

ЦИКЛОАЛКАНЫ

Номенклатура и строение



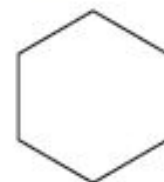
Cyclopropane



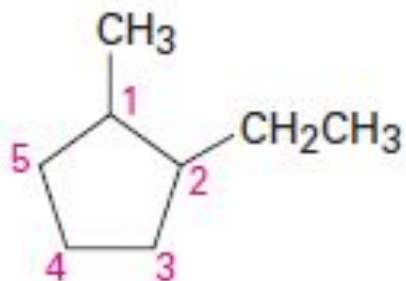
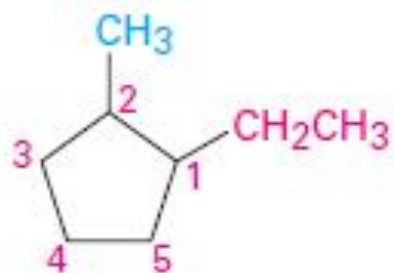
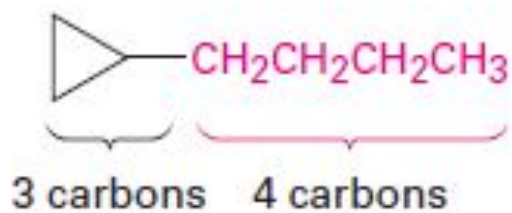
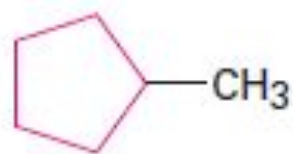
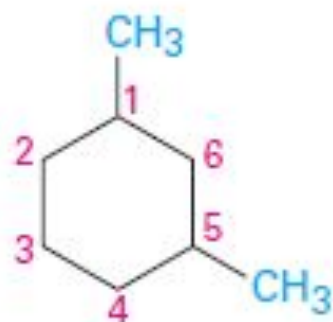
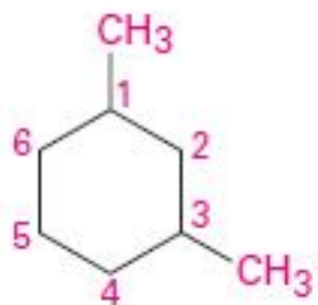
Cyclobutane



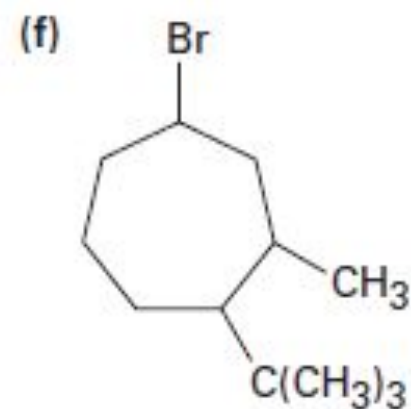
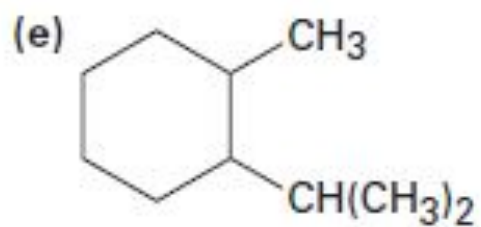
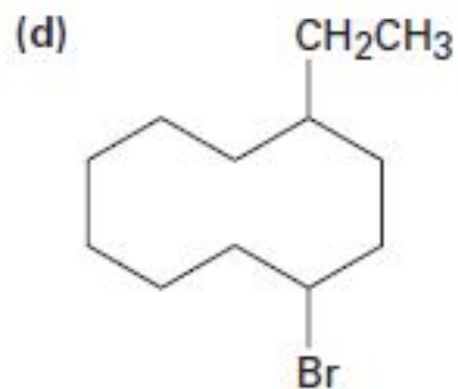
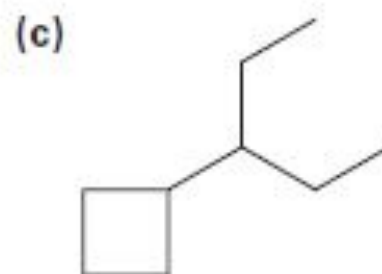
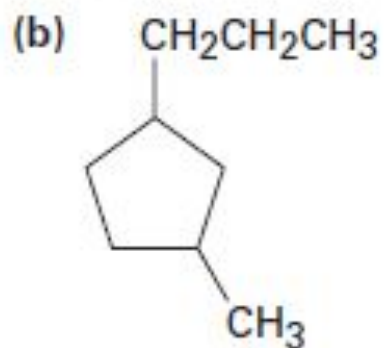
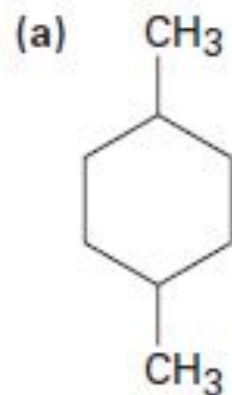
Cyclopentane

