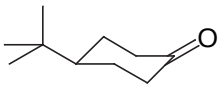
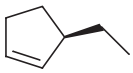
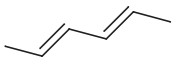
Practice problems



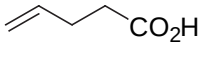
$LiBH(sec\text{-}Bu)_3$



$MCPBA, CH_2Cl_2$

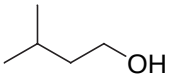


+ $CH_2{=}CHCN$ heat



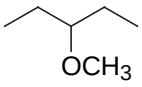
[a] $NaHCO_3$

[b] I_2

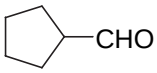


CrO_3-(pyridine)$_2$

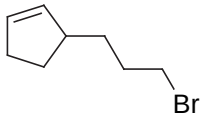
CH_2Cl_2, room temp



$BBr_3, CH_2Cl_2, 0\ °C$

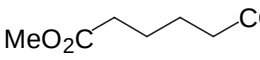


$(MeO)_2PO\overset{\ominus}{C}HCO_2Et$



$(n\text{-}Bu)_3SnH$, AIBN

PhH, reflux

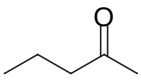


NaOMe, MeOH

$2CH_3CHO$ NaOMe, MeOH, room temp

(a) BH_3 - THF

(b) H_2O_2, NaOH



(a) MeMgBr

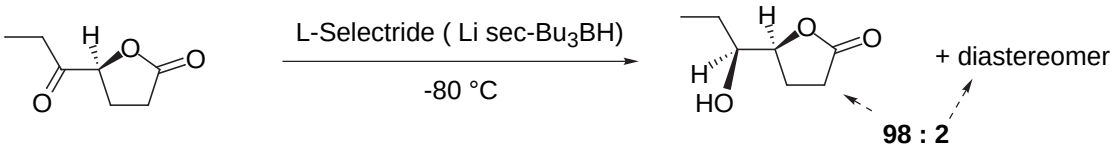
(b) $H_3O^{\oplus}$

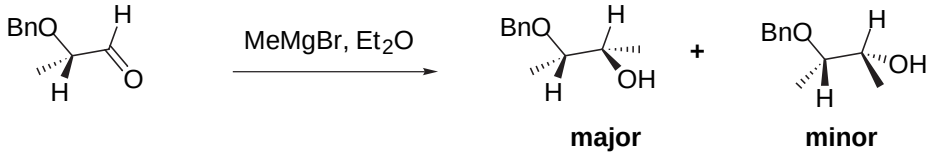
Draw a potential energy diagram to illustrate: Use ΔG as the label for the y-axis.

[a] an S_N1 reaction
[b] an S_N2 reaction
[c] an exothermic process starting from a reactive intermediate
[d] an endothermic process leading to the formation of an intermediate
[e] a kinetically controlled process wherein the product of thermodynamic and kinetic control are the same.
[f] the Hammond postulate

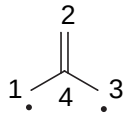
In class you saw that at equilibrium, the ratio of the more to less substituted enolate formed by adding 2-methylcyclohexanone to LDA in THF at -78 °C is 90:10. Determine the energy difference between the two enolates under these conditions.

Analyze the following diastereoselective transformations.
[a] Determine whether a r_e or a s_i face attack is illustrated.
[b] Illustrate the preferred approach of the nucleophile to the substrate.
[c] The first transformation is consistent with the Felkin-Anh model. The second is not. Suggest a reason why the second deviates. [Hint: Consider the substances formed from the Schlenk equilibrium of the Grignard reagent.]





Set up, but do not solve, the secular determinant and secular equations for trimethylenemethane. Use the numbering system illustrated.

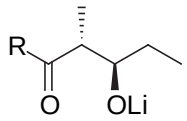


In *JOC*, **1993**, *58*, 1194-1198, one reads that the "Arrhenius function" for the transfer of a hydrogen atom from PhSH to RC(•)H_2 is given by:

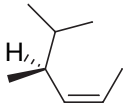
$\log k = 9.41 - 1.74/(2.3RT)$

[a] Rearrange the Arrhenius equation into a form that is consistent with the Arrhenius function illustrated above.
[b] What is the Arrhenius activation energy for the process?
[c] What is logA?

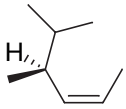
Illustrate the Zimmerman-Traxler *transition state* needed to construct the following substance.



[a] Highlight the $A^{1,3}$ strain that exists in the conformation illustrated below.

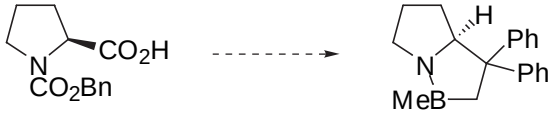


[b] Predict the product:



+ MCPBA

Indicate how to accomplish the following.



Show how to convert 3-methyl-2-butanone, a prochiral ketone, to (R)-2-hydroxy-3-methyl butane.

Provide a detailed conformational analysis that accounts for the following transformation. Pay particular attention to the stereo- and regiochemical outcome.