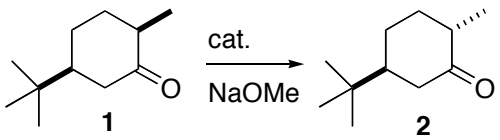
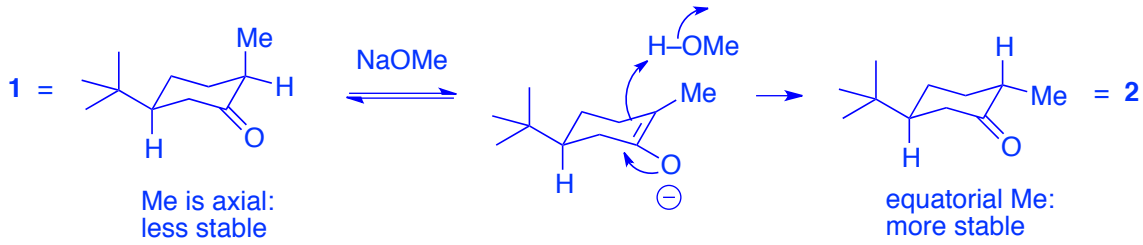
CHEM 330

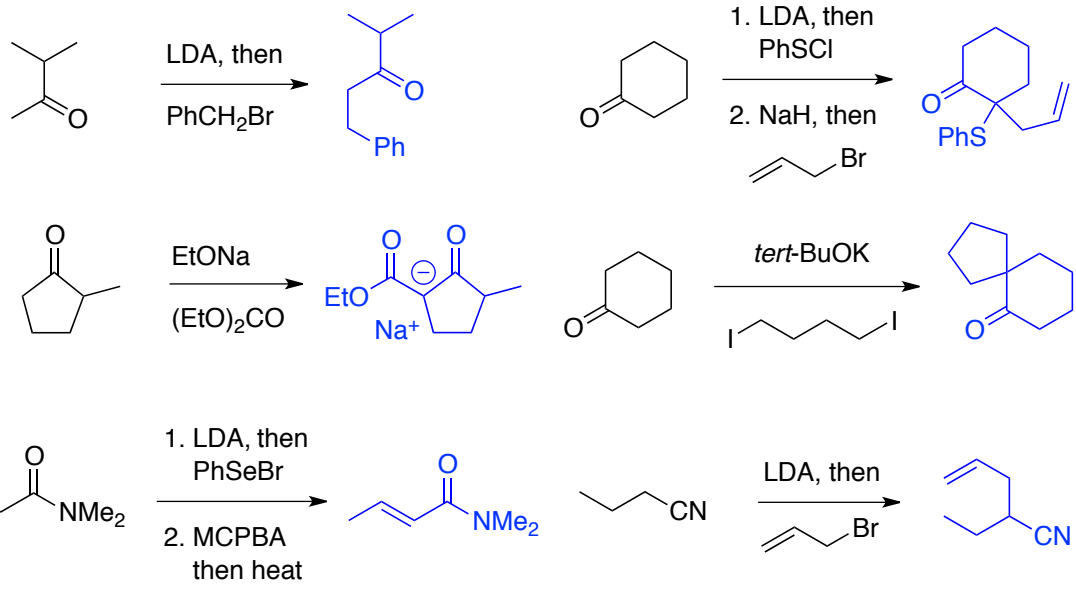
Problem set 3

1. Provide an explanation for the fact that exposure of **1** to a catalytic amount of NaOMe causes isomerization to **2**.



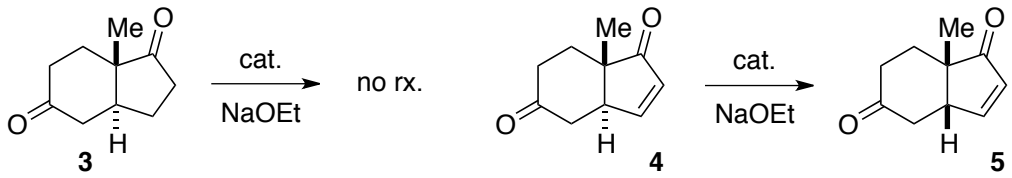


2. Predict the structure of the major product expected from the following reactions:



3. Provide an explanation for the following experimental observations and write accurate reaction mechanisms for each transformation:

(a) exposure of **3** to a catalytic amount of NaOEt results in no reaction, but treatment of **4** under the same conditions causes isomerization to **5**.

