1. *Write the best structure for **A**, including an assignment of the NMR and IR data. Then write the best mechanism for the formation of **A**.*

methyl 2-chlorobutyrate + acetone react with potassium tert-butoxide in THF for 2 hr at 25 °C
to give **A** + KCl + tert-butyl alcohol

A: ^{1}H NMR: δ 0.96 (3H, t, J=7 Hz), 1.41 (3H, s), 1.44 (3H, s), 1.92 (2H, q, J=7Hz), 3.89 (3H, s)
^{13}C NMR: δ 10.1, 11.0, 18.1, 18.8, 47.6, 48.1, 50.8, 173
IR: peak of significance at 1742 cm^{-1}
UV: no intense absorption above 200 mm.
Mass spectrometry molecular weight: 158.

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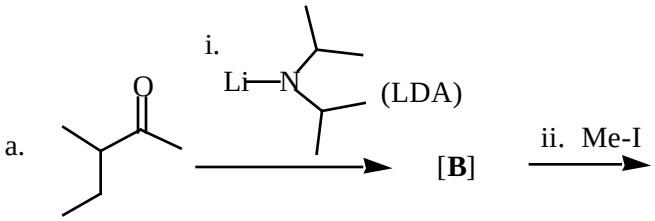
2. Consider each of the following pairs of reactions and write the product from the faster reaction of each pair. Explain why that reaction is the faster one, and why that product is formed (mechanism).

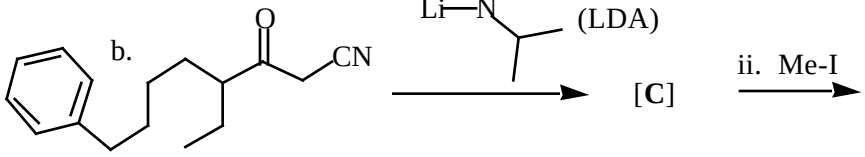
A.

a. methyl benzoate → (methyl amine)

b. benzoyl chloride → (methyl amine)

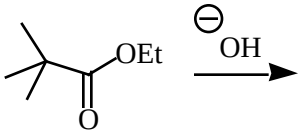
B.

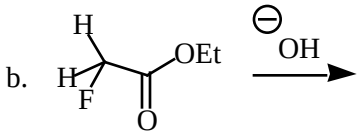
a. 

b. 

Consider the rate of the SECOND step in both cases.

C.

a. 

b. 

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3. Write a mechanism to rationalize the following observation: