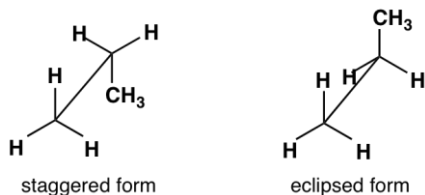
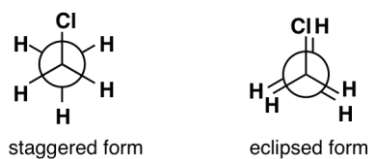


Solutions to Exercises, Chapter 4

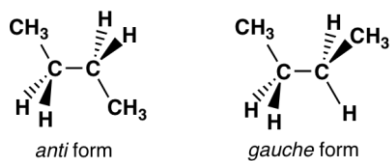
4.1



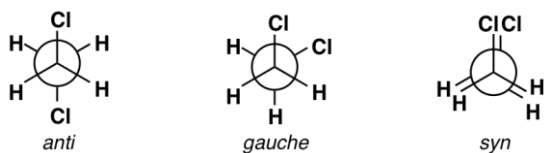
4.2



4.3



4.4

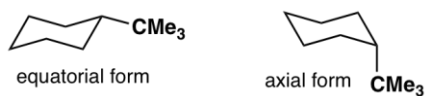


4.5 (a) 120° (b) about 128.6° (c) 135°

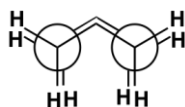
4.6



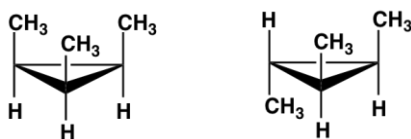
4.7 Equatorial and axial forms are possible, and the former is more stable.



4.8



4.9 Two isomers are possible, and the all-*cis* form is the less stable owing to the more severe steric strain arising from its three pairs of *syn* methyl groups:



4.10 Only one chair conformation with equatorial and axial methyl groups is possible since ring inversion gives an identical form.



4.11 (a) and (b) are both *cis*-1,3-dichlorocyclohexane, (c) is *cis*-1,2-dichlorocyclohexane, and (d) is *trans*-1,2-dichlorocyclohexane; three different compounds are given.

4.12 In a chair cyclohexane, the bulky *t*-butyl group invariably takes an equatorial position; the 3-methyl group is then equatorial in the *cis* isomer and axial in the *trans* isomer. The *cis* isomer must be the more stable because both substituents are equatorial.

