

Organic Chemistry - Exercise 6

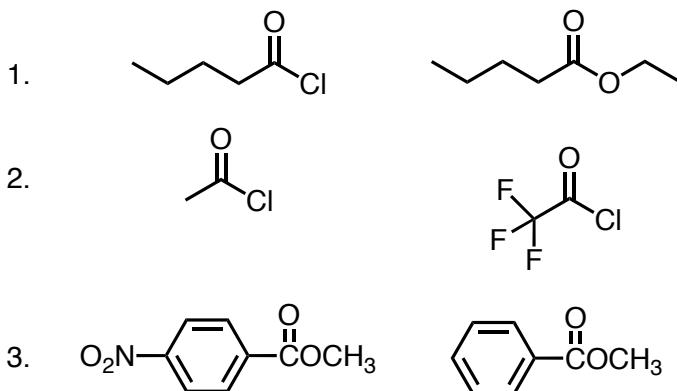
Distribution: November 1 2024

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1.

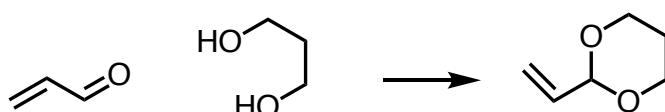
- a. Benzaldehyde is less reactive to nucleophilic addition reactions than aliphatic aldehydes. Explain.
- b. Explain by discussing the electrophilic character of the carbonyl carbon which compound would have the faster rate of nucleophilic substitution.



2.

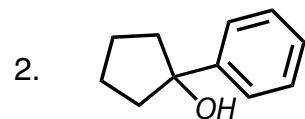
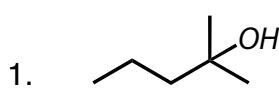
- a. Give the mechanisms of a nucleophilic substitution reaction between (R)-2-bromobutane and cyanide and a nucleophilic addition reaction between 2-butanone and cyanide (followed by protonation).
- b. For each reaction, explain if a racemic mixture is formed or not.

3. Consider the following acetalization reaction in the presence of an acid catalyst.

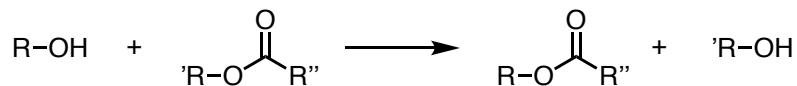


- a. Identify the nucleophile and the electrophile and give the mechanism of the reaction.

4. Propose a structure for a carbonyl compound and a Grignard reagent ($\text{R}-\text{Mg}-\text{X}$) that can undergo a reaction to yield the following alcohols.



5. A transesterification is the process of exchanging the organic functional group R' of an ester with the organic group R of an alcohol via a mechanism of addition-elimination.



- Formulate the reaction mechanism of the acid-catalyzed transesterification of methyl butanoate with ethanol in presence of HCl and explain in terms of reactivity why the acid catalyst is necessary for the reaction to proceed?
- Formulate the reaction mechanism of the transesterification of methyl butanoate with sodium ethoxide ($\text{NaOCH}_2\text{CH}_3$). Explain in terms of reactivity why the reaction can also proceed under these conditions, compared to the reaction with only ethanol.
- You would like to further push the reaction equilibrium in 5b towards the formation of products. Propose a different leaving group and explain if this change will significantly affect the reaction rate or not.