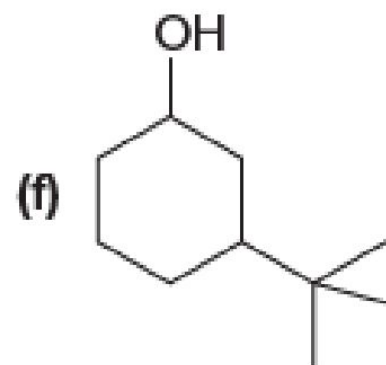
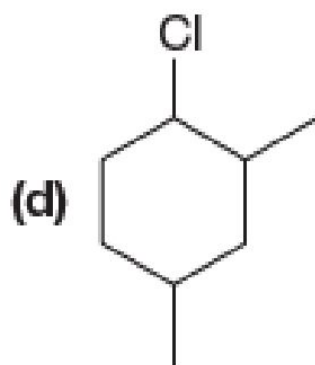
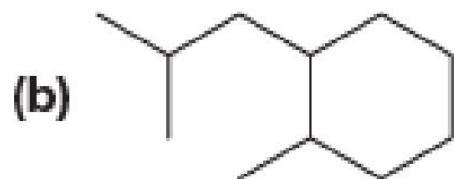
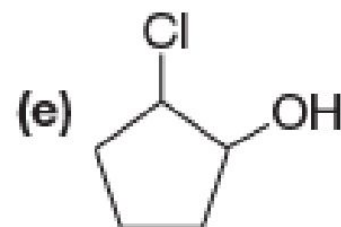
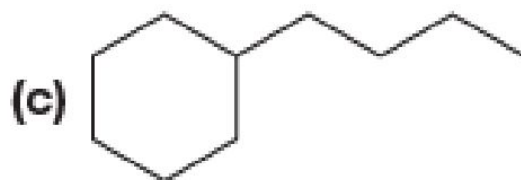
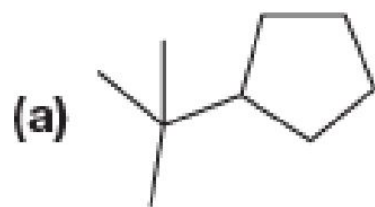


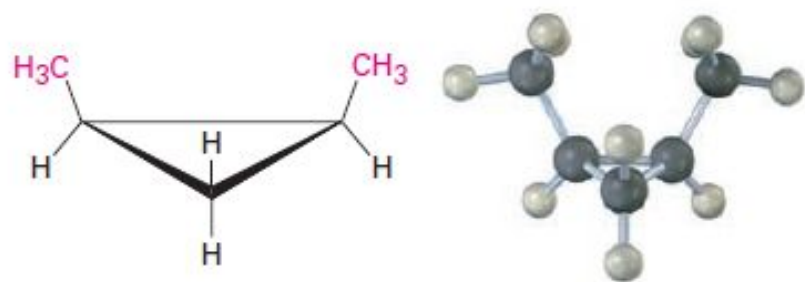
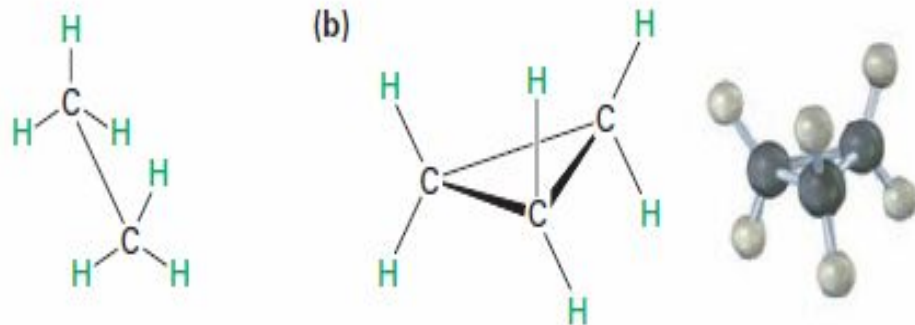
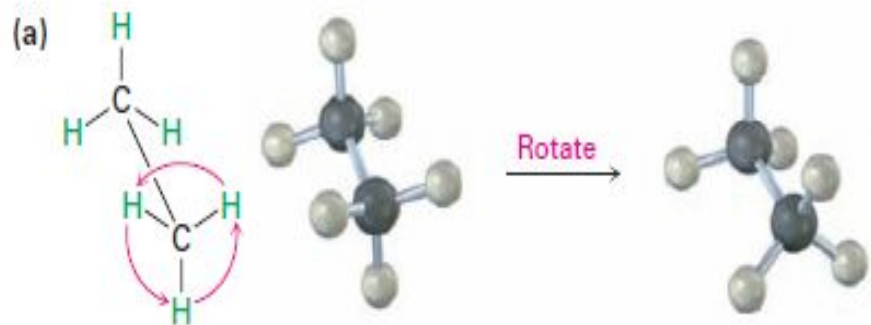
Cyclohexane



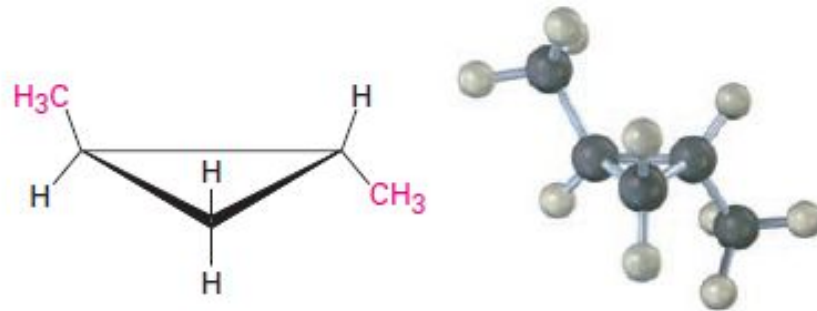
Give IUPAC names for the following cycloalkanes:



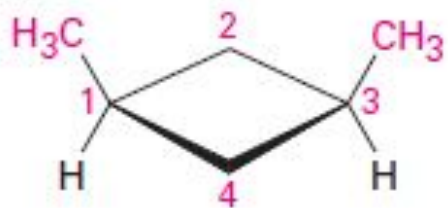




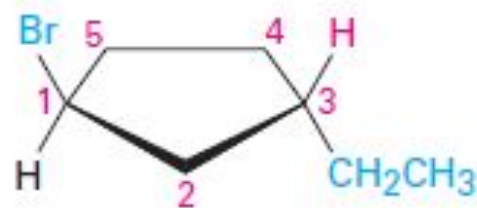
cis-1,2-Dimethylcyclopropane



trans-1,2-Dimethylcyclopropane

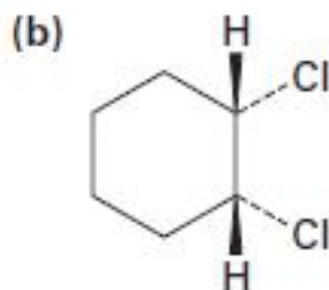
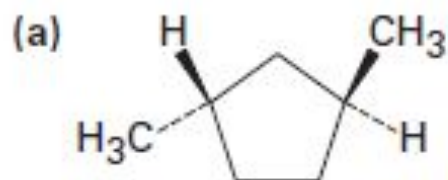


cis-1,3-Dimethylcyclobutane



trans-1-Bromo-3-ethylcyclopentane

Name the following substances, including the *cis*- or *trans*- prefix:



Draw the structures of the following molecules:

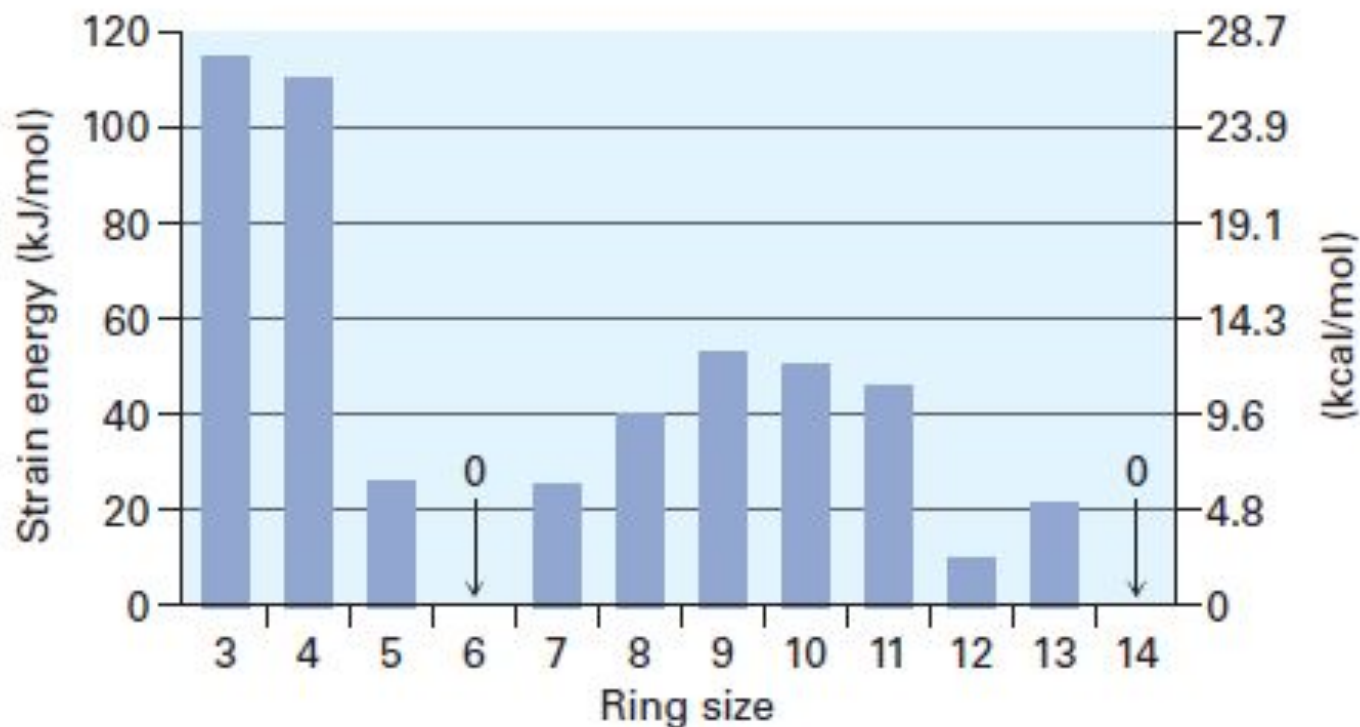
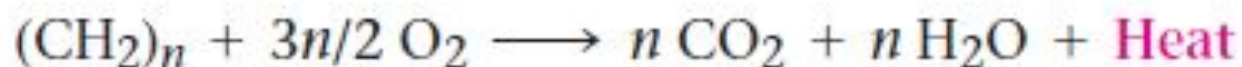
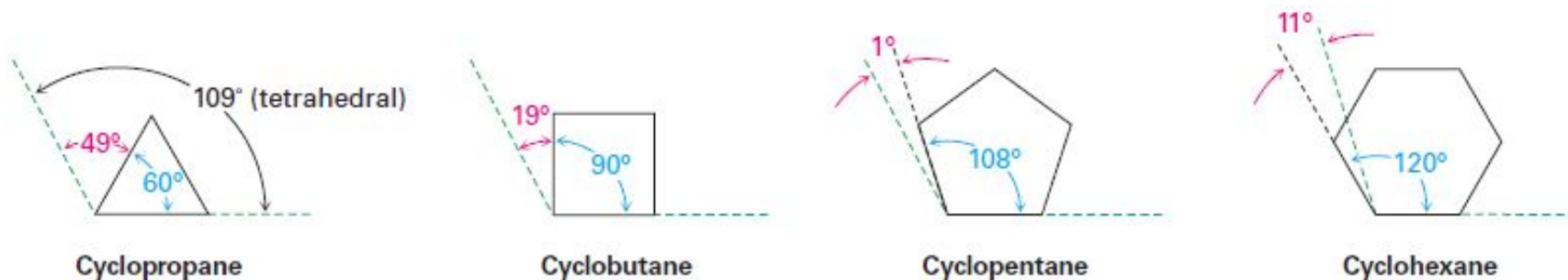
(a) *trans*-1-Bromo-3-methylcyclohexane

