## FINAL EXAMINATION, 59-230, 1991

1. 

(a)
$\mathrm{BH}_{3}$, then $\mathrm{H}_{2} \mathrm{O}_{2} / \mathrm{OH}^{-}$


(i)
$\mathrm{CH}_{3} \mathrm{CH}_{2} \mathrm{CH}_{2} \mathrm{OH}+\mathrm{CH}_{3} \mathrm{OH}$
(f)
(b)

(c)

(d)

(g)
$\mathrm{SOCl}_{2}$


(j)

(k)

2.
(a)

(b)
(e)

(e)
3.
(a)
(i) diastereomers
(ii) diastereomers
(iii) diastereomers
(iv) identical
(b) the left drawing of part (ii) and both drawings of part (iii) are meso forms
(c) Only (iii) since both compounds are meso forms and therefore optically inactive. The mixture must also be inactive.
(d) The priorities for the top carbon are $\mathrm{OH}>\mathrm{COOH}>$ chain $>\mathrm{CH}_{3}$. The configuration is $\underline{\mathrm{S}}$. The priorities for the bottom carbon are $\mathrm{Br}>$ chain $>\mathrm{CH}=\mathrm{CH}_{2}>\mathrm{H}$. Configuration is $\underline{\mathrm{S}}$.
4. (a) The second reaction has the poorer leavig group and neither of the reactions can proceed via a resonance stabilized intermediate. [Note that there is one extra carbon in the second example which makes resonance impossible.] Therefore, the second reaction will prefer the Sn2 mechanism.
(b) The first reaction will proceed faster. Both reactions will be Sn2 since the carbon undergoing substitution is primary. The nucleophile in the first reaction is much less hindered than the one in the second reaction.
(c) The second reaction will be faster. The first step in an electrophilic addition reaction is the rate determining step. The alkene is required to supply electrons in this step and the electronegative bromine atom will make this harder.
5.
(a)

overall


(b)



6. (a) Two stereoisomers are formed and they are related as diastereomers. The existing chiral centre ( $\underline{R}$ ) is in both but the new one is formed as a mixture of $\underline{R}$ and $\underline{S}$. Therefore, the two products are $\underline{R}, \underline{R}$, and $\underline{R}, \underline{S}$.
(b) In this case the starting material is a mixture of $\underline{R}$ and $\underline{S}$. Each of these will form a second centre which can be either $\underline{R}$ or $\underline{S}$ also. Therefore four stereoisomers $[\underline{R}, \underline{R} ; \underline{R}, \underline{S} ; \underline{S}, \underline{R}$; and $\underline{S}, \underline{S}]$ will be formed. These are two pairs of enantiomers.
7. [THE FOLLOWING ARE ONE OF SEVERAL POSSIBLE CORRECT ANSWERS]
(a) treat each with Na metal. The alcohol [2-butanol] will evolve a gas [ $\mathrm{H}_{2}$ ]whereas the ether will not.
(b) treat with bromine. The brown colour will be discharged with the alkene[2-methyl-2-butene] but not with the alkane.
(c) Treat with Tollens reagent. The aldehyde [2-methylpentanal] will give a precipitate or a silver mirror whereas the ketone will not.
8.

9.
(a)

(b)
(c)

10. (a)

(b)


