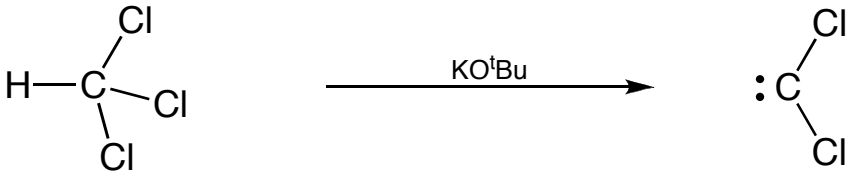
Carbenes and Carbenoids: Alpha-Elimination

- When chloroform is treated with strong base, **dichlorocarbene** ($:CCl_2$) is formed. Can you write a curved-arrow mechanism for this reaction?



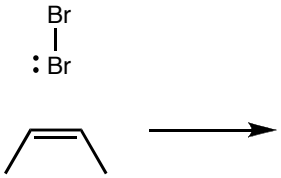
- Identify the structure, hybridization, and frontier orbitals in dichlorocarbene.

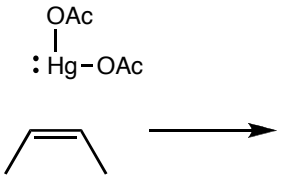
- When CH_2I_2 is treated with a zinc-copper couple (Zn-Cu), the Simmons-Smith reagent $I–CH_2–ZnI$ is formed. This reagent is similar to a Grignard reagent. What are the frontier orbitals in the Simmons-Smith reagent? Why is this species called a *carbenoid*?

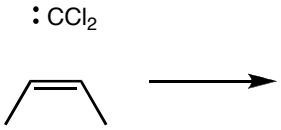
Reading: Section 9.8

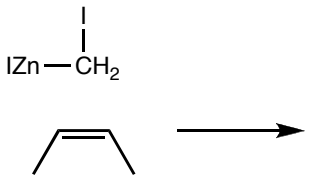
Reactions of Carbenes with Alkenes

- Carbenes react with alkenes in a reaction that is highly reminiscent of the reaction of bromine with alkenes. Draw in the curved-arrow mechanisms and predict the products of each of the following:







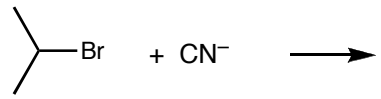


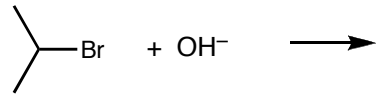
- What structures are formed by the addition of carbenes (or carbenoids) to alkenes?

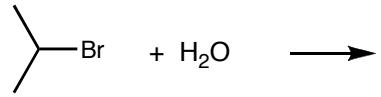
Reading: Section 9.8

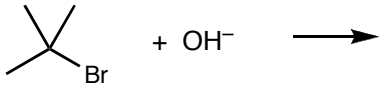
Test Yourself Now!

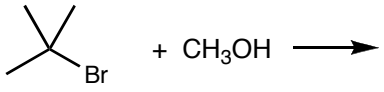
- Determine the primary product and identify any secondary products for each of the following reactions:

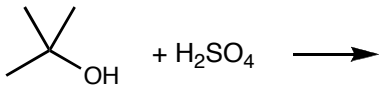






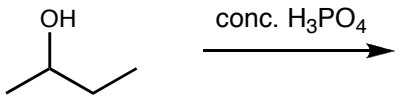


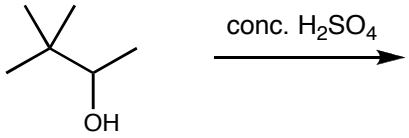




Dehydration of Alcohols

- Predict the product and show a mechanism for each of the following reactions:

