

CHEM 51C LEC A (40550)



Final (Fall Qtr 2016) - LETTER SIZE

7501 (3417)

ver. A

Assigned Seat#: _____

Instructions to Instructor:

Do not alter this coversheet in ANY way. Substantial delays and additional fees may apply.

Instructions to Student:

1. Clearly print your Last Name, First Name and the Date
2. Clearly print your Student ID number in the boxes provided. Use large, dark numbers. These numbers are captured automatically during the scanning process.
3. Bubble in each number of your Student ID completely. The bubbles are used only if your written ID number is not captured.
4. Write your Name and Student ID number in the upper right corner of all following pages of your exam.

Last Name, First Name: Key

Date: ___/___/___

STUDENT ID:

For Access UCI student, leave first column blank then enter your 7-digit Student ID number.

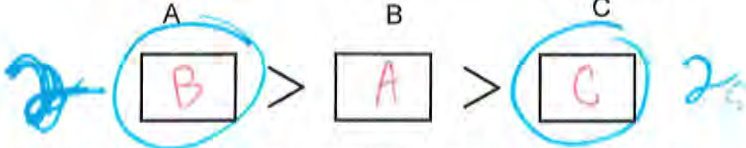
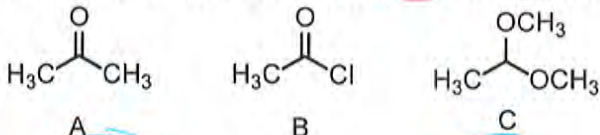
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8	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0

----- (This space for Instructor/TA use only) -----

Gr:	Question	1	2	3	4	5	
	Score	17	25	21	21	12 + 1 bonus	
		6	7	8	9	TOTAL	
		12	16	18	20	162 (+1 bonus)	

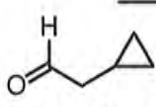
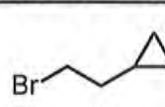
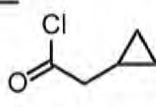
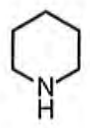

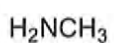
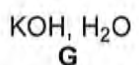
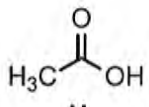
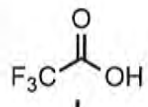
1 (16 points).

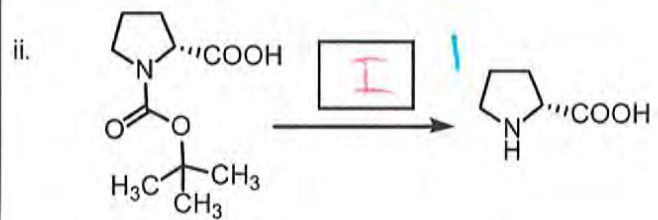
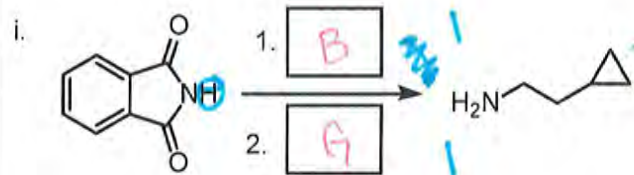
a. Rank the following compounds from **fastest** to slowest reaction with PhMgBr:



b. Fill in the starting materials to complete the syntheses

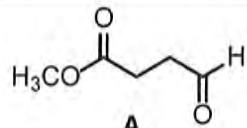
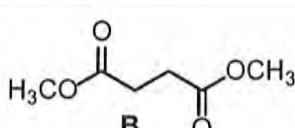
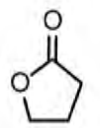
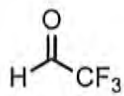
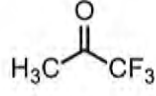
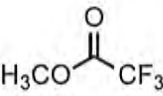
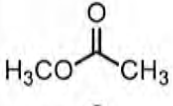
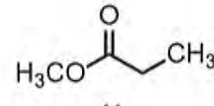
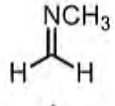
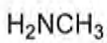

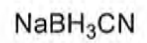
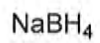

Starting materials

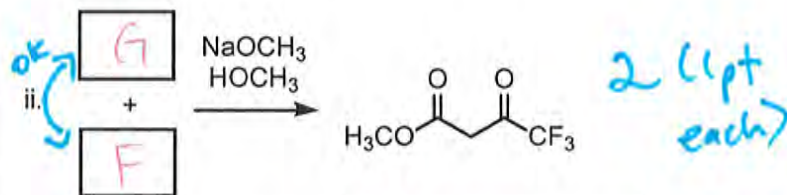
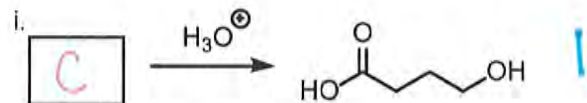
		
		
		



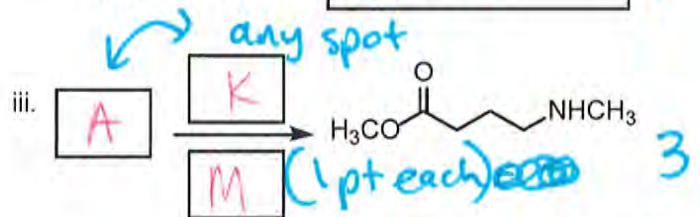
c. Fill in the starting materials to complete the syntheses

