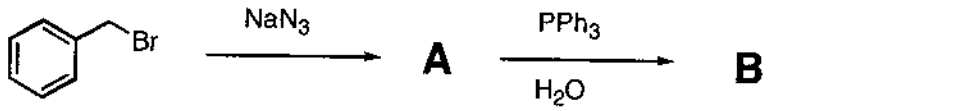
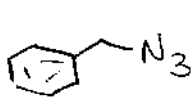
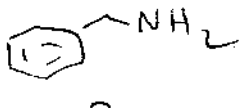
1) Provide structures of **A**, **B**, **C**, and **D**. Mechanisms are not needed. 3 points for each correct answer

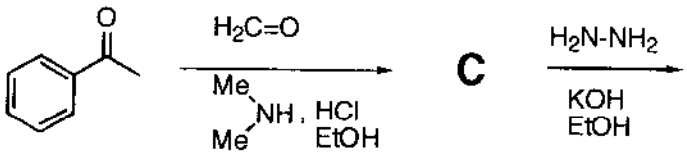


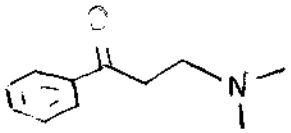


A

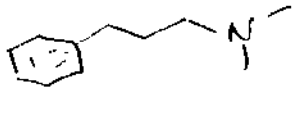


B





C



D

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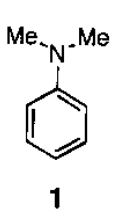
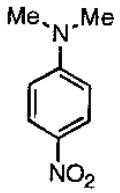
2a) Compound **1** is a stronger base than **2**. Provide a detailed but brief (<25 words) explanation. Use chemical structures to support your argument (10 points)

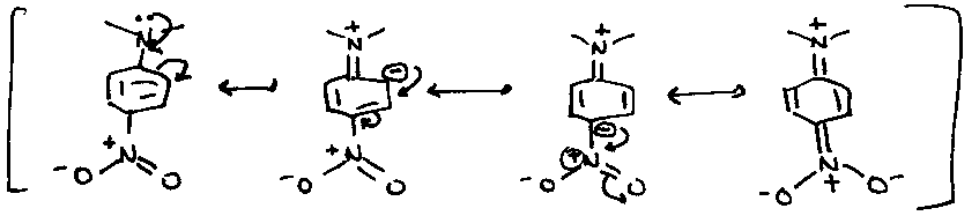


1

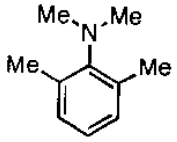


2

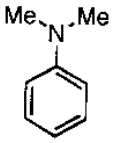
2 is less basic because the lone pair is conjugated with the electron withdrawing nitro group.



2b) Compound **3** is a stronger base than **1**. Provide a detailed but brief (<25 words) explanation. Use chemical structures to support your argument (10 points)

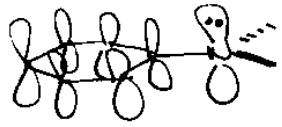


3



1

For 1

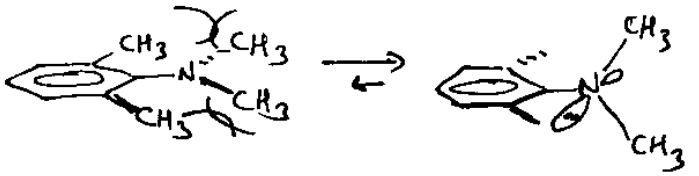


Lone pair can be co-planar with benzene ring (sp^2 hybridized nitrogen)

Delocalization is efficient:

Therefore 1 is less basic.

For 3



Inefficient delocalization because of the steric clash of the methyl groups. This causes rotation of the carbon-nitrogen bond which decreases overlap with the benzene ring

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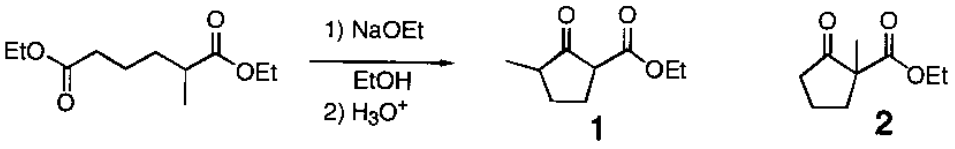
3) Circle the correct answer (2 points). Provide a clear and concise explanation (18 points). Use chemical structures to support your assignment



