Organic Chemistry - Exercise 5

Distribution: October 27 2024
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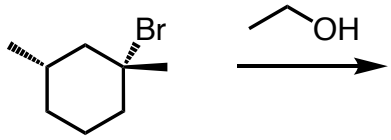
1. The following compound can react in presence of ethanol.



   a. Give the IUPAC name of the starting compound, including the absolute configuration at the stereocenters.

   b. Does the reaction proceed via S_N1 or S_N2? Explain why.

   c. The nucleophilic substitution leads to the formation of different isomers. Draw their structure and establish their isomeric relationship

   d.

      i. What is a side reaction that could occur in competition with the nucleophilic substitution ? Give a mechanism for the formation of one of the isomers.

      ii. Draw the structure of the three possible isomers and establish the isomeric relationship between them.

   e. (R)-3-bromo-1,3-dimethylcyclohex-1-ene can also undergo a nucleophilic substitution reaction in ethanol.

      i. Draw the structure of this compound.

      ii. Draw the reaction profile of the S_N of this compound along with the reaction profile of the S_N of the compound in question 1a (on the same diagram) and use it to explain briefly which one will react faster.

2. (E)-2-iodo-2,5-dimethylhex-3-ene and methanol can react via a nucleophilic substitution.
   a. Draw the reaction scheme of the net reaction (structure of starting materials and product).

b. Does the reaction proceed via S_N1 or S_N2? Explain why.

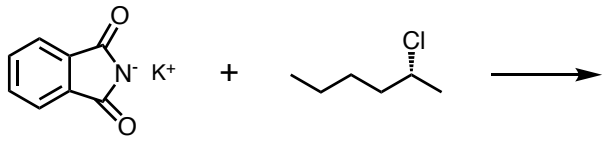
c. Draw the reaction profile of the reaction and mark the transition state(s)

d. Which step is rate-determining? What is the overall reaction order of this reaction?

3. (R)-2-bromobutane reacts with sodium hydroxide via a nucleophilic substitution mechanism
   a. Give the structures of the starting material, the net reaction scheme and the full IUPAC name of the product.

   b. Does the reaction proceed via S_N1 or S_N2? Explain why.

4. The first step of the Gabriel synthesis of primary amines proceeds via a SN2 reaction mechanism :



   a. Give the reaction mechanism.

   b. Why is it not possible for a second alkyl halide molecule to react with the product ?

Reading Suggestions:

Clayden, Greeves, Warren, Wothers, *Oxford University Press*, **2001**, pp. 304–334.
Organic Chemistry, John McMurry, *Thomson Brooks/Cole*, **2008**, pp. 152-161.
Chimie Organique: Les Grands Principes, John McMurry, *Dunod Editeur*, **2015**, pp. 95-98.
Clayden, Greeves, Warren, Wothers, *Oxford University Press*, **2001**, pp. 407–441.
Organic Chemistry, John McMurry, *Thomson Brooks/Cole*, **2008**, pp. 152-161 + 359-381.
Chimie Organique, Paul Arnaud, *Dunod Editeur*, **2015**, pp. 103-125, 285-303, 327-351.