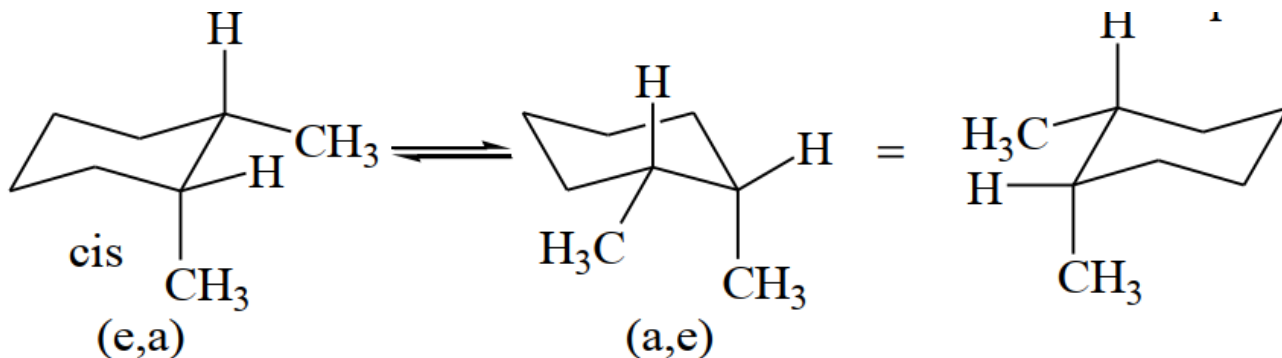


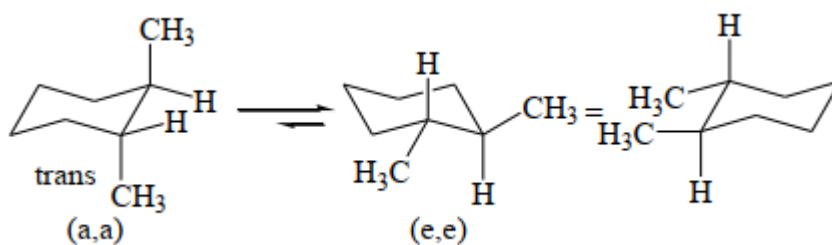
Question: discuss the relative stabilities of various conformations of 1,3-dimethylcyclohexane

Answer:

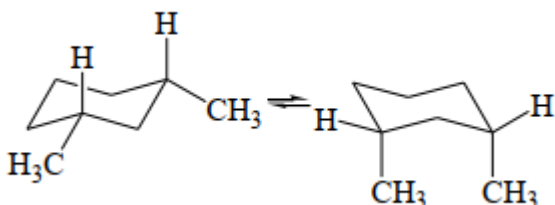
1. If we consider cis isomer of 1,2-dimethylcyclohexane, the e,a and a,e both conformer is optically active and no element of symmetry present. In both conformer three extra gauche butane interaction present and hence both conformer is equally populated. But on flipping it gives the mirror image conformer and hence they are enantiomers of each other. So due to internal compensation net optical rotation is zero and they are called invertomer. Theoretically enantiomers should be separable at very low temperature but in practice there are no such reports



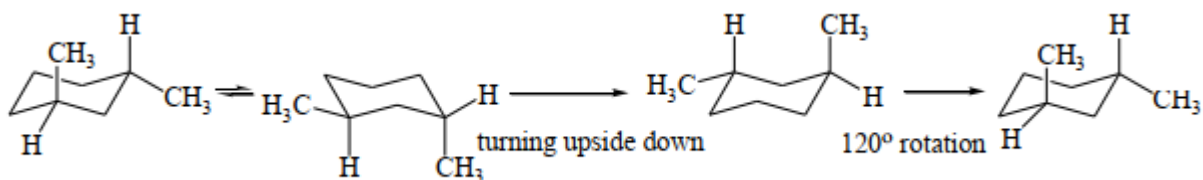
Whereas both the a,a and e,e conformation of trans 1,2-dimethylcyclohexane is optically active, can exist in enantiomers and they are resolvable. Both the a,a and e,e conformer contain a C₂ axis passing through C1-C2 and C4-C5 bond. It is obvious that in a,a conformer there is four gauche butane interaction whereas in e,e conformer there is only two gauche butane interaction and hence the e,e conformer is more stable and maximum populated.



If we look the conformation analysis of cis 1,3-dimethylcyclohexane, both the e,e and a,a conformer possess a sigma (σ) plane and hence it is optically inactive; no question of resolution arises. In a,a conformer there is two extra gauche butane interaction and hence the e, e conformer is more populated.



In case of trans isomer, both the e,a and a,e conformer contains one extra gauche butane interaction and hence both conformer is equally populated. But ring inversion itself produces an equivalent conformer and hence it is an example of topomerisation. The planar structure contains a C₂ axis and hence it is dissymmetric but puckered structure contain no element of symmetry and hence it is asymmetric molecule.



More information we can find in the link below.

<http://www.haldiagovtcollege.org.in/wp-content/uploads/2017/12/cyclohexane-2.pdf>

Answer provided by www.AssignmentExpert.com