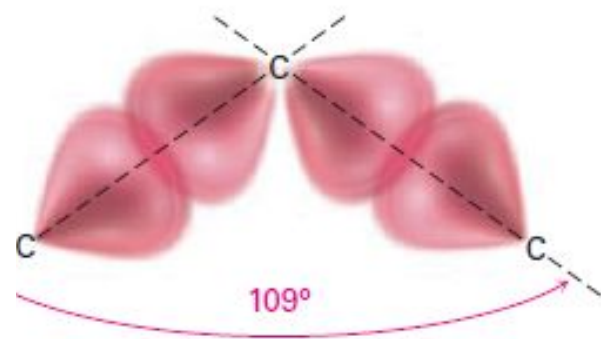
(b) *cis*-1,2-Dimethylcyclobutane

(c) *trans*-1-*tert*-Butyl-2-ethylcyclohexane

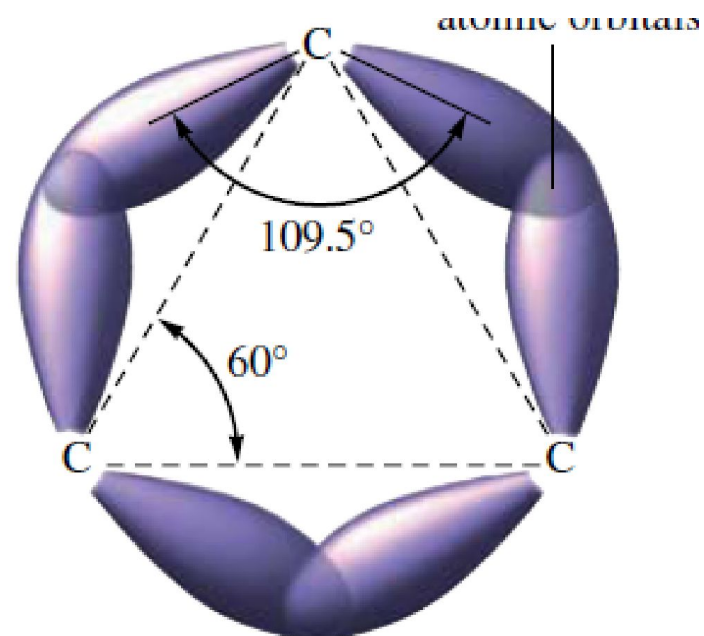
Name the following substances, including the *cis*- or *trans*- prefix (red-brown = Br):







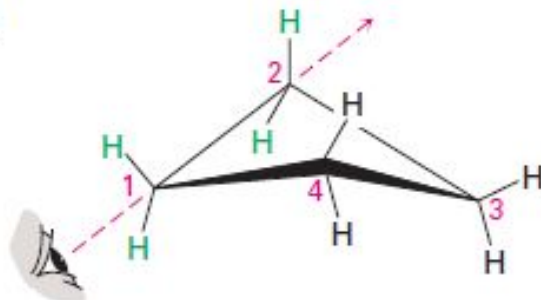
Typical alkane C-C bonds



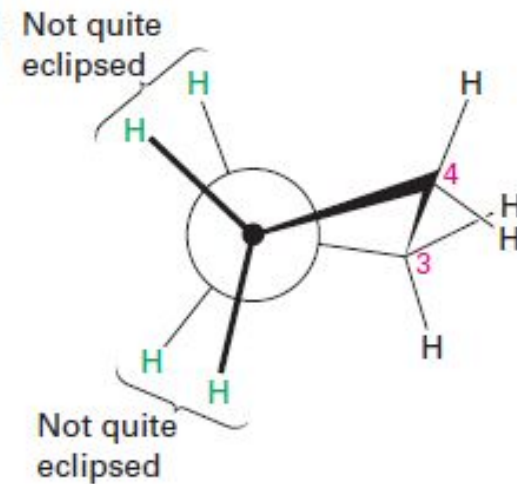
(a)



(b)



(c)



Two conformations of *cis*-1,3-dimethylcyclobutane are shown. What is the difference between them, and which do you think is likely to be more stable?

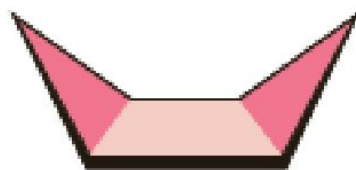
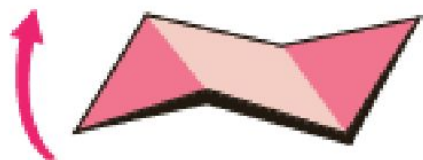
(a)



(b)



