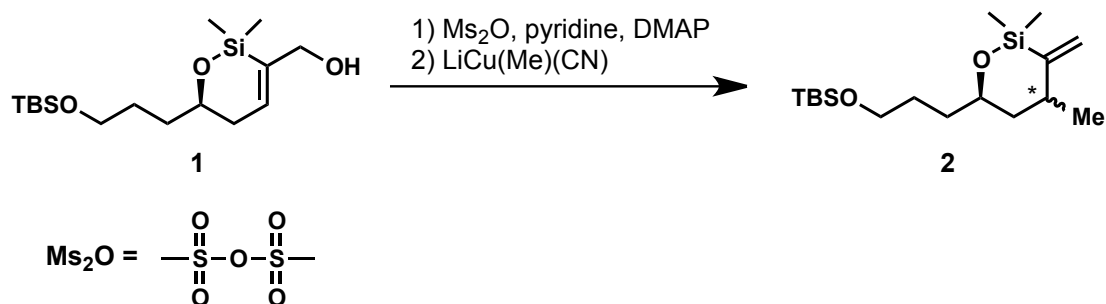


ROC Exam 2012

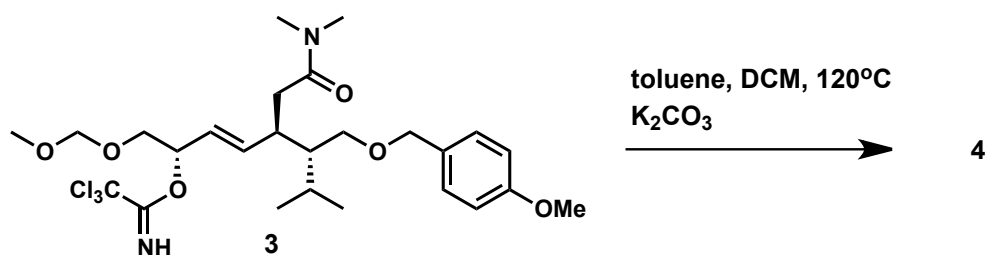
Problem 1

Silyl ether **1** is transformed into **2** in a two step process. Predict, through a detailed mechanistic rationale, the stereochemistry of the newly formed chiral center.



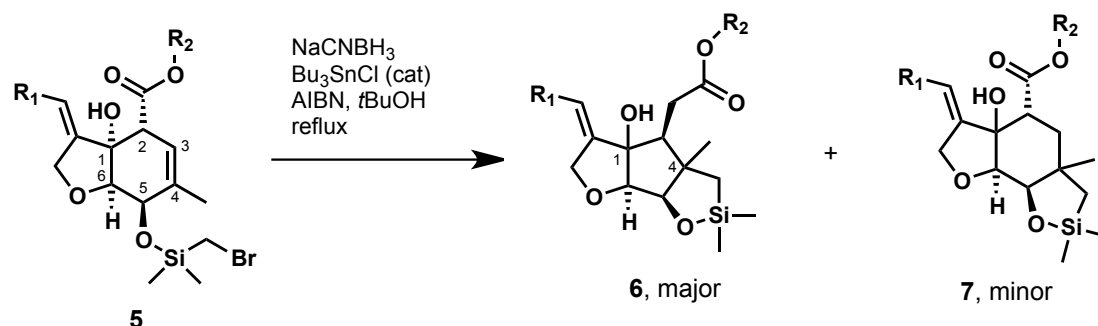
Problem 2

Compound **3** has been transformed into compound **4** by heating in toluene (NB: the base does not participate in the reaction). Give the structure of compound **4**, including absolute stereochemistry, and the mechanism of its formation.



Problem 3

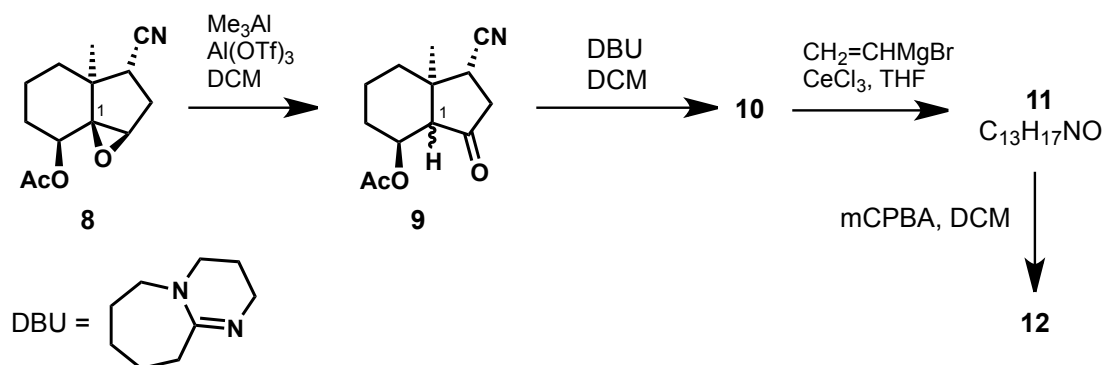
Avermectin B1 is a macrolide with anti-parasitic properties. In the course of the total synthesis of avermectin B1, it was discovered that reaction of compound **5** with NaCNBH_3 , Bu_3SnCl and AIBN in refluxing *tert*-butanol led to the predominant formation of structure **6** (compound **7** was isolated as a side product). Provide a detailed mechanism, which accounts for the formation of **6** from **5**. Predict the stereochemistry at C1 and C4 in product **6**. Justify your prediction.



Problem 4

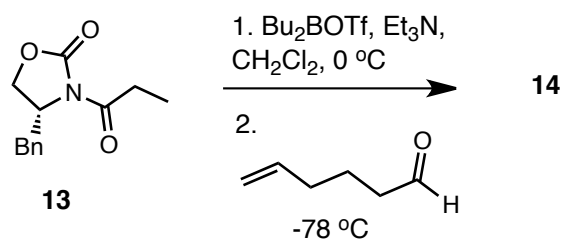
Solanoeclepin A is a substance that can be used to combat potato parasites. Recently the first total synthesis of this complex molecule was reported and depicted below are a number of steps from this synthesis.

- Give a mechanism to account for the Lewis acid mediated formation of compound **9** from **8**. Predict the stereochemistry at C1 in **9** and explain your answer.
- Compound **9** is treated with DBU to give compound **10**, which is transformed into **11** using $\text{CH}_2=\text{CHMgBr}$ and CeCl_3 (which form a "hard" cerium Grignard reagent). Give the structure of compound **10** and **11** and the mechanism of their formation. Account for the observed stereoselectivity.
- Next, compound **11** is treated with mCPBA (~ 1 equivalent) to give **12**. Give the structure of **12** and a mechanism leading to its formation. Explain the stereoselectivity of the reaction.



Problem 5

Chiral amide **13** was treated with dibutylboron triflate in presence of base and subsequently 5-hexenal was added to give compound **14** as the major product. Give the structure of **14** and the mechanism of its formation. Show the absolute stereochemistry of **14** and explain how it arises by evaluating the relevant transition state.

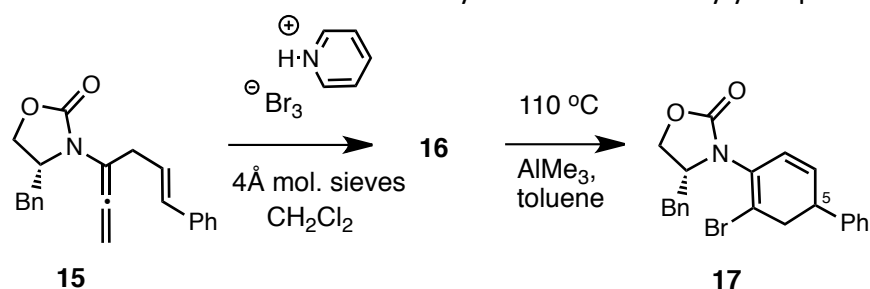


Problem 6

Allene **15** was treated with pyridinium bromide (a source of Br_2) and molecular sieves as an acid scavenger to give compound **16**. Give the structure of **16** and show the mechanism of its formation. Give the stereochemistry of the newly formed stereogenic feature in **16** and explain your answer.

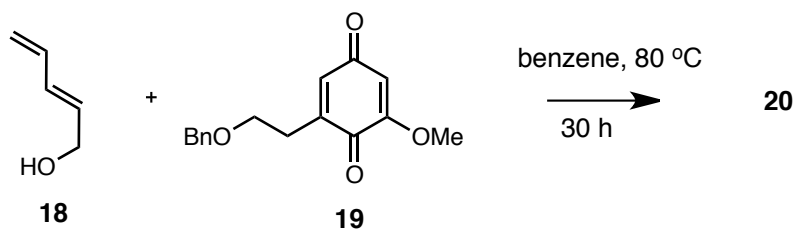
16 was heated in toluene to give **17**. Give the structure of **17** and the mechanism of its formation. (NB: The Lewis acid, AlMe_3 , has no apparent role in this transformation).

Bonus. Predict the stereochemistry at C-5 in **17**. Justify your prediction.



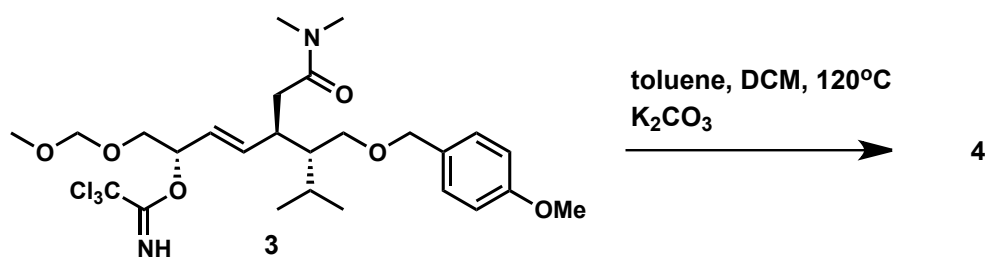
Problem 7

The uncatalyzed reaction of (2*E*)-2,4-pentadien-1-ol (**18**) and **19** produces product **20** in one step. Give the structure of product **20**. Draw the transition state of this reaction. Show all stereochemical features of **20**. Explain how this stereochemistry comes about.

