Chem 220a - Organic Chemistry
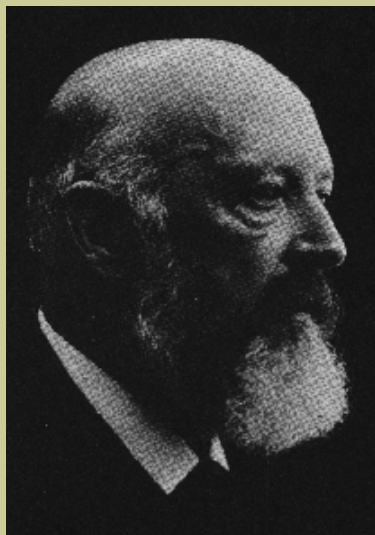
Problem Set 2

Chapter 3

Due: Monday, September 24, 2001

Adolf von Baeyer (1835-1917)

Baeyer was an Assistant Professor under Kekule at Ghent (1858). After professorships at the Technical College(1860) and Strassburg (1872), he succeeded Liebig at Munich (1877).

Baeyer's ideas on Strain Theory predicted that cyclopentane was less strained than cyclohexane which came from considering rings as flat. Because there was only one cyclohexane carboxylic acid, he concluded that there could not be both an equatorial and axial isomer.

1. The Conformation Module in the Study Aids will give you a good overview of the subject of conformation. Work your way through it. (You will need Chime^{TM} to view the Module). [How to manipulate Chime structures].

2. Redraw (line angle formula) and name (IUPAC) the hydrocarbon in this problem. For a dynamic view [get Chime^{TM} here] click here. For a static view click here.

[Problems 3-5 involve the conformations of cyclohexane. For assistance with this topic review cyclohexane and Drawing Cyclohexane (Powerpoint) in the Conformation Module.]

3. Of the seven possible dichlorocyclohexanes, only four have a value of $\Delta G^o = 0$ between their respective chair conformations. Draw structures showing the two conformations in equilibrium for each of the four.

4. In problem 3, which of the four equilibria having $\Delta G^o = 0$ produce mirror image structures? Which ones do not? What is the relationship in the latter case?

5. A 1,4-disubstituted cyclohexane occurs as two stereoisomers, **A** and **B**. The energy difference between the two chair conformations of isomer **A** is 2.7 kcal/mol while the energy difference in **B** is 1.5 kcal/mol. With the assistance of a little algebra and the table on pg. 118 of your text, determine the identity of the unknown functional groups. Show your math and the two equilibria. Assign energies and structures to **A** and **B**.

6. The heat of combustion of n-heptane is 1150 kcal/mol. Estimate the heat of combustion of n-hexane. Show work.

7. Draw a Newman projection of the most and least stable conformations of 2,3-dimethylbutane about the C_2-C_3 bond. Consider both staggered and eclipsed conformations. Calculate the energy of each conformation. For a review, click here.