Carbonyls #1: Reconnecting with Carbonyls—A Quick Review

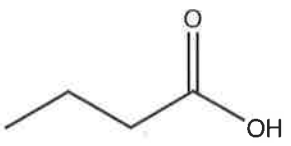
Alright, gang: We are finally out of the woods as far as Conjugated Systems and Aromaticity are concerned. But you'll see soon enough though, just like in O Chem 1, a lot of the things we talk about rear their ugly heads again, so don't empty your head of all the stuff we just covered.

Anyways, moving on. Now, we're going to dive into Carbonyl chemistry. I know what you're thinking, "But Joe, we've done the Grignard Reaction, are you telling me that there's more to carbonyls than just that?" And I would say yes: There's a ton more. To be honest with you guys, this is the section of O Chem 2 a lot of kids get overwhelmed, fall behind and get lost, and then eventually give up. There's a lot of info, and while it is challenging material, if you stay organized and keep the big picture in mind, you will thrive—I promise. So my goal is to lay this stuff out and break it down into the best way for you all to absorb. The worksheets may seem long, tedious, and ask you to do a lot of the same mechanisms over and over, but trust me on this: repetition is absolutely imperative with this material.

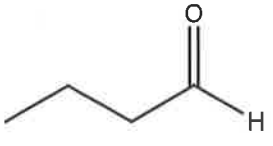
Sorry for the longer-than-normal intro. This worksheet will be on the shorter side, and it'll be a review of the carbonyl functional group—its properties and different ways to make them from alcohols/revert them to alcohols. It's all stuff you've seen before. Let's knock this out quick, and then get to the new stuff ☺.

1.) As you could've probably guessed, we're going to start out with some physical properties (shocker).

a.) Given the 4 molecules below, assign boiling point rankings from 1-4, 4 indicating the **highest** boiling point.



4



2

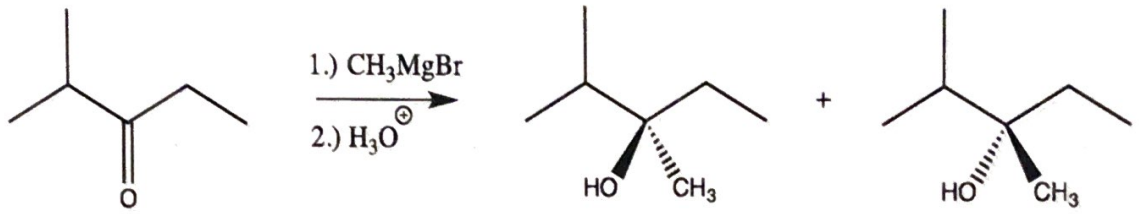
1

3

1.) (continued)

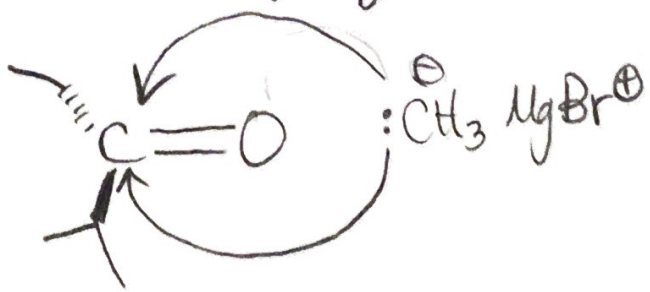
b.) In the last video, we discussed the geometry of carbonyls as well as how the geometry plays a role in reactions such as S_N2 attacks on carbonyls. Given the Grignard Reaction below, explain **why a racemic mixture is obtained**. Don't focus on the reaction itself: I'm interested in your explanation as to why the product mixture is racemic.

**Some quick O Chem 1 refreshers: we have a stereocenter cause the one carbon is bonded to 4 different things. Also, remember a racemic mixture is a mixture that contains a 50%/50% split of both enantiomers (enantiomers are the "left and right hand" stereoisomers of each other—completely opposite stereochemistry at each stereocenter).

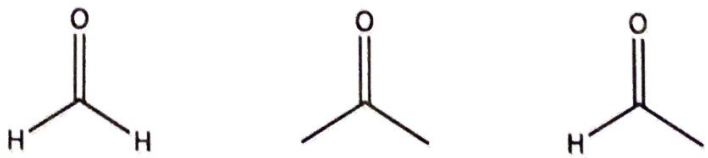


50% 50%

Carbonyl carbon is sp_2, trigonal planar (flat)
-attack happens equally on top & on bottom



c.) Last question: Rank the following molecules 1-3 (1 being the slowest reaction speed, 3 being the fastest) in terms of reaction speed when attacked by EtMgBr.



3 1 2

2.) Moving on. Alright, we're going to round out this worksheet by reviewing oxidation/reduction reactions regarding carbonyls. If you're having trouble with this, I would recommend you jump back to the Alcohols video/worksheet in O Chem 1 in jOeCHEM where we covered this. Otherwise, keep chugging along, complete these reactions, and then we'll move on with more carbonyl stuff ☺.