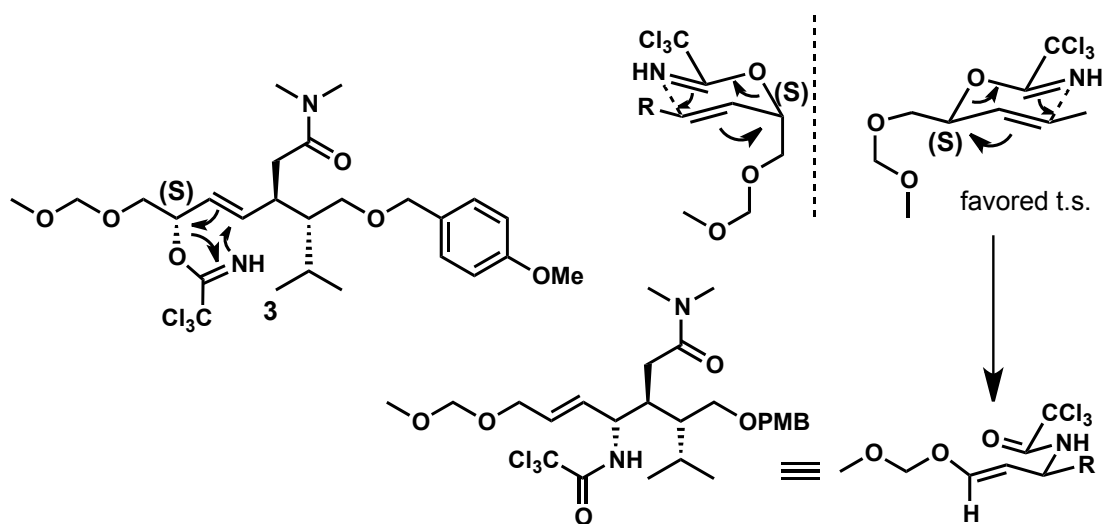


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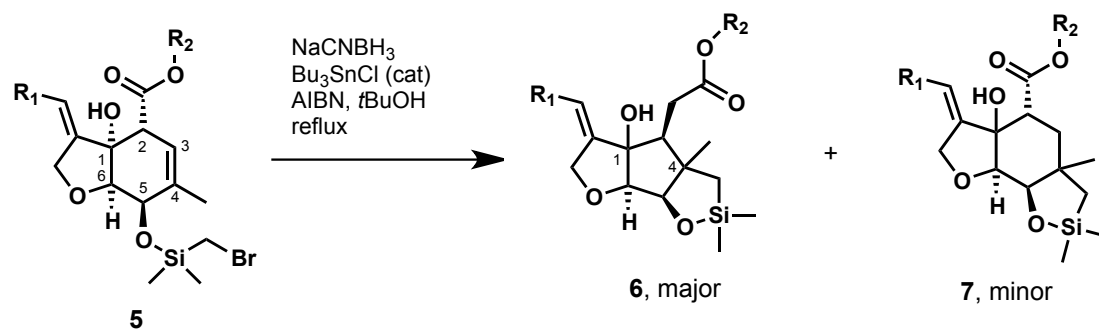


Solution: Organic Letters **2010**, *12*, 5756-5759.