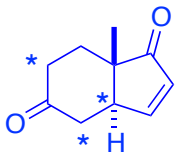


3 **4** **5**

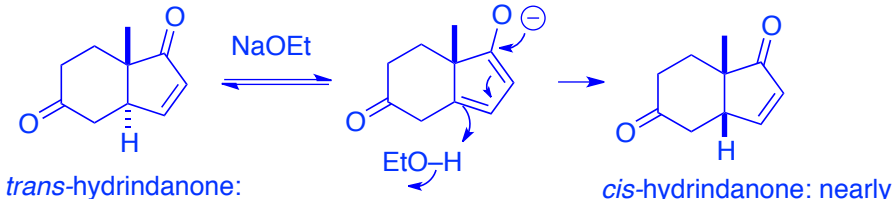
under the stated conditions, compound 3 can undergo reversible deprotonation at any of the three starred positions:

However, reversible deprotonation at any position is inconsequential

under the stated conditions, compound 4 can undergo reversible deprotonation at any of the three starred positions:



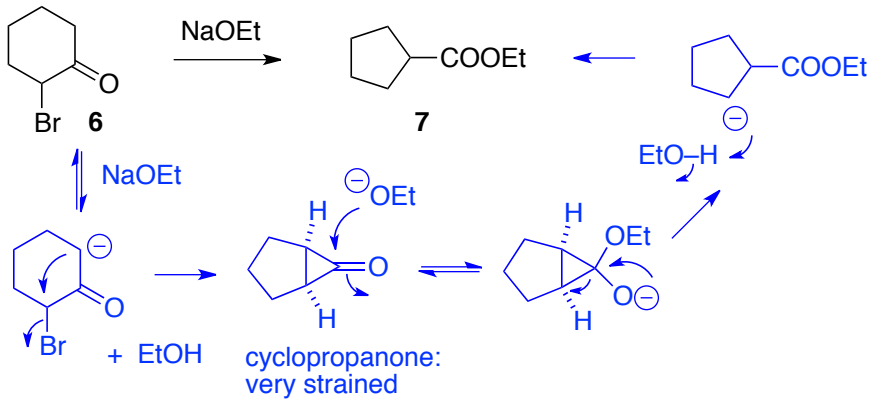
Whereas reversible deprotonation of either side of the cyclohexanone segment is inconsequential, reversible deprotonation at the ring junction can cause isomerization to a more stable (less strained) *cis*-hydrindanone:



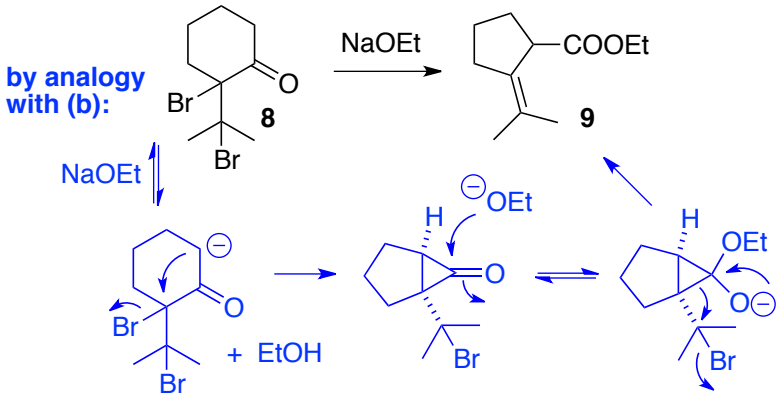
trans-hydrindanone: strained, less stable

cis-hydrindanone: nearly strain-free, more stable

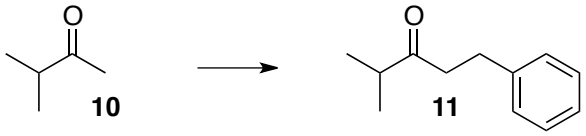
(b) treatment of compound **6** with NaOEt results in formation of **7** (an example of Favorskii reaction)



