Stereochemistry **Name:**
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Problem Set No. 4 (14.5.2013)

1. a) The inversion barrier of (*S*)-N-methyl-2-ethyl-2-methylaziridine is in the range of 90 kJ/mol. What is the stereochemical relationship of the two isomers obtained by inversion? What is the topicity of the protons of the CH_2 unit of the ethyl group?

Why is the inversion barrier relatively high?

Why is the barrier of the related N-phenyl derivative lower?

2. Give examples of a chiral phosphane and a chiral sulfoxide derivative, respectively, **different** from those presented in the lecture! Why are phosphanes configurationally more stable than the corresponding amines?

3. a) Give an example demonstrating that the 1,3-dipolar cycloaddition of diazomethane to a suitably substituted electron-deficient alkene is stereospecific!

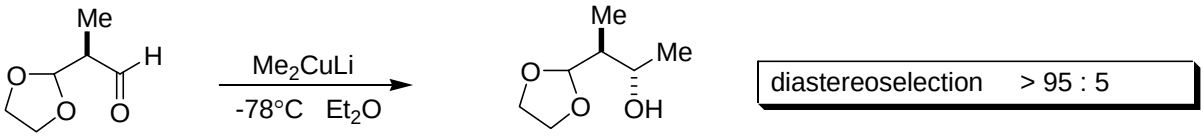
4. Draw the reactive conformations of (*S*)-2-benzyloxypropanal in the absence of a Lewis acid according to the Felkin-Anh model and in the presence of $TiCl_4$! Which side of the carbonyl group will be attacked by nucleophiles with preference? Assign these faces of the carbonyl group by *Re* and *Si*!

5. a) Propose a synthetic route to the *N*,*N*-dibenzyl-protected (*S*)-2-amino-3-phenylpropanal!

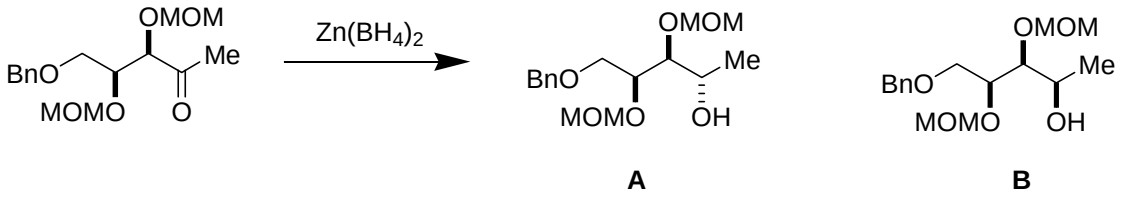
b) The addition of Allyl-$Ti(NEt_2)_3$ to this chiral aldehyde provides at -78 ^oC the product in an *anti/syn* ratio of 93:7. Explain this result! What is the energy difference of the two transition states involved?

c) Deprotect the obtained product to the free primary amine!

6. Provide an explanation for the stereochemical outcome of the following reaction:



7. The two diastereomers are formed in a 93:7 (A:B) ratio. Which of the stereocenters present in the starting material determines the outcome in this case? L-Selectride provides the two diastereomers in reversed 8:92 ratio. Provide an account for these results.



8. Reduce 2-methylcyclopentanone with L-Selectride in alcohol! Which is the preferred stereoisomer? Try to find the literature reference for this transformation!