NAME (Print): _____

SIGNATURE: _____

Chemistry 320M/328M Dr. Brent Iverson Synthesis Practice November 16, 2022

Please print the first three letters of your last name in the three boxes

1. These are synthesis questions. You need to show how the starting material can be converted into the product(s) shown. You may use any reactions we have learned. Show all the reagents you need. Show each molecule synthesized along the way and be sure to pay attention to the regiochemistry and stereochemistry preferences for each reaction because only predominant products can be used. All the carbon atoms of the product(s) must come from the starting material(s) shown.



Recognize that this is a primary bromoalkane with no hydrogen atoms on the adjacent (central) carbon atom (i.e. no E2 possible here), so reaction with NaOH gives the desired S_N2 product

Synthesis Practice



1. (cont.) All the carbon atoms of the product(s) must come from the starting material(s) shown.

Recognize this alkene as the Zaitsev product of an E2 reaction of the bromoalkane produced in the first step.



1. (cont.) All the carbon atoms of the product(s) must come from the starting material(s) shown.



Recognize that the rest of the process is just taking the alkane to an alkyne, which is the set of reactions we refer to as "I-35" on your roadmap. You should be very familiar with all of these reactions, because they show up quite often in synthesis problems.

Synthesis Practice

1. (cont.) All the carbon atoms of the product(s) must come from the starting material(s) shown.



via the often used reaction sequence of halogenation of the alkene, followed by double elimination of the vicinal dihalide.



1. (cont.) All the carbon atoms of the product(s) must come from the starting material(s) shown.

Recognize that the alkene product has 6 carbons, exactly twice the number of the starting material. That means two molecules derived from the starting material were reacted to make a new carbon-carbon bond. The only reaction you know that can generate a new carbon-carbon bond is the S_N^2 reaction of a deprotonated terminal alkyne with a primary haloalkane. Thus, the problem comes down to conversion of the staring propene into an alkyne using halogenation and double elimination. Propene can be converted into 1-bromopropane in one step using the non-Markovnikov, free radical addition of H-Br in the presence peroxide (ROOR) and light.

Note Besides the reduction of an alkyne using Na°, the alkene product could have been the Zaitsev product derived from E2 elimination of an haloalkane or dehydration of an alcohol. We can rule out these latter two reactions in favor of the alkyne reduction reaction because we know that the alkyne must be involved since a C-C bond was made.

Synthesis Practice

1. (cont.) All the carbon atoms of the product(s) must come from the starting material(s) shown.



Recognize that the key to this problem is counting carbons correctly. We have four carbons in the product, but only three in the starting material. From this you conclude that in this synthesis there must be a C-C bond forming reaction to give a molecule with 6 carbon atoms, followed by an ozonolysis to give a product with only 4 carbons. In addition, we gave the hint that the last problem's answer was related, so we hoped you would realize that an ozonolysis of the product from problem H) would give an aldehyde with the required 4 carbon atoms. Oxidation of the 4-carbon aldehyde product of ozonolysis gives the carboxylic acid product.

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