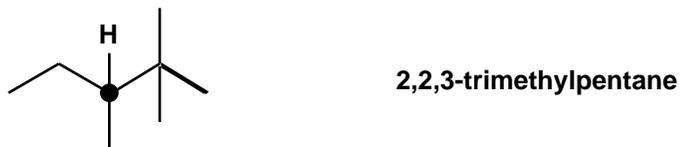
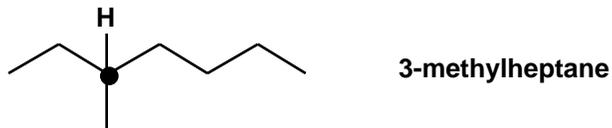


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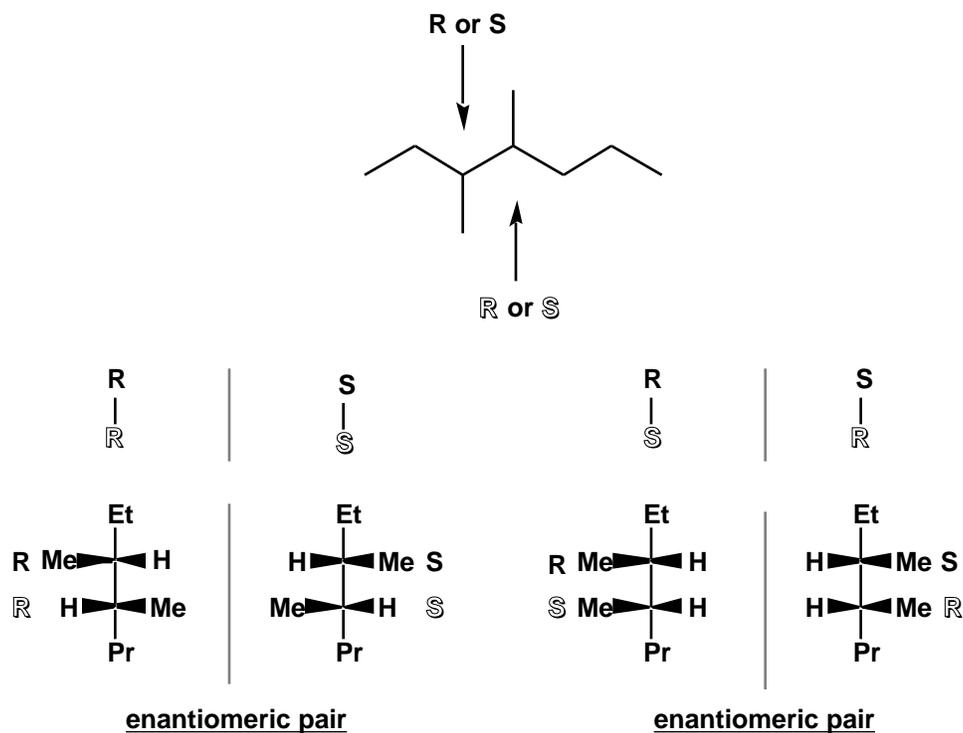
To elaborate on the ideas developed so far, let us work out in some detail the cases of those C_8H_{18} hydrocarbons that contain a stereogenic center or centers. Considering first only constitution, of the eighteen different constitutional formulae possible in the C_8H_{18} manifold, in just five of these does one find a stereogenic carbon atom or atoms, substituted with four constitutionally distinct ligands, and marked in the figure by a dot. In those four cases where there is only a single stereogenic center, the situation is precisely the same as for 3-methylhexane. Each of these four constitutional formulae represents an enantiomeric pair, that is, two configurational isomers differing in their configuration at the stereogenic carbon atom. One isomer will have R absolute configuration, and the other S.



the five constitutional isomers (among eighteen total) having molecular formula C_8H_{18} that contain a stereogenic center or centers

On the other hand, the case with two stereogenic centers, 3,4-dimethylhexane, presents a particularly instructive example and will lead us once again onto some new ground. A special symmetry in the molecule is apparent: each of the two stereogenic centers is identically substituted — from the point of view of constitution — by hydrogen, a methyl group, an ethyl group, and a secondary butyl group. In the next segment we shall see that there exist *three* molecules, all three having the constitution 3,4-dimethylhexane, but each one differing from the other two in its configuration. However, in order to understand this situation clearly, it will be fruitful to consider first a related case from the series of hydrocarbons having molecular formula C_9H_{20} . In a molecule having the constitution

3,4-dimethylheptane there are two *non-equivalent* stereogenic carbon atoms. One is substituted by hydrogen, a methyl group, an ethyl group, and a 5-carbon (secondary pentyl) group. The other is substituted by hydrogen, a methyl group, a propyl group, and a 4-carbon (secondary butyl) group:



configurational isomers of 3,4-dimethylheptane

Simple combinatorial analysis suggests that there ought to be four configurational isomers having this constitution: the first stereogenic carbon atom can be R or S in its absolute configuration; the same holds true for the second stereogenic carbon atom, but since its substituents differ from those of the first, we should designate this difference, for example by using the labels R_{shadow} and S_{shadow} , as shown. The four possible combinations are drawn in the figure using the convenient Fischer projection. All four of these molecules have the same constitution. They are termed configurational (as opposed to conformational)

stereoisomers. (However, unless specifically mentioned to the contrary, it is common usage to use the term "stereoisomer" as synonymous with "*configurational* stereoisomer.") These molecules can be classified as two enantiomeric pairs. The relationship between molecules which are configurational stereoisomers but *not* configurational enantiomers is termed configurational diastereoisomerism (or diastereomerism). *A diastereoisomer (or diastereomer) is any stereoisomer that is not an enantiomer.* Diastereoisomers differ more profoundly than do enantiomers in the relative spatial relationships among their atoms: two diastereoisomers can be expected to have different physical, chemical, and spectroscopic properties. In sum, within the envelope of molecules having the constitution 3,4-dimethylheptane we have found two diastereoisomeric (or diastereomeric) enantiomeric pairs.

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