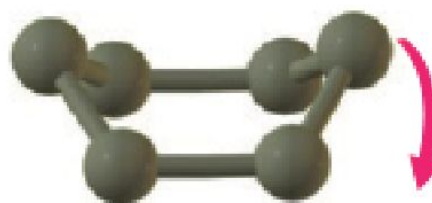
Twist this
carbon up



Twist this
carbon down



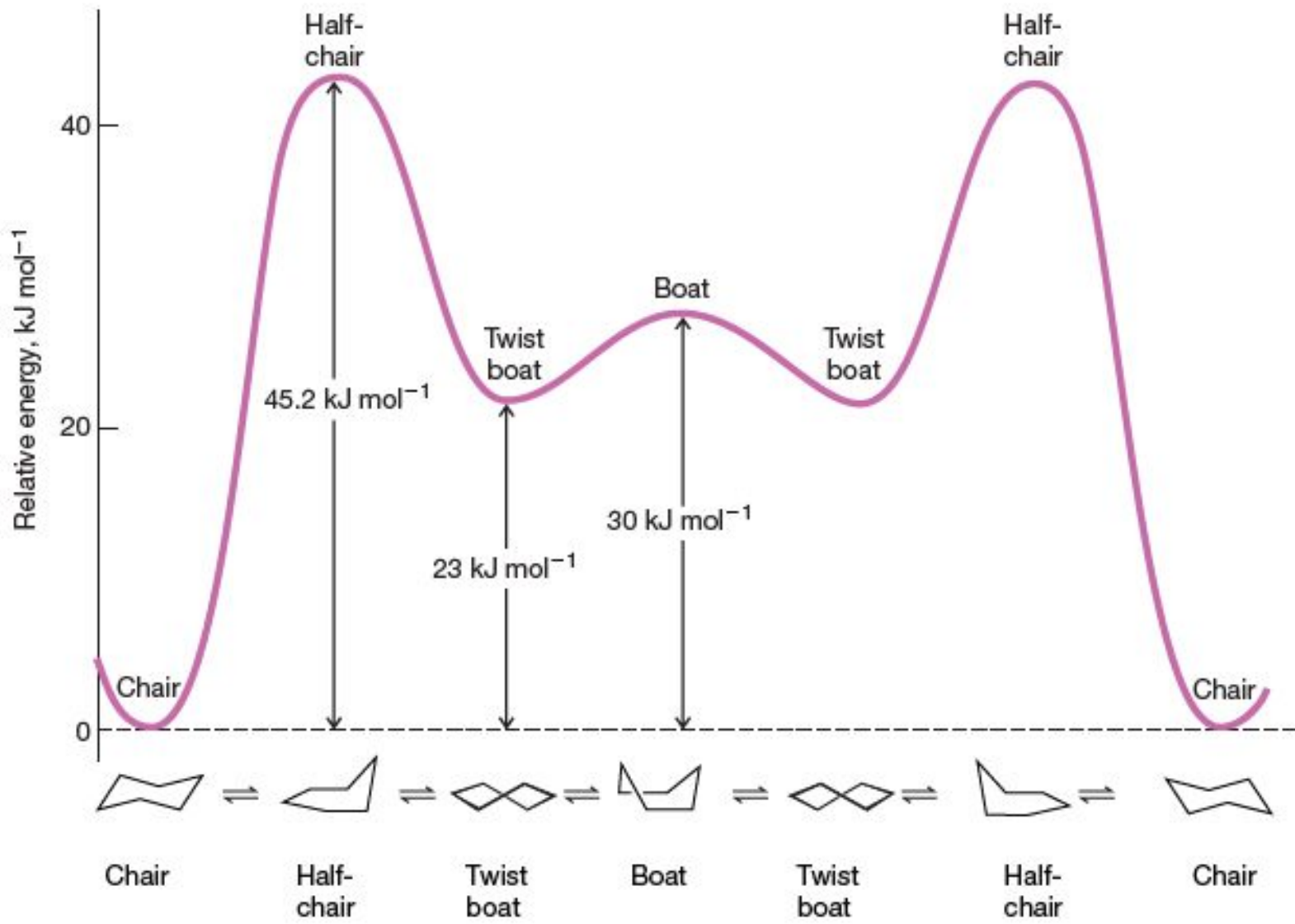
Chair conformation



Boat conformation



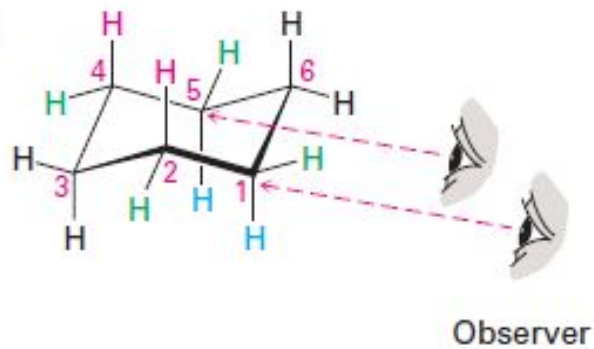
Chair conformation



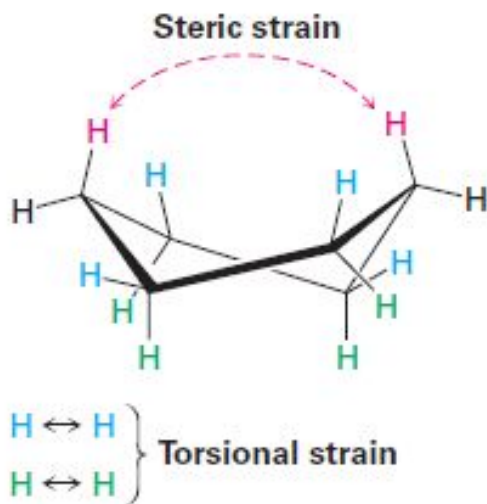
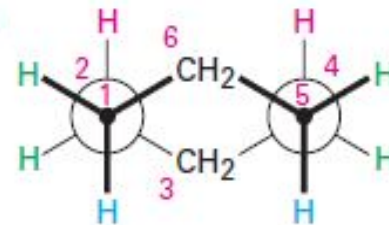
(a)



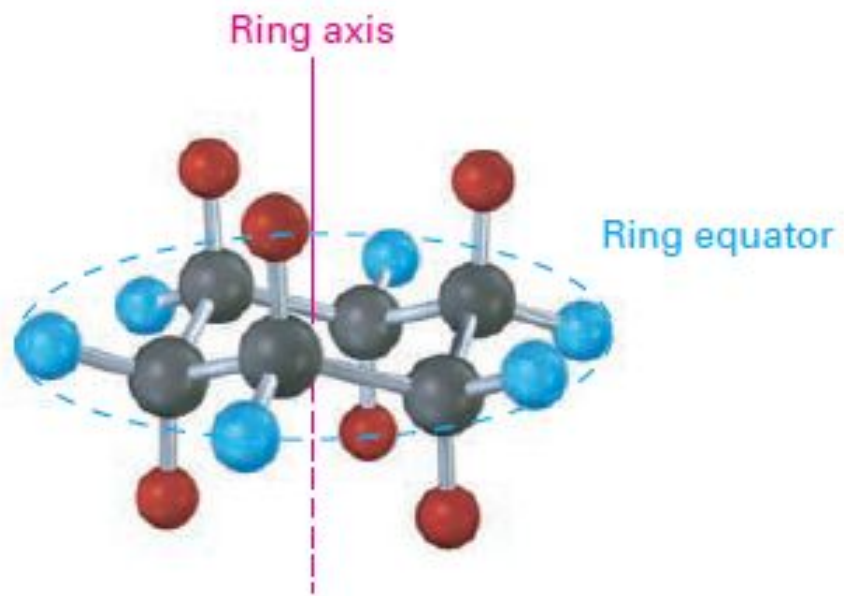
(b)