(c) treatment of compound **8** with NaOEt results in formation of **9**

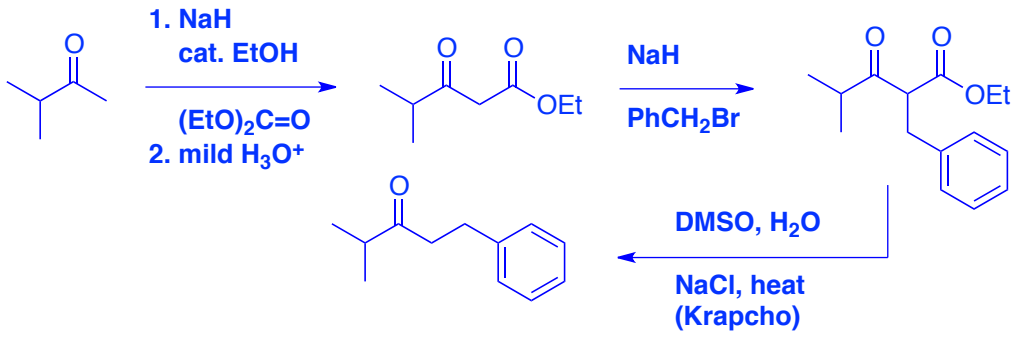


4. In the past, the regioselective alkylation of an unsymmetrical ketone was often achieved through a sequence involving a Claisen-type condensation as a key step. Show how this could be done by proposing an avenue to compound **11** from ketone **10** using any permutation of the solvents/reagents listed below:



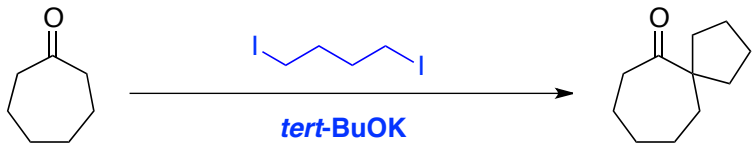
Permissible solvents and reagents:

H_2O	NaH	H_2SO_4	CH_3COOEt	MeI
EtOH	KOH	HNO_3	PhCOOEt	$PhCH_2Br$
DMSO	Na_2SO_4	HCl	$(EtO)_2CO$	PhI
Et_2O	$KMnO_4$	TsOH	CH_3COOPh	$Ph(CH_2)_2I$
MeOH	NaBr	H_2CrO_4	PhCOPh	$BrCH_2CH_2Br$

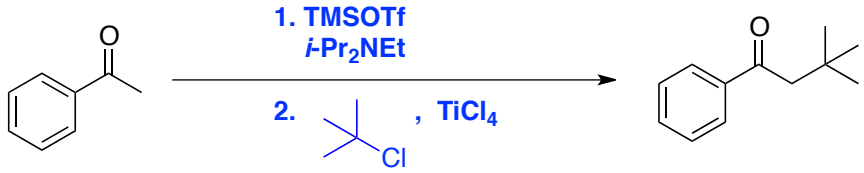


5. Propose a method to achieve the following transformations:

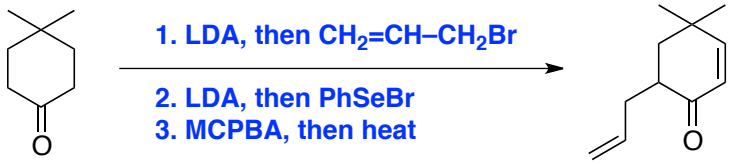
a.



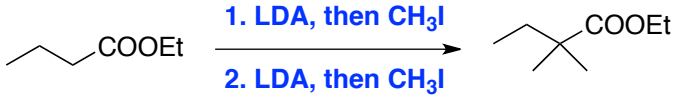
b.



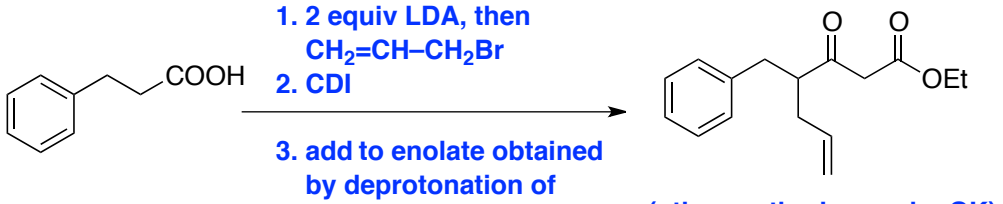
c.



d.



e.



(other methods may be OK)

f.