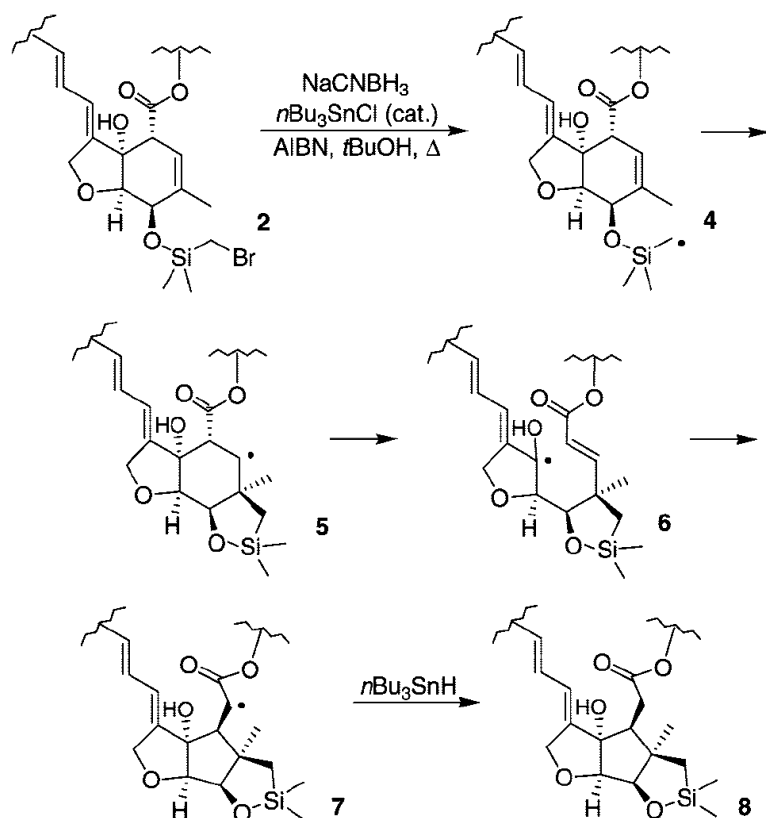


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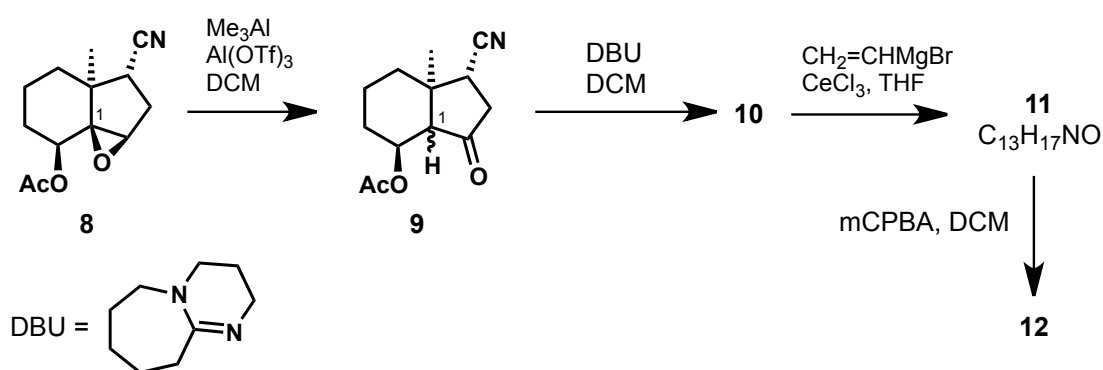
Solution: Organic Letters **2008**, *10*, 2255-2258.



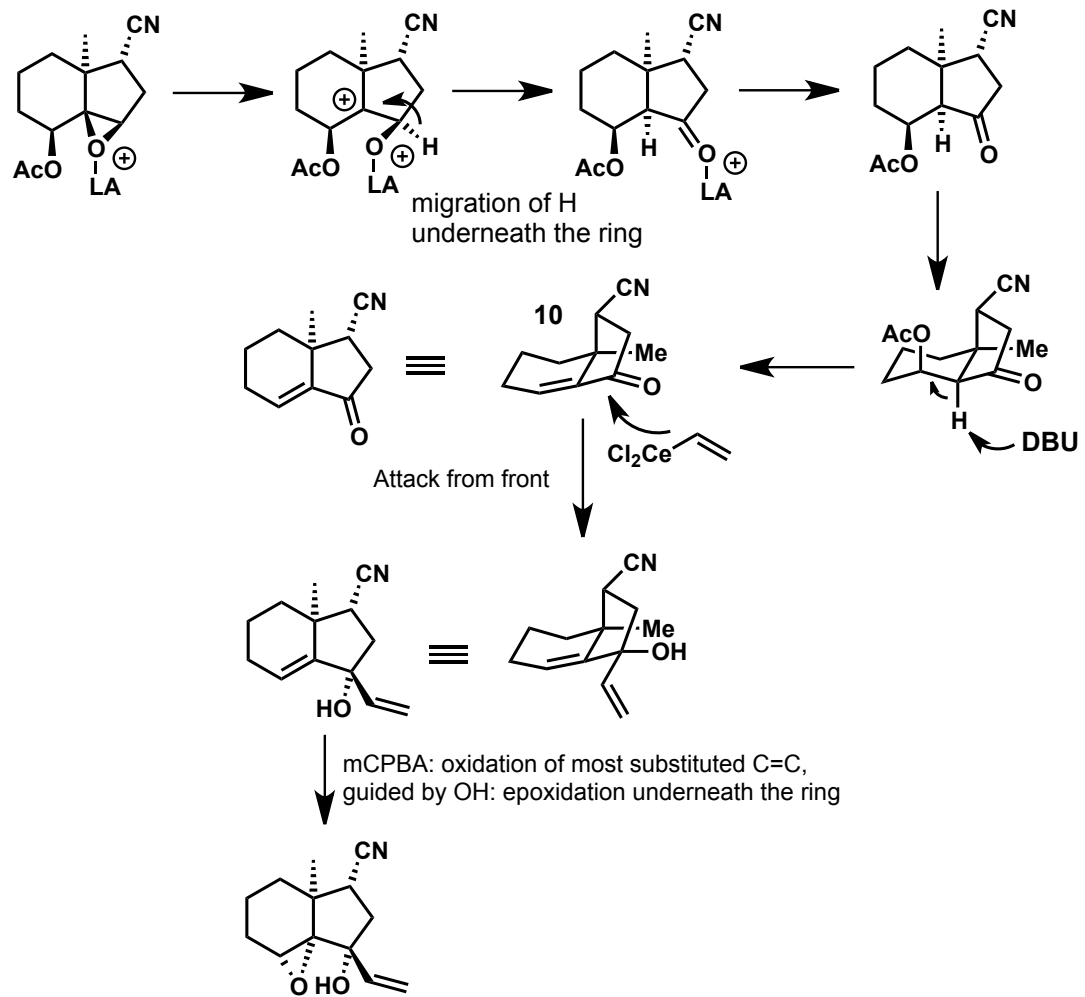
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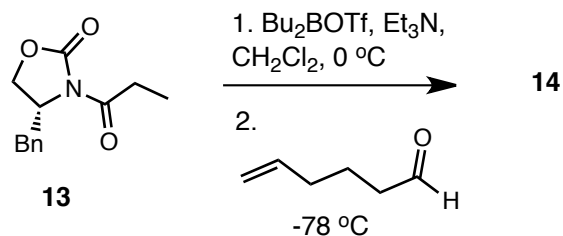


