

**Reactivity in Organic Chemistry Exam**

**Monday 29-01-2018**

**14:00-17:00**

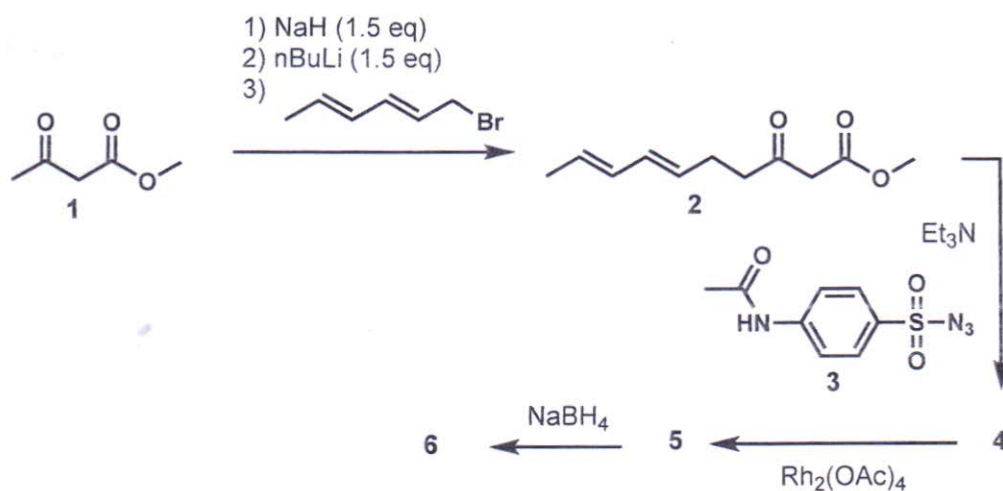
Provide every answer sheet with your  
**name and student number**

**Indicate how many answer sheets are handed in**

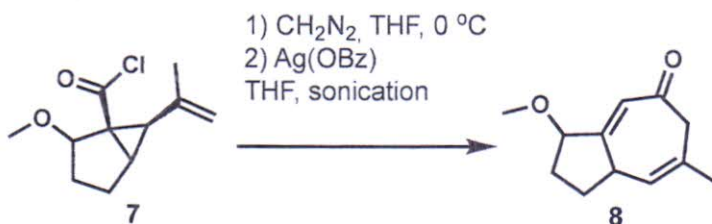
**Problem 1 (35 points)**

Below part of a synthesis towards fused 5,7-membered ring systems is described.

- Provide the mechanism of the reactions leading to the formation of product **2** from **1**. Comment on the regioselectivity of the reaction. (5 points)
- Provide the mechanism of the reactions leading to the formation of product **4** from **2** using reagent **3**. (5 points)
- Provide the mechanism of the reactions leading to the formation of product **5**. Comment on the stereoselectivity and regioselectivity of the transformation. (10 points)
- Provide the structure of product **6** and comment on the chemo- and stereoselectivity of the reaction leading to the formation of product **6**. (5 points)

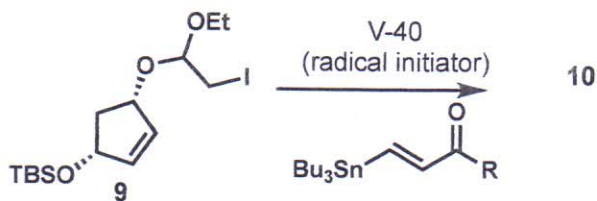


- In a related synthesis the following transformation is achieved. Provide a plausible mechanism for the reactions. (10 points)



### Problem 2 (10 points)

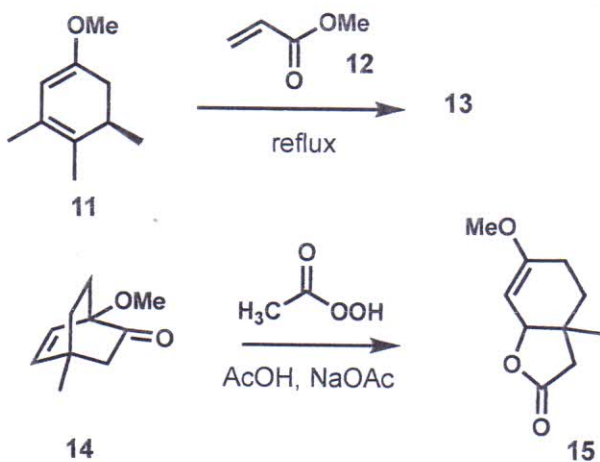
Below the synthesis of a bicycle is presented. Provide the mechanism for the reaction involved in the transformation of **9** into **10** and account for the observed stereoselectivity of the newly formed stereocenters and elements (VX-40 is a radical initiator).