(c)

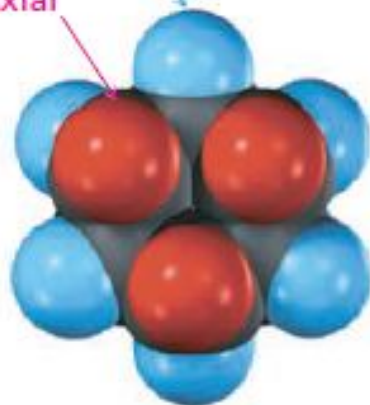


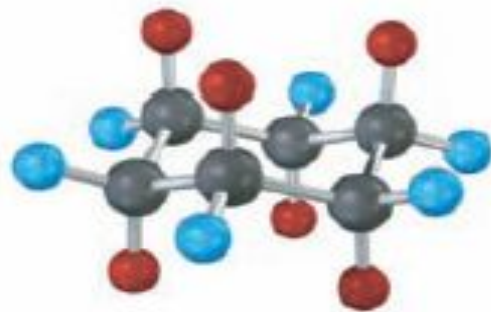
Twist-boat cyclohexane
(23 kJ/mol strain)



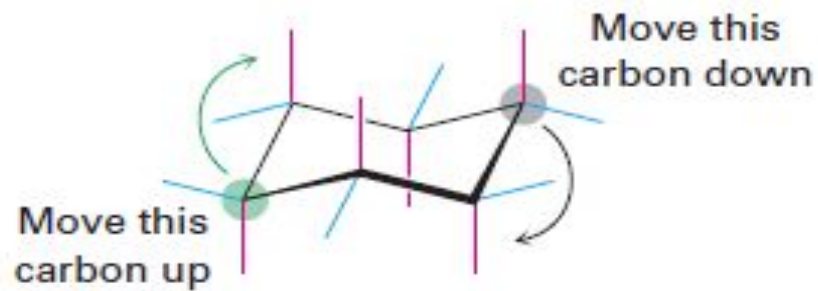
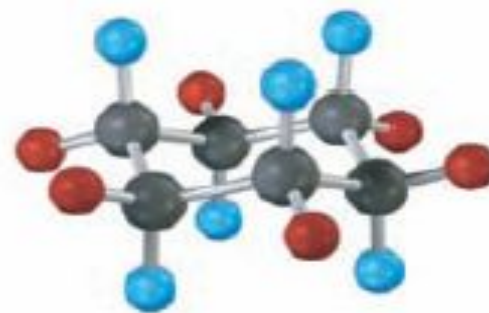
Equatorial

Axial

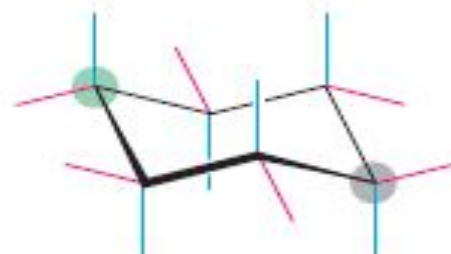




Ring-flip
↔



Ring-flip
↔



Ring-flip
↔

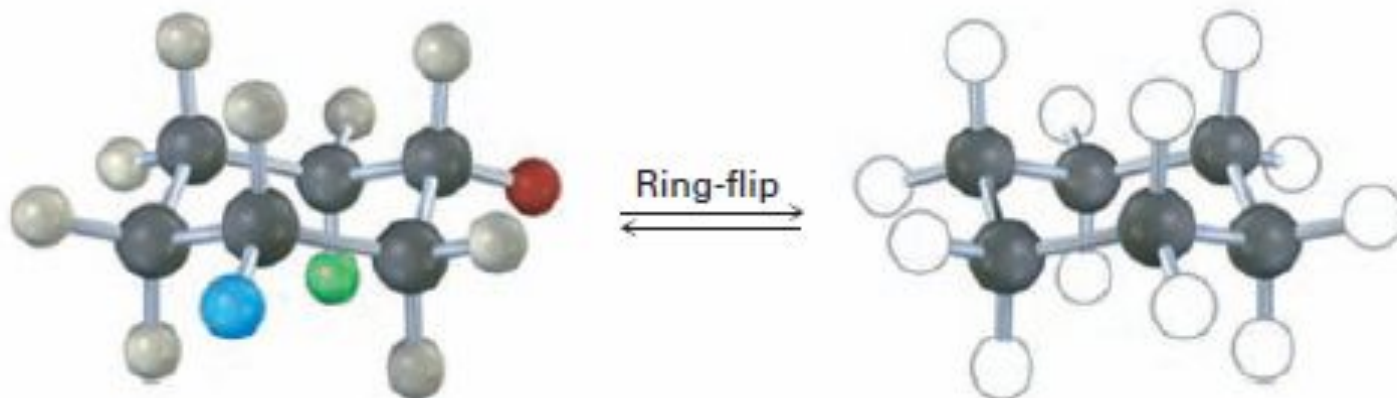


Axial bromocyclohexane

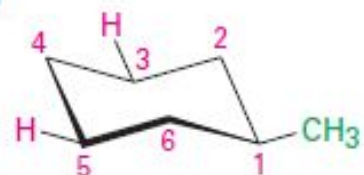
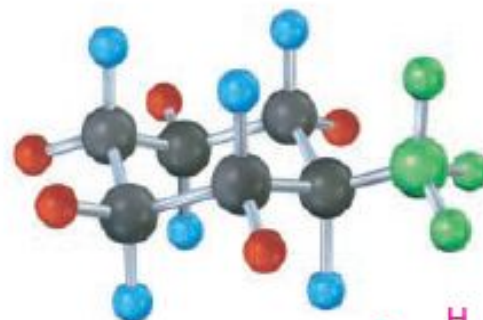
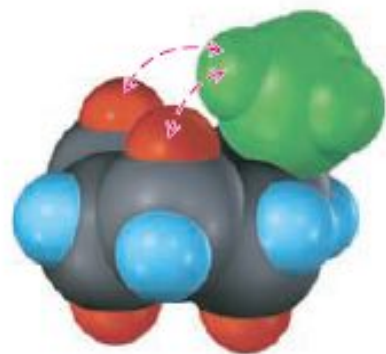
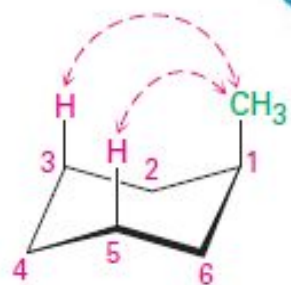
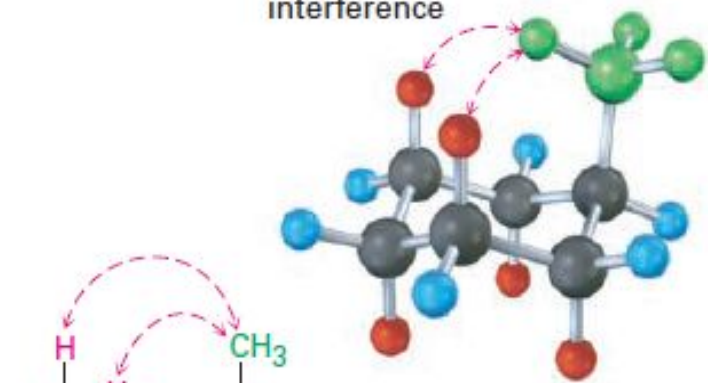


Equatorial bromocyclohexane

Identify each of the colored positions—red, blue, and green—as axial or equatorial. Then carry out a ring-flip, and show the new positions occupied by each color.



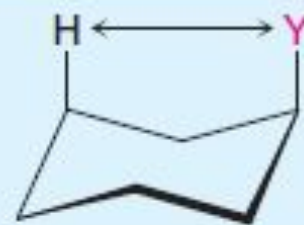
Steric interference



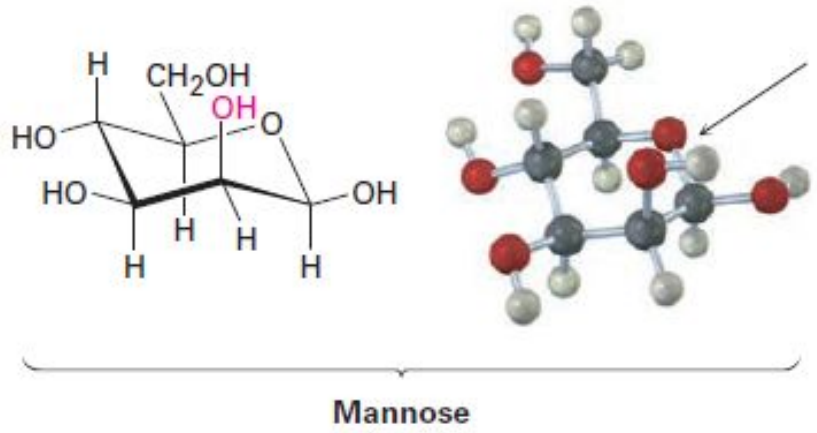
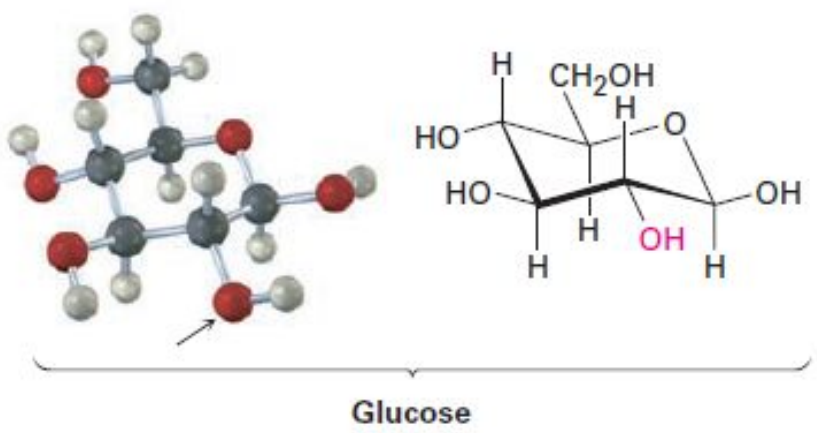
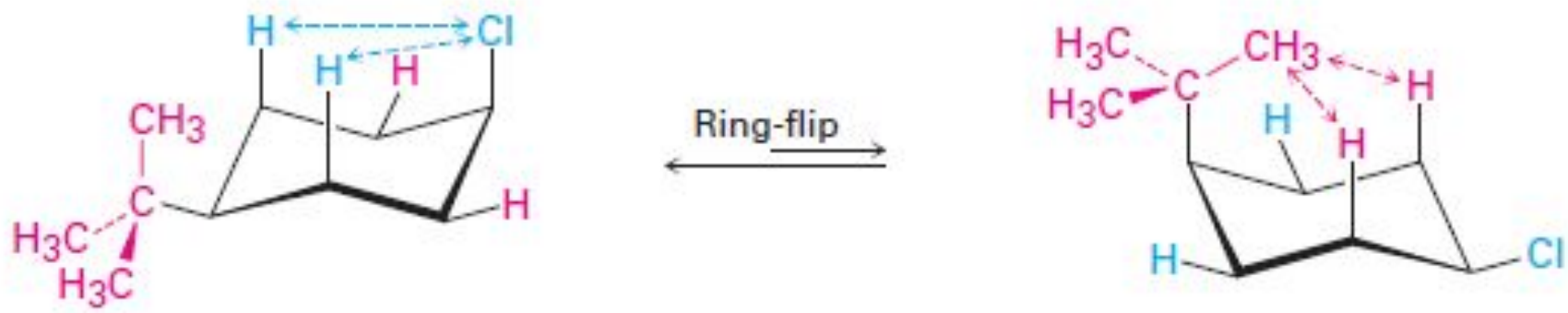
Ring-flip
↔