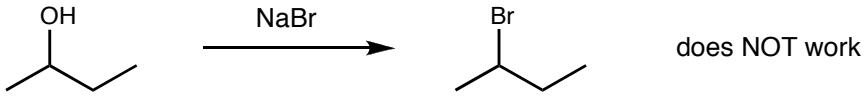




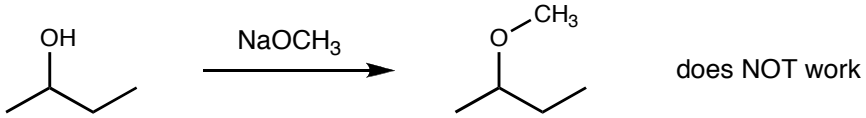
Reading: Section 10.1

Making Alcohols Leave: Part 1–The Problem

- Explain why each of the following reactions is not effective:



does NOT work

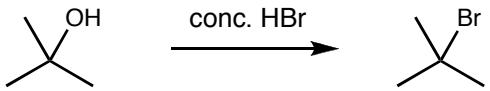


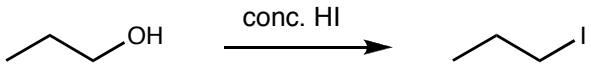
does NOT work

Reading: Section 10.2

Making Alcohols Leave: Part 2–Using Acid

- We can convert an alcohol into a good leaving group by **protonating** the alcohol in strong acid. Let's see how this works:

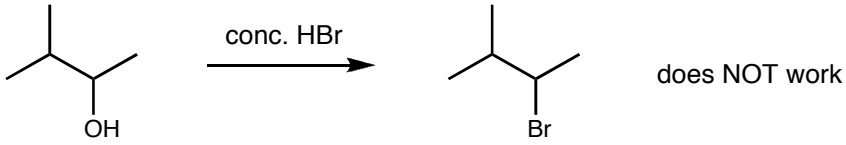




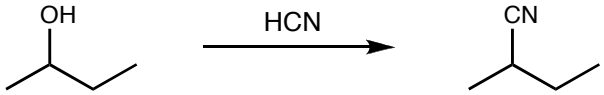
Reading: Section 10.2

Making Alcohols Leave: Part 2–Acid Is A Problem

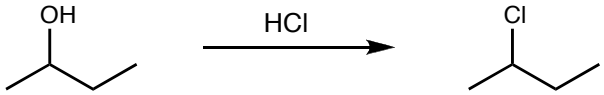
- Strong acids are not *generally* useful for converting alcohols into good leaving groups. What is the problem with each of the following reactions?



does NOT work



does NOT work

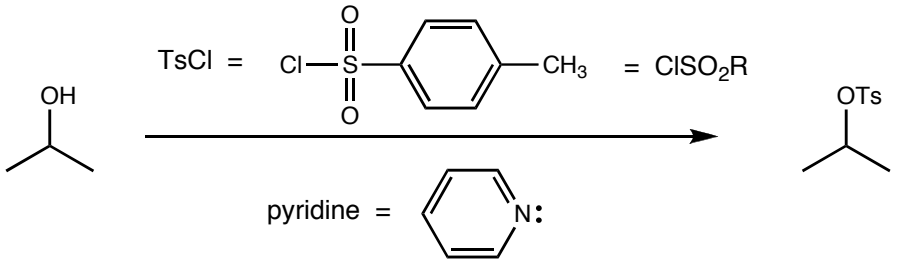


does NOT work

Reading: Section 10.2

Making Alcohols Leave: Part 3–Using Tosylates

- Show the mechanism for the following reaction, in which an alcohol is converted into a good leaving group known as a *tosylate*:



- What can we do with a tosylate?

