14.36 For the following five compounds:





EQ 06.21

Provide the missing products in the following reaction schemes. In all cases, show only the major organic product. The byproducts of the reaction do not need to be shown.

(a) $H_{3}CO + CH_{3} + CH_{$

Chemistry 215 • Thinking in Blue • Week 07

14.36 For the following five compounds:





This is certainly an example of a question whose topic is not a challenge to decode! Relative acidity can sometimes be evaluated from fundamental principles, if the molecules do not differ too wildly in the issues being compared. Otherwise, using the pKa table to construct arguments by analogy is needed.

Here, all of the molecules represent carbon acids (i.e., H-C-EWG, EWG is some electron-withdrawing group). The acidic protons need to be clearly identified.



What is the effect of EWG on acidity? This is a fundamental principle and should not need to be derived at this point. In general, EWG increase the aciditiy (lower the pKa) of nearby protons. The effect of the EWG is greater when it can stabilize the conjugate base by delocalization, and the delocalization is generally better when the electrons are being delocalized onto more electronegative atoms or groups. Thus, having two EWG that can stabilize the conjugate base makes the proton that much more acidic than if there was only one EWG, and the more potent the group is at stabilizing a negatively charged atom, the more acidic the original carbon acid will be.

Molecule A stands out as the only one with only one EWG, and as it is the same one that appears in many of these others, and they all have two EWGs, then even without the pKa table, this one can be assigned as the least acidic. Similarly, molecule C stands out from among the other three because the phenyl ring is not as strong an EWG as the C=O or N=O groups, so among those with two EWG, molecule C can confidently be assigned as the next least acidic, after Molecule A.

Among the other three, the pKa needs to be consulted to see if there are some experimental precedents that can be used. H₃C H₃CO[^]

pKa 10.2

The nitro group is the most acidifying (presumably because of the direct attachment of the positively charged nitrogen atom). The ester group is less acidifying than the ketone group (presumably beause the OR group is diminishing the partial positive of the carbonyl carbon, through delocalization).

	>		>		>	С	>	А
most acidic								least acidic
2 EWG: nitro nitro		2 EW ketor ester	/G: ne	2 EW ester ester	G:	2 EWO ester pheny	G: 1	1 EWG: ester
E	>	В	>	D	>	С	>	A
most acidic								least acidic

Provide the missing products in the following reaction schemes. In all cases, show only the major organic product. The byproducts of the reaction do not need to be shown.



In a problem, indicating "excess" is usually there for a reason. In this case, there are two different carboxylic acid derivatives capable of undergoing acylation, and in the absence of other information, you can assume that they both will. Because the nucleophile is a strong and irreversible one (a Grignard Reagent), the general idea that two equivalents are consumed needs to be considered: acylation of carbon nucleophiles creates a ketone, and the ketone can undergo a second, productive addition reaction once it forms. The general concept is, then:



the ketone is generally more reactive than the acyl starting material, so once it forms it reacts faster than the acyl substrate

And yet, functional group identification is still critically important because sometimes the general concept has a footnote or two, where there are unique discoveries that diverge from the general result. These discoveries are exactly that: discoveries... unexpected results that can be consistent with the overall picture when understood. These two examples (above) represent such cases, and in both cases they are structured to present the internal comparison between "the general result" and "the non-general result." This conclusion is what needs to be made when looking at these questions, before writing anything down, because those "non-general results" cannot be figured out or derived from the information presented here. Those are the skills that must be brought into the room.

QUESTION A has the Weinreb amide, which react with organometallics to give ketones and not alcohols.

conditions

happens normally



Provide the missing products in the following reaction schemes. In all cases, show only the major organic product. The byproducts of the reaction do not need to be shown.



QUESTION A has the Weinreb amide, which react with organometallics to give ketones and not alcohols.



QUESTION B has an amide combined with LiAlH₄, which react to give amines and not alcohols.

