Stereochemistry: The study of properties of matter in 3D.
Constitutional isomers: Different compounds with the same molecular formula. For example, C_4H_{10} has two constitutional isomers:

n-butane *i*-butane

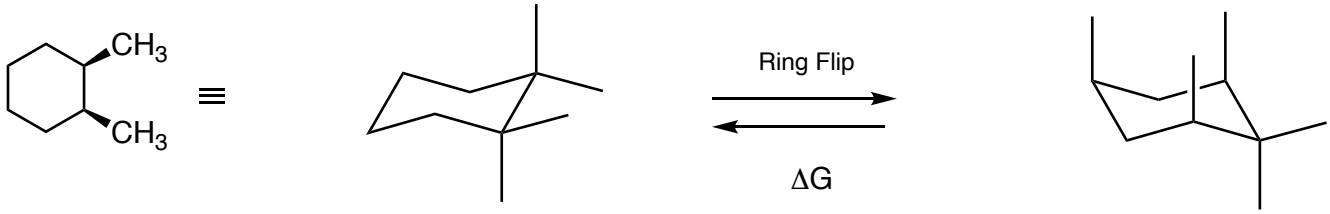
Stereoisomers: Two or more compounds with identical molecular formula and arrangement of atoms in space. However, they differ from each other in the spatial orientation of groups.

For example: **1,2-dimethylcyclohexane** has two stereoisomers, *cis* and *trans*.

To differentiate the two isomers by name, consider one of the structures below.

Name:_____

Fill in the missing H's and methyl groups to show the chair structures of the **1,2-dimethylcyclohexane** stereoisomer and its conformer, as they interconvert by a chair ring flip.

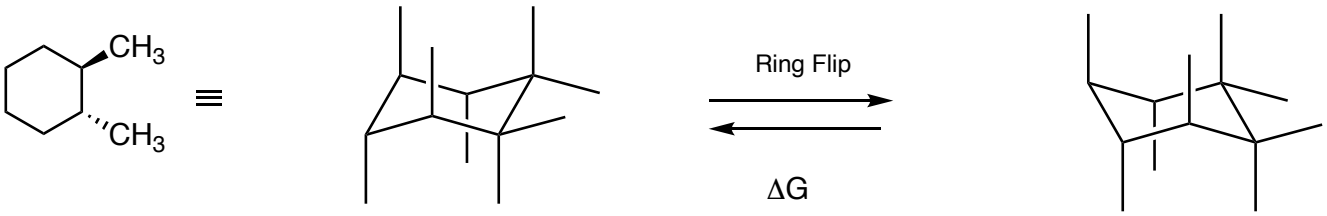


The *A* value for each H/CH_3 *1,3-diaxial* interaction is 0.9 kcal/mol; *i.e.* each 1,3-diaxial interaction raises the strain energy of the molecule due to steric hindrance.

What is the strain energy of each conformational isomers?

What is ΔG at equilibrium?

1) Fill in the missing H's and methyl groups to show the chair structures of *trans*-1,2-dimethylcyclohexane as they interconvert by a chair ring flip. Note: 3 equitorial H's are not shown for clarity.

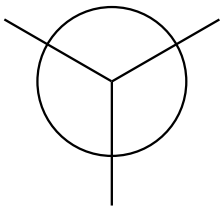


A **B**

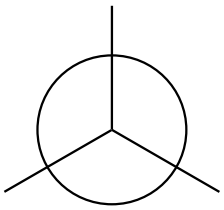
2) Draw the curved lines to show the exisiting 1,3-diaxial interactions in both **A** and **B**.

3) Draw the Newman Projection between carbons 1 and 2 in the ring (the ones bonded to the methyl groups) and identify any other sources of steric hindrance, if any.

A



B



4) Consider the following Strain Values:
Each CH_3/CH_3 *gauche* interaction raises the internal energy by 0.9 kcal/mol.
Each H/CH_3 *1,3-diaxial* interaction raises the internal energy by 0.9 kcal/mol.
Each CH_3/CH_3 *1,3-diaxial* interaction raises the internal energy by 0.9 kcal/mol.

What is the strain energy of **A** and **B**?

A = _____

B = _____

5) What is the relative energy difference between both chair conformational isomers above?

_____ Kcal/mol