Reading: Section 10.3

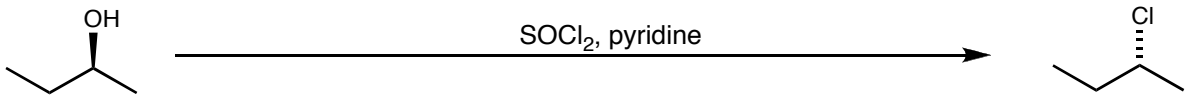
Making Alcohols Leave: Part 3–Reactions of Tosylates

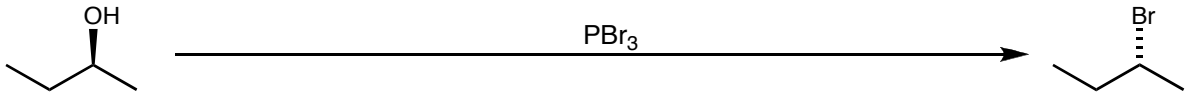
- For each of the following reactions, predict the product and show stereochemistry:

Reading: Section 10.3

Making Alcohols Leave: Part 4–$SOCl_2$ and PBr_3

- Provide complete curved-arrow mechanisms for the following reactions:



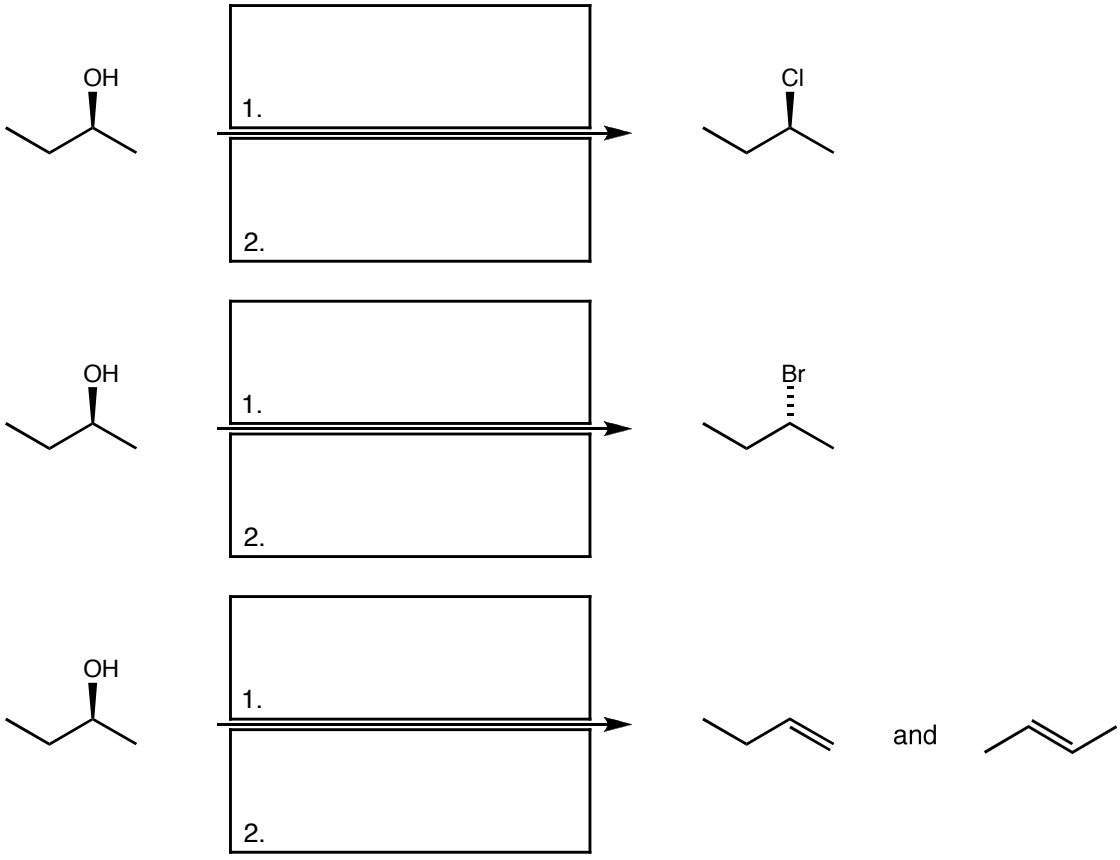


Reading: Section 10.3

Making Alcohols Leave: Part 4–Stereochemistry

- For each of the following reactions, predict the product and show stereochemistry:

- What reagents are needed to carry out the following transformations?



Reading: Section 10.3