### Problem 3 (20 points)

Below, a reaction is shown that has been performed *en route* to the assembly of nootkatone.

- Provide the mechanism of reaction leading to the formation of product **13** from **11** and **12**. Account for the observed regio- and stereoselectivity. (10 points)
- Upon treatment of **14** with peracetic acid rearranged product **15** is formed. Provide the mechanism of reaction leading to the formation of product **15** and show the stereochemistry of the chiral centers. (10 points)

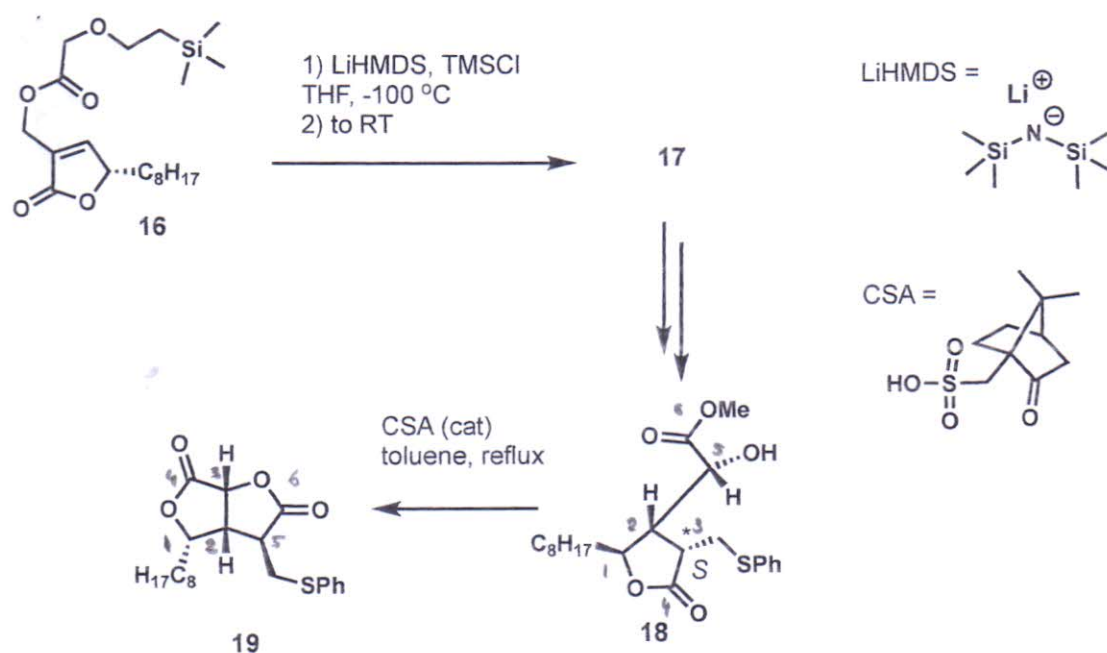


### Problem 4 (15 points)

Below part of the synthesis of Isoavenaciolide, an antibacterial agent, is shown.

- A) Provide the mechanism of the reactions leading to the formation of product **17** from **16** using the reaction sequence shown. Account for the observed stereoselectivity. (10 points)
- B) After a few transformations **18** is obtained and transformed into **19**. Provide the mechanism of the reactions leading to the formation of product **19** from **18**. (5 points)

**BONUS:** The *R*-epimer (at the chiral center indicated with an \*) of **18** does not react under these conditions. Provide an explanation for this observation.



### Problem 5 (20 points)

Part of a synthesis to the marine natural product Brevetoxin is shown below.

- Provide the mechanism of the reaction leading to the formation of product **21** from **20**. Account for the observed regio- and stereoselectivity. (7 points)
- Next the diol is treated with benzaldehyde dimethyl acetal and a catalytic amount of acid to provide **22**. Provide the mechanism of reactions leading to the formation of product **22** from **21**. Account for the observed stereoselectivity. (8 points)
- Next **22** is reduced with the reagents shown. Provide the structure of the formed product and account for the observed regio- and stereoselectivity. (7 points)