Solution: Nature Chemistry **2011**, 3, 484-488

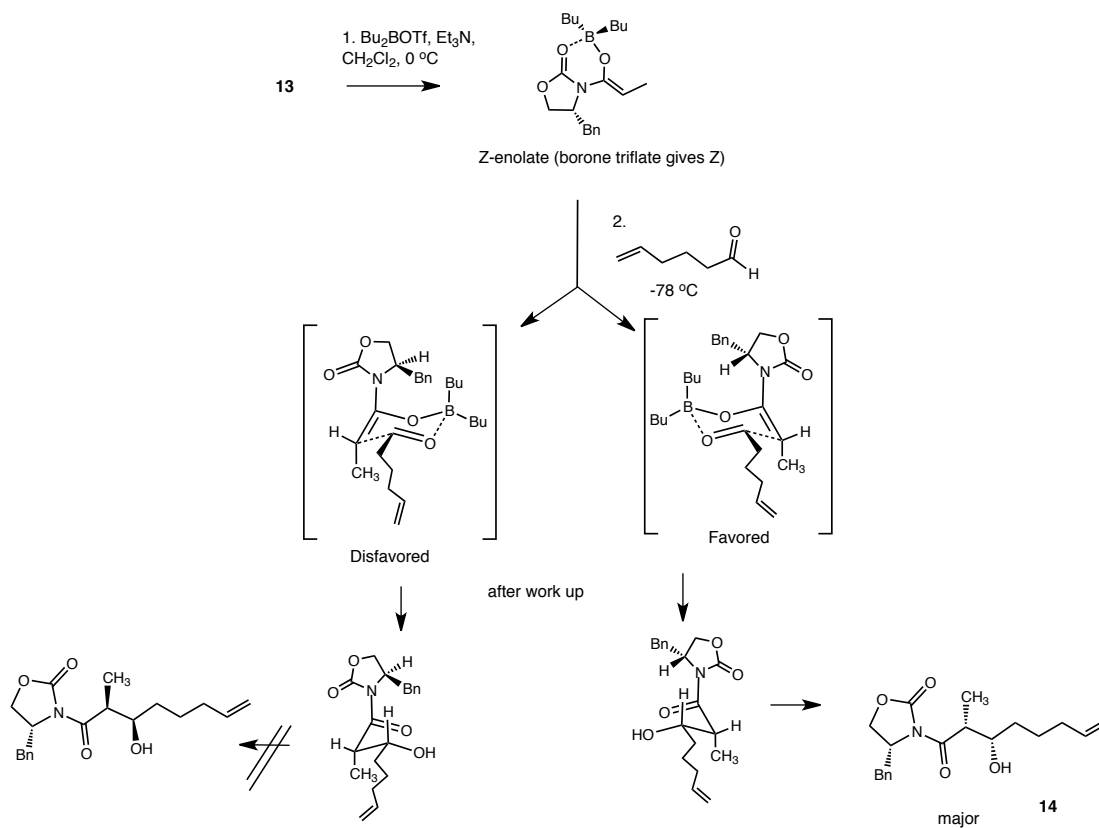


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Solution: Organic Letters **2007**, *9*, 711-714.

