Exam #2

Friday, October 19, 2001

This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

Ъ

3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

CI OH
$$_{\text{DH}=2.5}$$

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

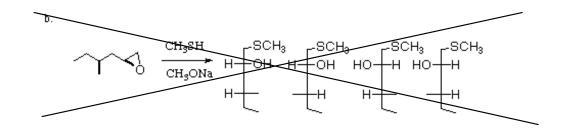
b) Deduce the stucture of A, and draw an arrow-pushing mechanism for its formation.

21.3, t

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

- (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.
- a. Br $\rightarrow \frown$ Br $\rightarrow \frown$ CH3O \rightarrow Br Br $\rightarrow \frown$ OCH3



4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.

HOOH

HOOH

$$H^+$$
, - H_2O

S-CH₃

BC NMR:

 16.5 , q
 1.33 , s, 3H
 1.33 , s, 3H

Exam #2

Friday, October 22, 1999

This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or the same.

3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

a.

3. (cont) For each reaction, indicate the expected major product. Explain your reasoning in detail.

c.
$$O_{OTs} \xrightarrow{CH_3OH} O_{OTs} \xrightarrow{K_2CO_3} O_{OTs} O_{O$$

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.

1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.

a.

$$\downarrow$$

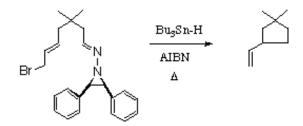
2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.

(20 points) For each reaction, indicate the expected major product. Explain your reasoning.

a.

Buffer,
$$pH = 2.9$$

4. (30 points) Draw a detailed arrow-pushing mechanism for the following transformation.



5. (30 points) Deduce the structure of ${\bf A}$, and draw a detailed arrow-pushing mechanism for its formation.

CH ₃ O	но он	A	¹³ C NMR:	¹H NMR:
01.130	H ⁺	$C_6H_{14}O_4$	95, t (2)	4.06, s, 4H
		0 17 7	72, t (2)	3.67, s, 4H
			53, q (2)	3.35, s, 6H

Friday, October 24, 1997

This is an open-book, open notes exam. Please show your work in detail.

(12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.

2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.

(20 points) For each reaction, indicate the expected major product. Explain your reasoning.

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation.

5. (40 points) Deduce the structure of ${\bf A}$, and draw a detailed arrow-pushing mechanism for its formation.

1. (8 points) Assign the absolute configuration (R vs. S) for each center.

2. (12 points) For each pair, indicate whether they are diastereomers, enantiomers or the same.

3. (20 points) For each, indicate the expected major product. Explain your reasoning.

4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.

5. (20 points each) For each, draw a detailed arrow-pushing mechanism.

1. (12 points) Assign the absolute configuration (R vs. S) for each.

2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same.

3. (20 points) For each, indicate the expected major product. Explain your reasoning.

4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.

5. (20 points each) For each, draw a detailed arrow-pushing mechanism.

(5R)-5-bromoheptanenitrile

Friday, October 19, 2001

This is an open-book, open notes exam. Please show your work in detail.

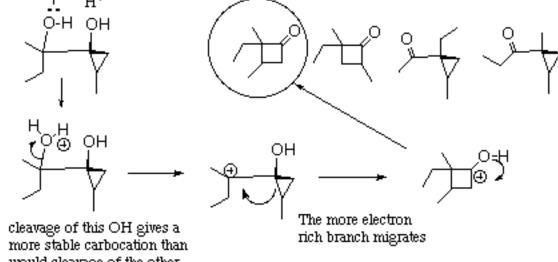
1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

At this pH, only the dichloro acid is ionized, so that carboxylate is the nucleophile. That carboxylate effects $S_{N}2$ displacement of the chloride attached to the sp^{S} -hybridized carbon.

symmetrical, so doesn't matter which side opens



would cleavage of the other OH

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

b) Deduce the stucture of A, and draw an arrow-pushing mechanism for its formation.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

(2S, 3R)-3-methyl-1,2-pentanediol

((2R, 3R)-2-bromo-3-methylpentoxy)benzene

(2S, 3R)-3-methyl-1-phenoxy-2-pentanol

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

(30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

a.
$$Br \xrightarrow{MeOH} CH_3O \xrightarrow{Br} Br \xrightarrow{OCH_3}$$

these are $S_N l$ conditions - the reaction proceeds by way of the cation, and it is much easier to form the cation from the tertiary halide than from the primary halide

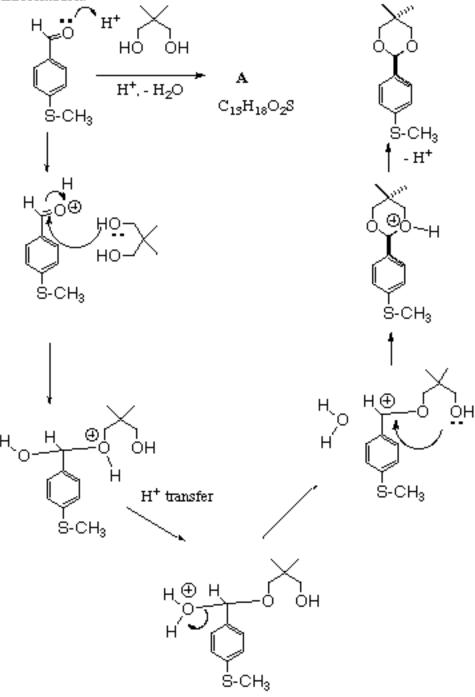
Ъ.

Neither center inverts

Both centers invert

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.



Exam #2

Friday, October 22, 1999

This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or the same.

3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

a. Br
$$F = 6.5$$
 Both are ionized; is the better nucleophile A

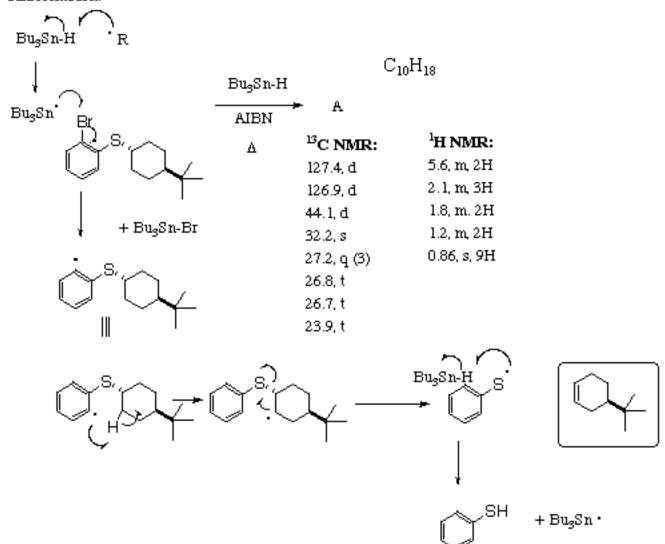
3. (cont) For each reaction, indicate the expected major product. Explain your reasoning in detail.

Benzylic center is the more reactive; only the reaction center inverts

Only the reaction center marked with the arrow inverts

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.



1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.

а

$$\bigvee_{i=1}^{R}$$

2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.

enantiomers

$$\mathcal{A}$$

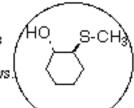
Ъ.

same (meso)

3. (20 points) For each reaction, indicate the expected major product. Explain your reasoning.

a.

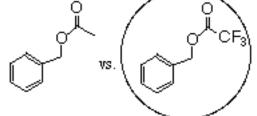
HO S-C



The reaction proceeds with inversion at one center. The other center is not changed.

ъ.

Buffer, pH = 2.9



At pH = 2.9, only the trifluoroacetic acid is ionized. The ionized carboxylate is a more reactive nucleophile than the unionized acid.

4. (30 points) Draw a detailed arrow-pushing mechanism for the following transformation.

5. (30 points) Deduce the structure of A, and draw a detailed arrow-pushing mechanism for its formation.

1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.

(8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.

enantiomers

3. (20 points) For each reaction, indicate the expected major product. Explain your reasoning.

 $S_{N}2$ does not proceed on sp^{2} -hybridized center

both the thiolate and the alkoxide will form, in equilibrium with each other, but the thiolate is much the more nucleophilic of the two anions

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation.

5. (40 points) Deduce the structure of $\bf A$, and draw a detailed arrow-pushing mechanism for its formation.

Exam #2 1996

This is an open-book, open notes exam. Please show your work in detail.

1. (8 points) Assign the absolute configuration (R vs. S) for each center.

S

2. (12 points) For each pair, indicate whether they are diastereomers, enantiomers or the same.

a.

R

enantiomers

S

h

same ... also meso

3. (20 points) For each, indicate the expected major product. Explain your reasoning.

The allylic position is activated for $S_{N}2$ displacement

Of the three nucleophiles available, $\mathrm{CH_3S}^-$, HO^- , and $\mathrm{CH_3O}^-$, $\mathrm{CH_3S}^-$ is the most stable, so will be present in the highest concentration, and is also the most nucleophilic. The reaction will proceed with inversion of absolute configuration.

(20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.

5. (20 points each) For each, draw a detailed arrow-pushing mechanism.

* * * * *

1. (12 points) Assign the absolute configuration (R vs. S) for each.

2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same.

one center inverted, not both = diastereomers

3. (20 points) For each, indicate the expected major product. Explain your reasoning.

4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.

$$Br$$
 CH_3OH
 CH_3O
 Br
 Br
 Br
 Br
 CH_3OH
 CH_3

5. (20 points each) For each, draw a detailed arrow-pushing mechanism.