1,3-Diaxial strain



Y	1,3-Diaxial strain	
	(kJ/mol)	(kcal/mol)
F	0.5	0.12
Cl, Br	1.0	0.25
OH	2.1	0.5
CH ₃	3.8	0.9
CH ₂ CH ₃	4.0	0.95
CH(CH ₃) ₂	4.6	1.1
C(CH ₃) ₃	11.4	2.7
C ₆ H ₅	6.3	1.5
CO ₂ H	2.9	0.7
CN	0.4	0.1

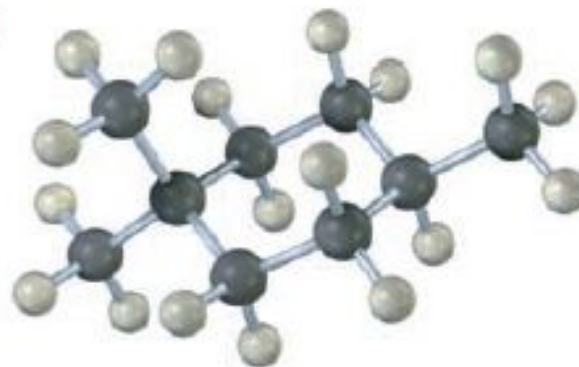


4.22 Name the following cycloalkanes:

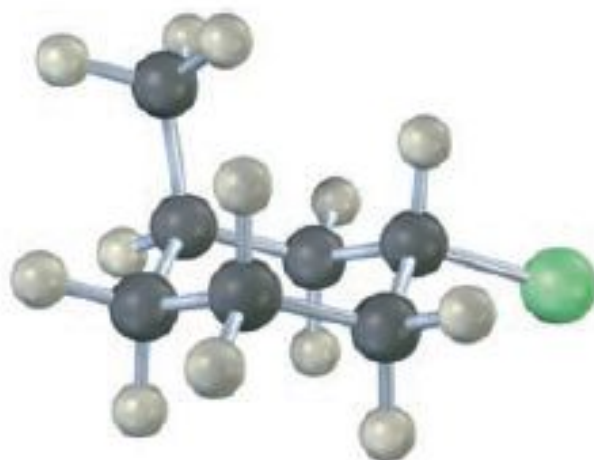
(a)



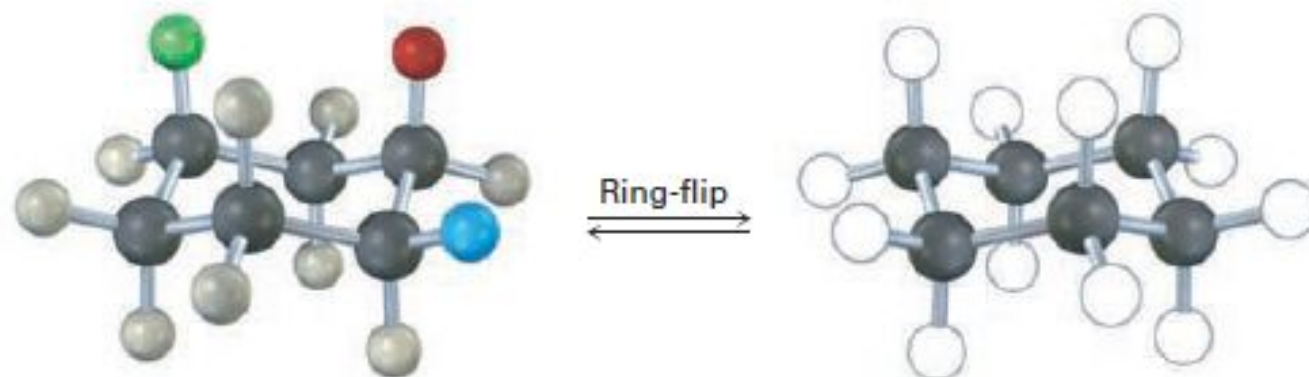
(b)



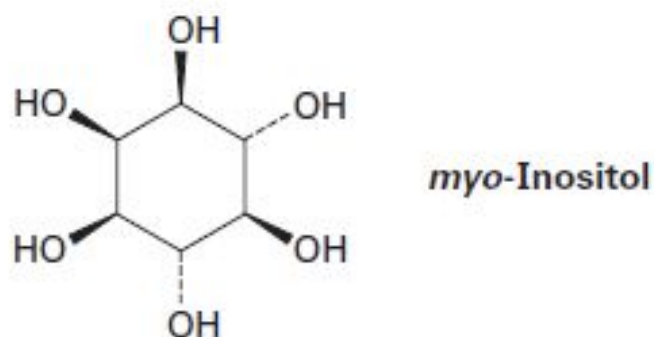
Name the following compound, identify each substituent as axial or equatorial, and tell whether the conformation shown is the more stable or less stable chair form (green = Cl):



▲ A trisubstituted cyclohexane with three substituents—red, green, and blue—undergoes a ring-flip to its alternative chair conformation. Identify each substituent as axial or equatorial, and show the positions occupied by the three substituents in the ring-flipped form.



▲ *myo*-Inositol, one of the isomers of 1,2,3,4,5,6-hexahydroxycyclohexane, acts as a growth factor in both animals and microorganisms. Draw the most stable chair conformation of *myo*-inositol.



How many cis–trans stereoisomers of *myo*-inositol (Problem 4.55) are there? Draw the structure of the most stable isomer.