CHAPTER OVERVIEW

4: STRUCTURE AND STEREOCHEMISTRY OF ALKANES

Learning Objectives

After reading this chapter and completing ALL the exercises, a student can be able to

- distinguish between the different hydrocarbon functional groups - refer to section 4.1
- explain & predict the physical properties of alkanes including relative bp and solubility in a mixture - refer to section 4.2
- interpret and draw the rotation about a carbon-carbon single bond using Newman projections and sawhorse structures - refer to section 4.3 - 4.5
- correlate energies of conformations with rotational energy diagrams and predict the most stable conformations for butane, higher alkanes, cyclohexane, mono-substituted cyclohexanes, and disubstituted cyclohexanes - refer to sections 4.3, 4.3, 4.4, 4.5, and 4.7, 4.8, and 4.10 respectively
- explain the partial rotation of carbon-carbon single bonds in rings - refer to section 4.6
- explain ring strain and its relationship to cycloalkane stability - refer to section 4.6
- draw cyclohexane conformations (chair & boat) - refer to section 4.7
- draw mono-substituted cyclohexane conformers (chair only) - refer to section 4.8
- identify & draw the geometric (cis/trans) isomers of cycloalkanes - refer to section 4.9
- draw di-substituted cyclohexane conformers (chair only) - refer to section 4.10
- recognize and draw the three ways to join two rings - refer to section 4.11
- describe the uses and sources of alkanes - refer to section 4.12
- recognize and distinguish between the two major reactions of alkanes (combustion and halogenation) - refer to section 4.13

4.1: Hydrocarbon Functional Groups
4.2: Physical Properties of Alkanes
4.3: Structure and Conformations of Alkanes
4.4: Conformations of Butane
4.5: Conformations of Higher Alkanes
4.6: Cycloalkanes and Ring Strain
4.7: Cyclohexane Conformations
4.8: Conformations of Monosubstituted Cyclohexanes
4.9: Cis-trans Isomerism in Cycloalkanes
4.10: Conformations of Disubstituted Cyclohexanes
4.11: Joined Rings
4.12: Uses and Sources of Alkanes
4.13: Reactions of Alkanes - a Brief Overview
4.14: Additional Exercises
4.15: Solutions to Additional Exercises

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