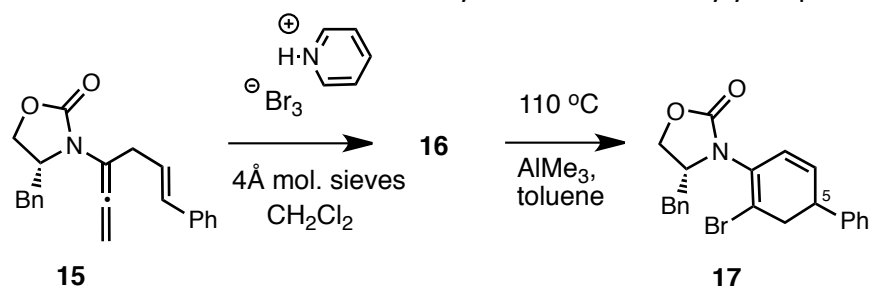


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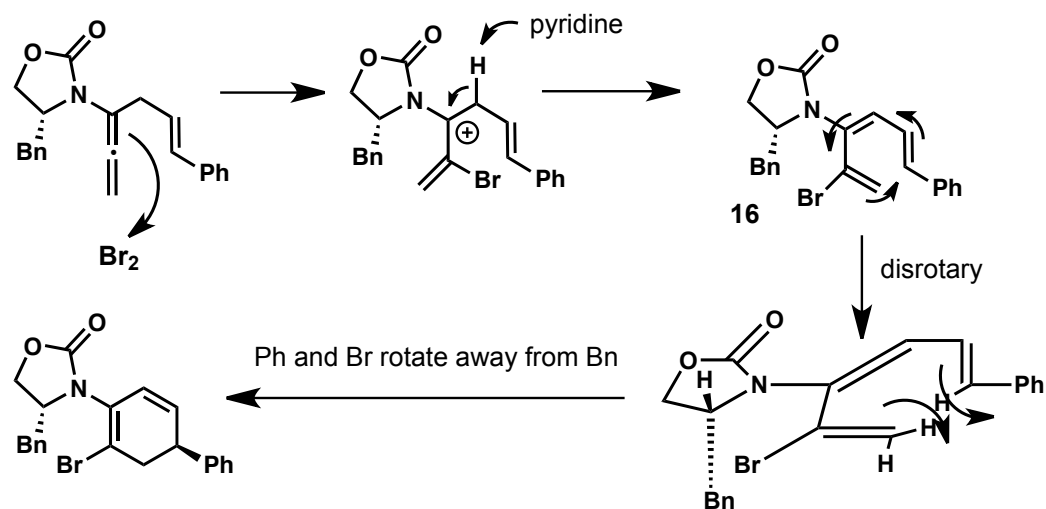
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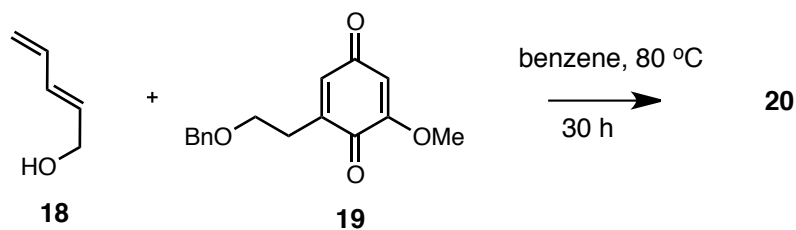


Solution: Organic Letters



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Solution: Angewandte Chemie **2002**, *41*, 1668-1698 (p. 1673)