1 2

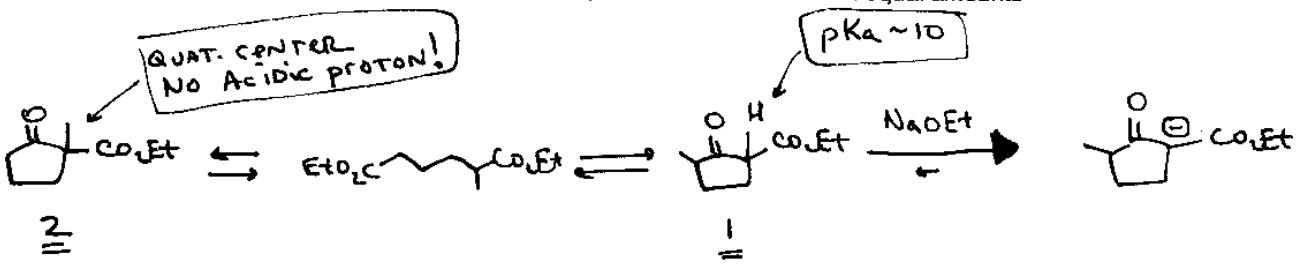
a. Only product **1** will be formed

b. Only product **2** will be formed

c. Both products will be formed, but **1** will be the major product

d Both products will be formed, but 2 will be the major product

e Both products will be formed in equal amounts

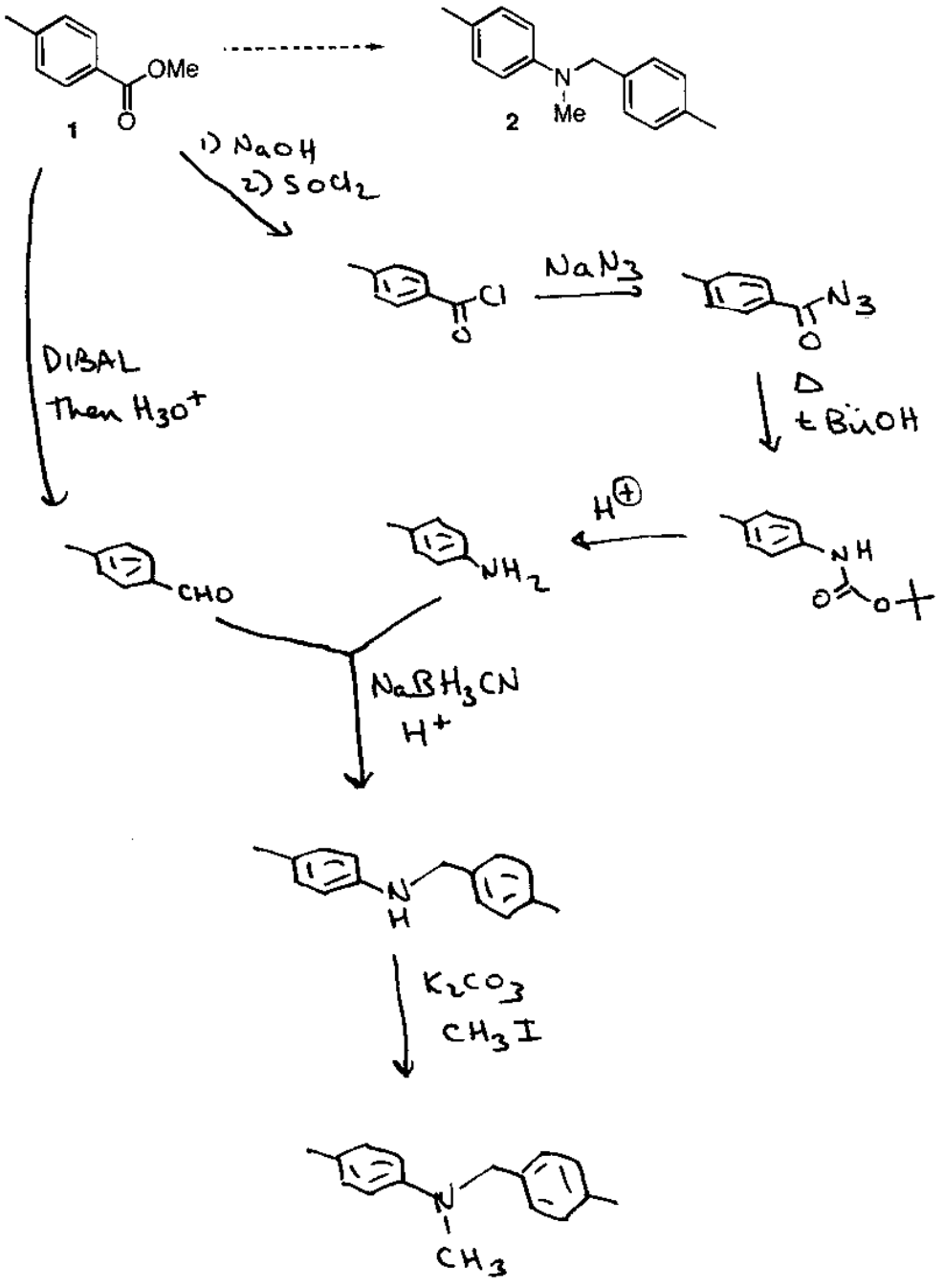


2 1

THIS STEP DRIVES THE EQUILIBRIUM!

DIECKMANN CONDENSATION CAN PRODUCE BOTH 1 & 2, BUT ONLY 1 CAN BE DEPROTONATED. THE DEPROTONATION DRIVES THE EQUILIBRIUM.

4) Outline a multistep synthesis of **2** using **1** and any other starting materials that contain 3 carbons or less. Reagents (e.g. PPh_3) may contain more than 3 carbons. (24 points)



5) Provide a detailed, arrow pushing mechanism

(24 points)