Starting materials



Name of reaction: Claisen 2



Name of reaction: reductive amination 2

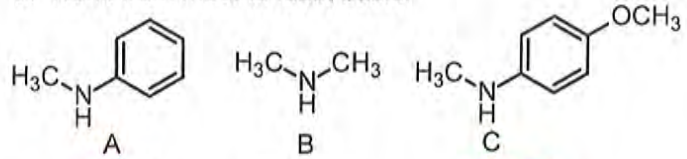
amine reduction: 1

17

Initials: _____

2 (22 points)

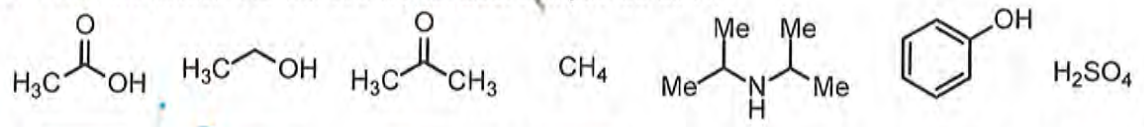
a. Rank from most to least basic:



2 B > C > A 2

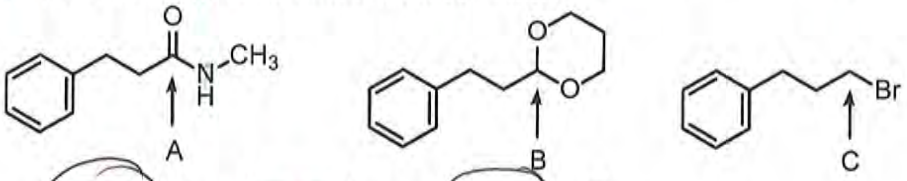
b. Fill in the pKas. We will count your best 6, if you do all 7.

1pt each
max 6



5 16 20 50 36 10 -9
 ok: 3-6 14-18 18-22 45-55 33-38 8-12 -11 to -7

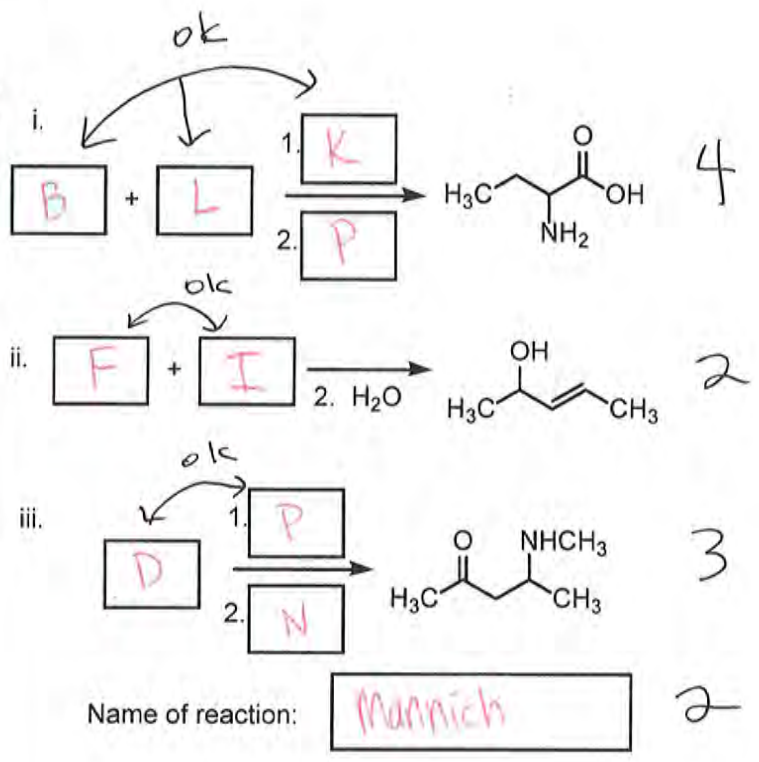
c. Rank from highest to lowest oxidation state:



2 A > B > C 2

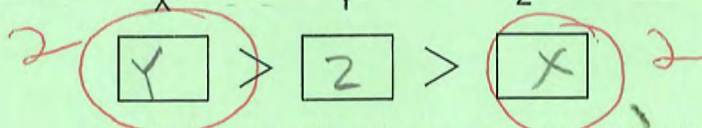
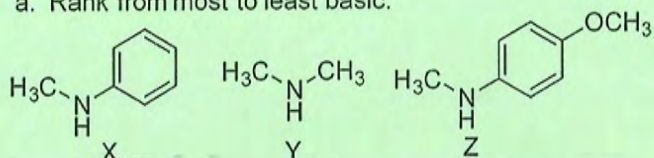
d. Fill in the starting materials to complete the syntheses

Starting materials				
<chem>CC=O</chem>	<chem>CCCC=O</chem>	<chem>CC=O</chem>	<chem>CC(=O)C</chem>	
A	B	C	D	
<chem>CC(O)C=C</chem>	<chem>CC=CC=O</chem>	<chem>LiAlH4</chem>	<chem>NaBH4</chem>	
E	F	G	H	
<chem>BrMgCH3</chem>	<chem>LiCu(CH3)2</chem>	<chem>NaCN</chem>	<chem>NH4Cl</chem>	<chem>CO2</chem>
I	J	K	L	M
<chem>CN=C</chem>	<chem>CN=C</chem>	<chem>H3O+</chem>	LDA	
N	O	P	Q	

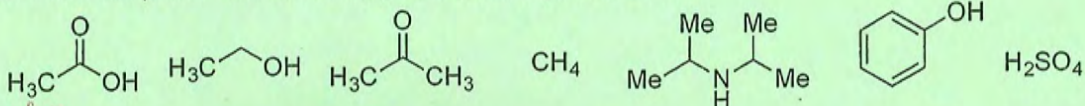


1 (22 points)

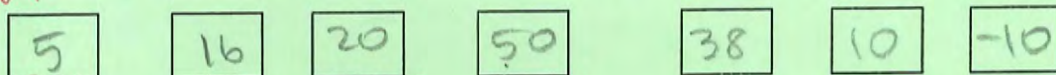
a. Rank from most to least basic:



b. Fill in the pKas. We will count your best 6, if you do all 7.

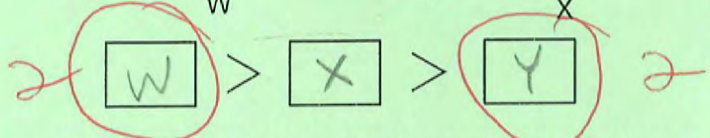
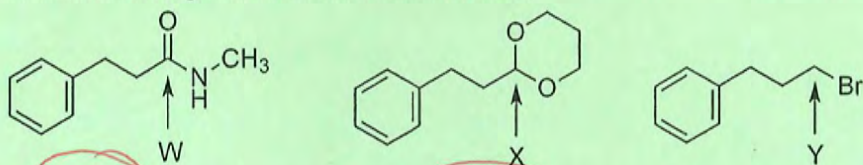


6 max
1pt/each



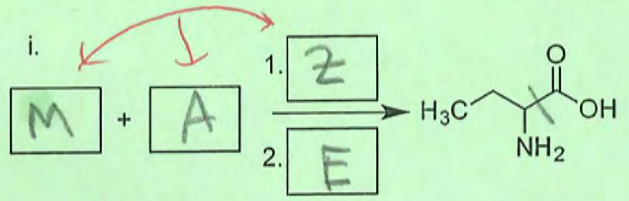
5-6 14-18 18-22 45-55 33-38 8-12 -11 - -7

c. Rank from highest to lowest oxidation state:

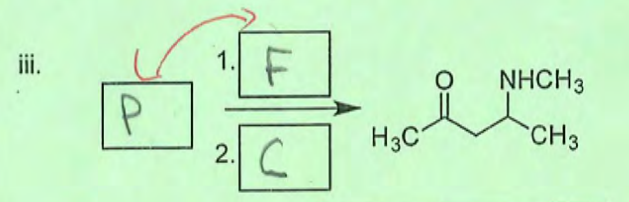
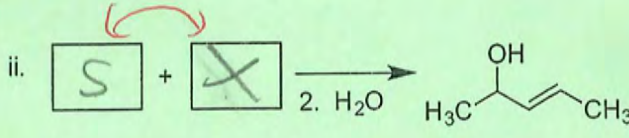


d. Fill in the starting materials to complete the syntheses

Starting materials							
<chem>CC=O</chem>	<chem>CCC=O</chem>	<chem>CC=O</chem>	<chem>CC(=O)C</chem>				
M	N	O	P				
<chem>CC(O)C=C</chem>	<chem>CC=O</chem>	<chem>LiAlH4</chem>	<chem>NaBH4</chem>				
R	S	T	W				
<chem>BrMgCH3</chem>	<chem>LiCu(CH3)2</chem>	<chem>NaCN</chem>	<chem>NH4Cl</chem>	<chem>CO2</chem>			
X	Y	Z	A	B			
<chem>CN=C</chem>	<chem>CN=C</chem>	<chem>H3O+</chem>	LDA				
C	D	E	F				



Stredcar!

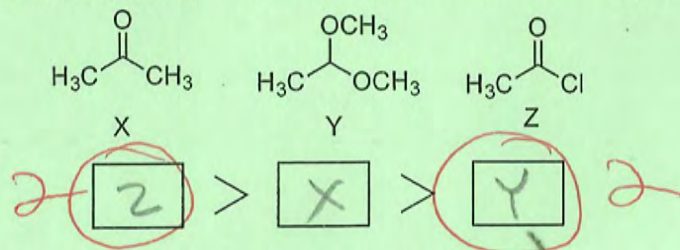


Name of reaction: Mannich 2

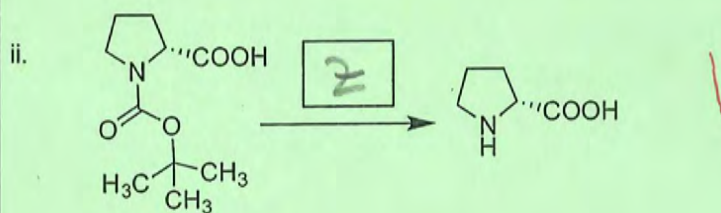
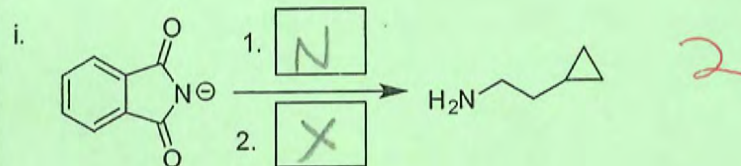
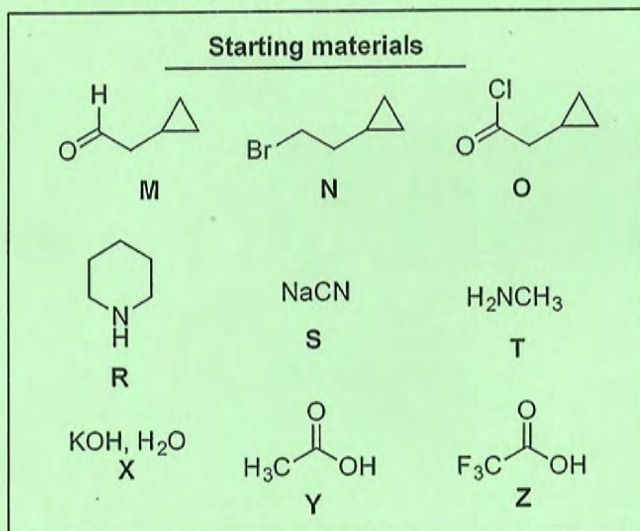
Initials: _____

2 (16 points).

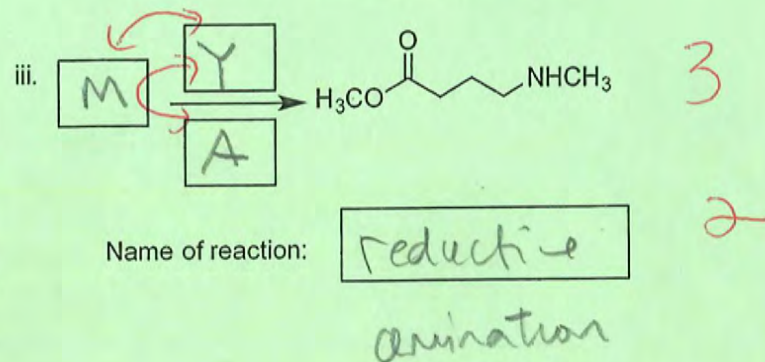
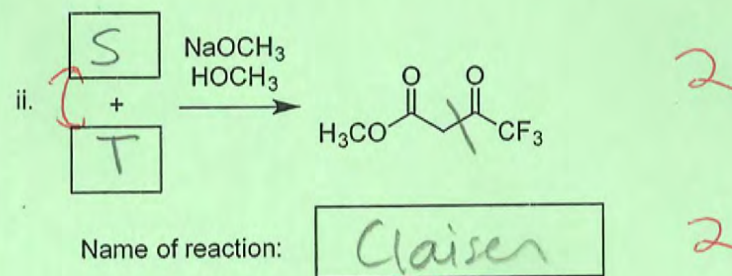
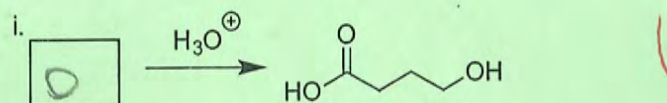
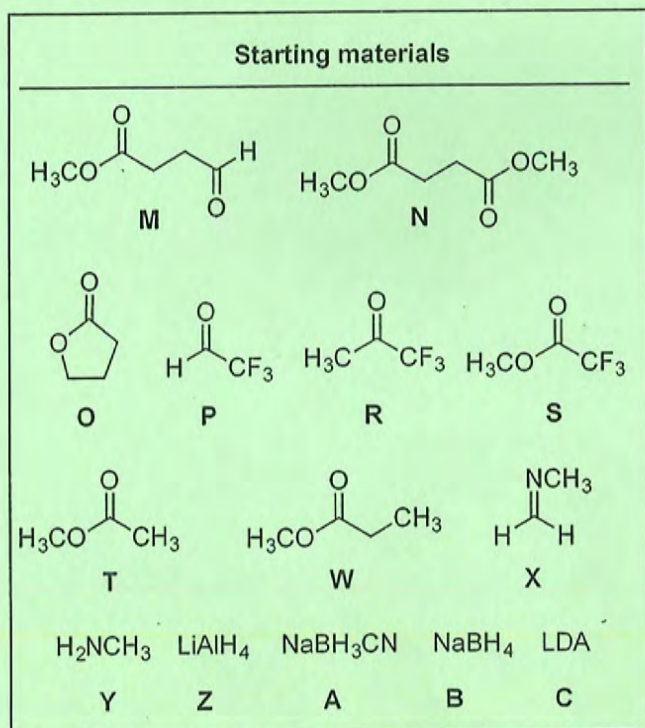
a. Rank the following compounds from fastest to slowest reaction with PhMgBr:



b. Fill in the starting materials to complete the syntheses

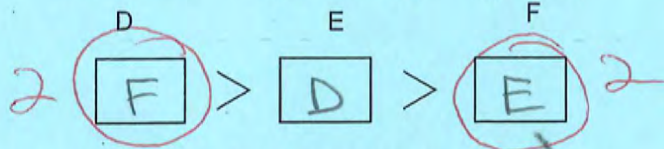
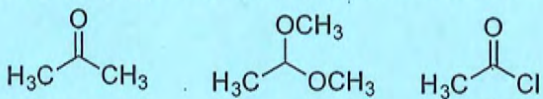


c. Fill in the starting materials to complete the syntheses



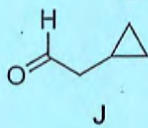
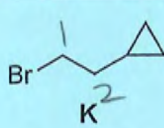
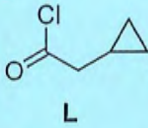
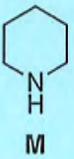
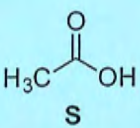
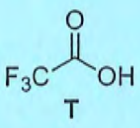
1 (16 points).

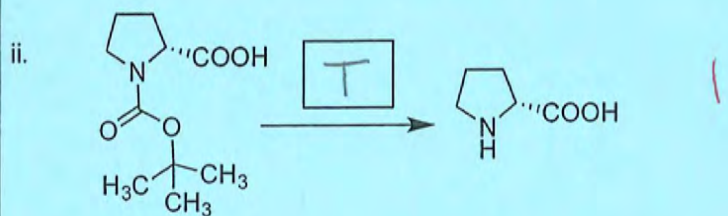
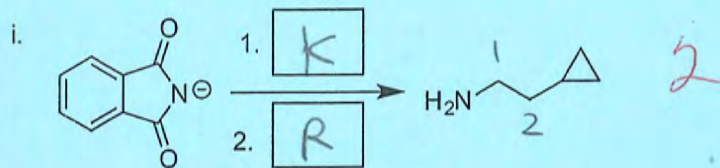
a. Rank the following compounds from fastest to slowest reaction with PhMgBr:



b. Fill in the starting materials to complete the syntheses

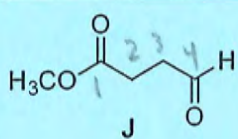
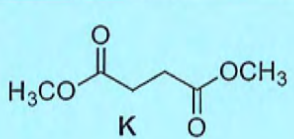
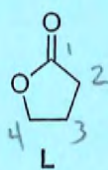
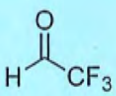
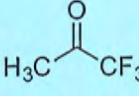
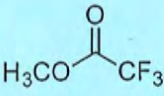
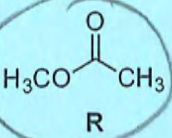
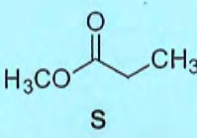
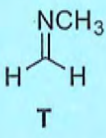
Starting materials

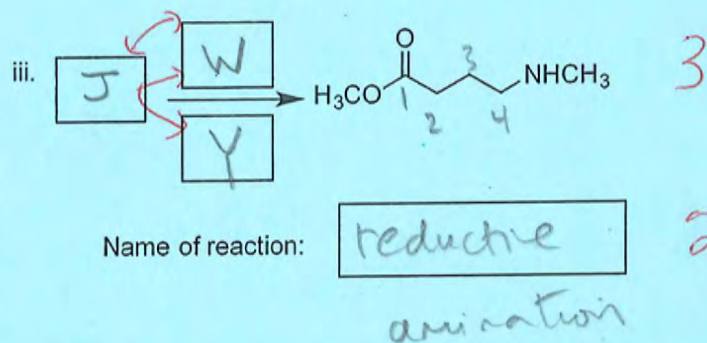
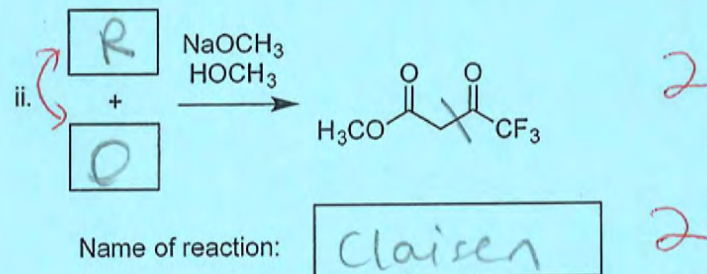
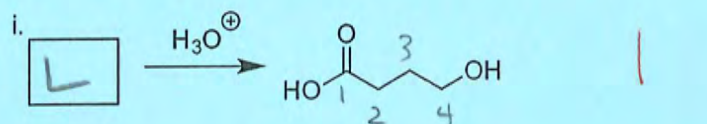
		
	NaCN N	H ₂ NCH ₃ O
KOH, H ₂ O R		



c. Fill in the starting materials to complete the syntheses

Starting materials

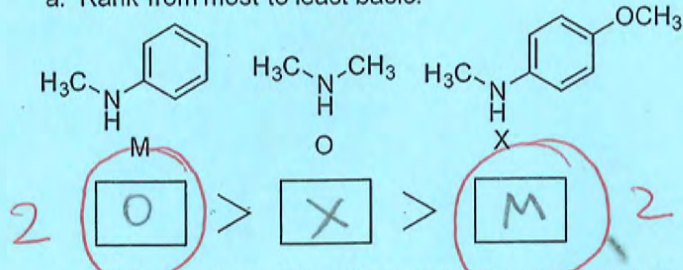
	
	
	
	
	
H ₂ NCH ₃ LiAlH ₄ NaBH ₃ CN NaBH ₄ LDA W X Y Z A	



Initials: kyj

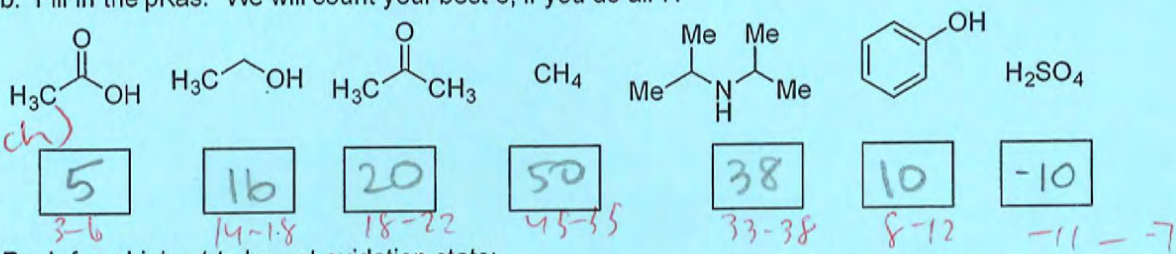
2 (22 points)

a. Rank from most to least basic:

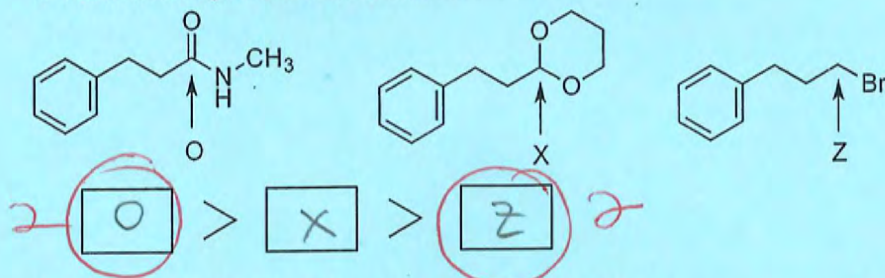


b. Fill in the pKas. We will count your best 6, if you do all 7.

max 6 total (1pt each)

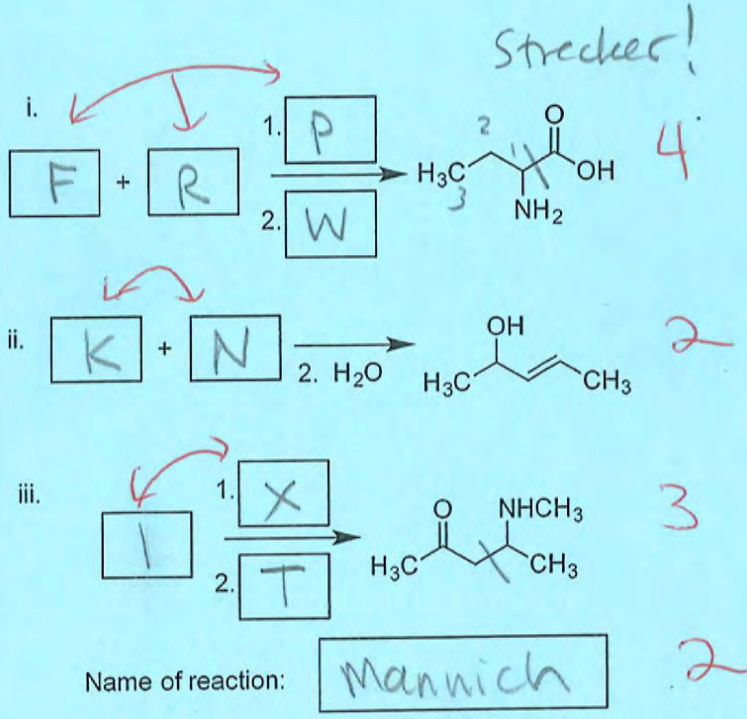


c. Rank from highest to lowest oxidation state:



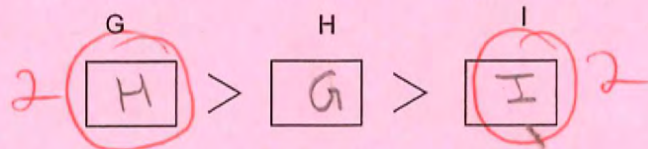
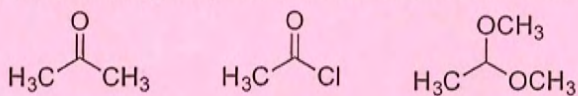
d. Fill in the starting materials to complete the syntheses

Starting materials							
<chem>CC(=O)C</chem> F	<chem>CCCC=O</chem> G	<chem>CC=O</chem> H	<chem>CC(=O)C</chem> I				
<chem>CC(O)C=C</chem> J	<chem>CC=CC=O</chem> K	<chem>LiAlH4</chem> L	<chem>NaBH4</chem> M				
<chem>BrMgCH3</chem> N	<chem>LiCu(CH3)2</chem> O	<chem>NaCN</chem> P	<chem>NH4Cl</chem> R	<chem>CO2</chem> S			
<chem>CN=C</chem> T	<chem>CN=C(C)C</chem> V	<chem>H3O+</chem> W	<chem>LDA</chem> X				



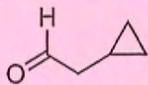
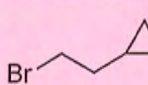
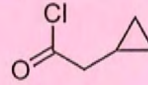
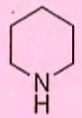
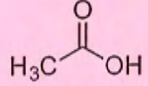
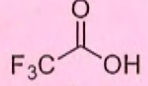
1 (16 points).

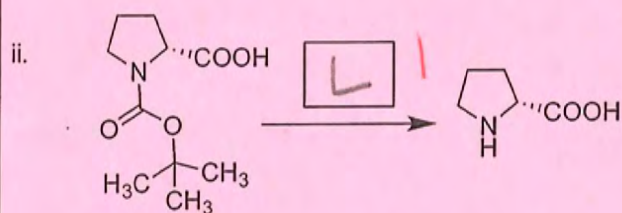
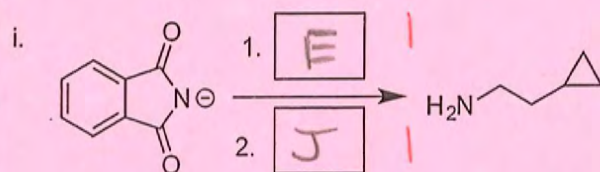
a. Rank the following compounds from fastest to slowest reaction with PhMgBr:



b. Fill in the starting materials to complete the syntheses

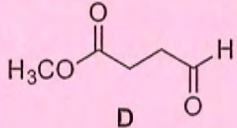
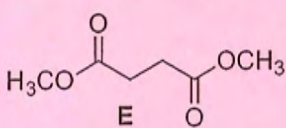
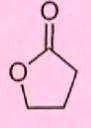
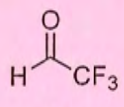
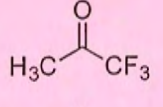
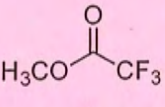
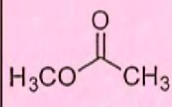
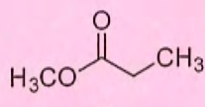
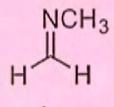
Starting materials

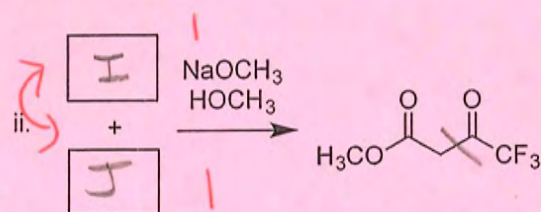
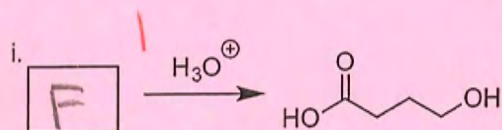
 D	 E	 F
 G	NaCN H	H ₂ NCH ₃ I
KOH, H ₂ O J	 K	 L



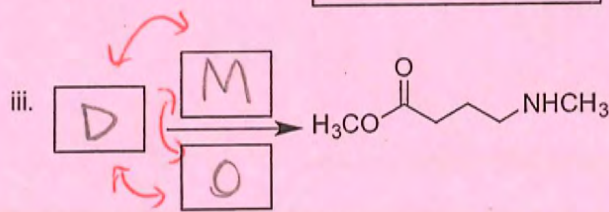
c. Fill in the starting materials to complete the syntheses

Starting materials

 D	 E			
 F	 G	 H	 I	
 J	 K	 L		
H ₂ NCH ₃ M	LiAlH ₄ N	NaBH ₃ CN O	NaBH ₄ R	LDA S



Name of reaction: Claisen 2

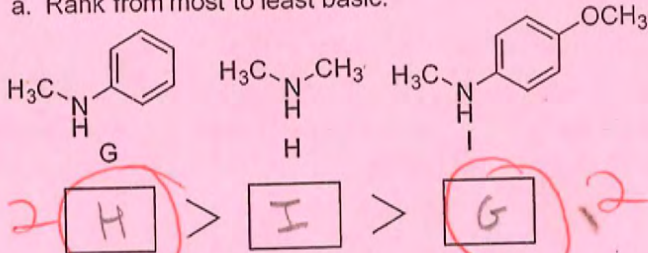


Name of reaction: reductive amination 2

Initials: _____

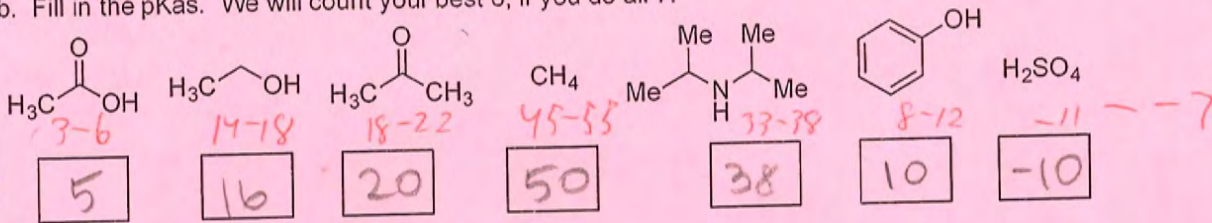
2 (22 points)

a. Rank from most to least basic:

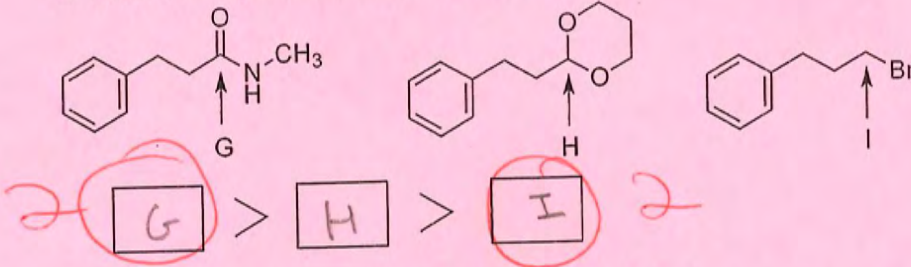


b. Fill in the pKas. We will count your best 6, if you do all 7.

6 max
1 pt
each

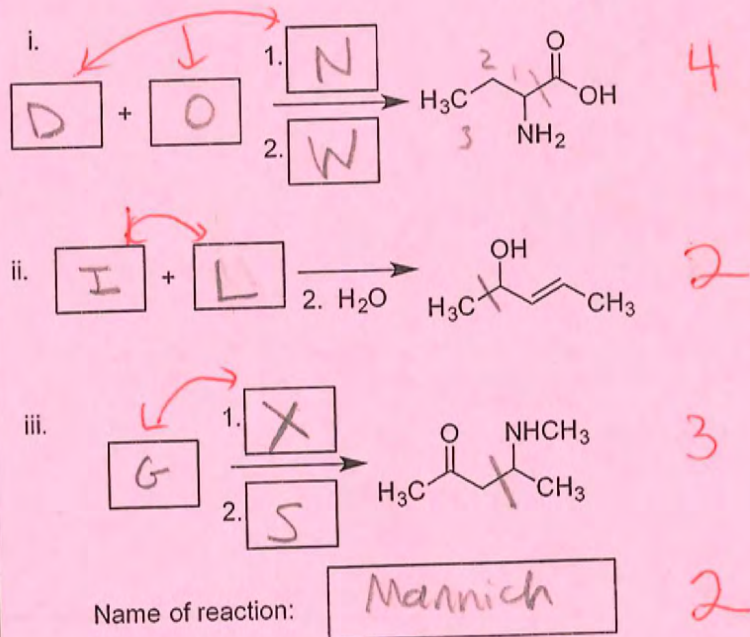


c. Rank from highest to lowest oxidation state:



d. Fill in the starting materials to complete the syntheses

Starting materials				
<chem>CC(=O)C</chem> (D)	<chem>CCC=O</chem> (E)	<chem>CC(=O)C</chem> (F)	<chem>CC(=O)C</chem> (G)	
<chem>CC(O)C=C</chem> (H)	<chem>CC=O</chem> (I)	<chem>LiAlH4</chem> (J)	<chem>NaBH4</chem> (K)	
<chem>BrMgCH3</chem> (L)	<chem>LiCu(CH3)2</chem> (M)	<chem>NaCN</chem> (N)	<chem>NH4Cl</chem> (O)	<chem>CO2</chem> (R)
<chem>CN=C</chem> (S)	<chem>CC(=O)C</chem> (T)	<chem>H3O+</chem> (W)	<chem>LDA</chem> (X)	

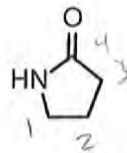


21 points

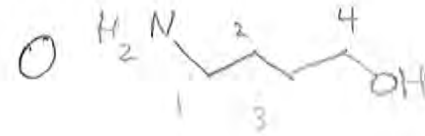
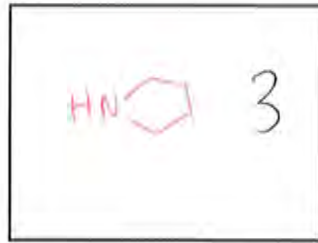
3. Fill in the boxes with the appropriate starting material, reagent or major product (31 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers)

Initials: _____

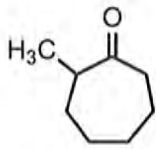
a.



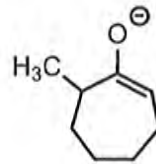
1. LiAlH₄
2. H₂O



b.



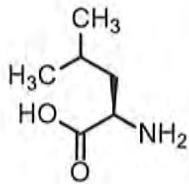
Box containing handwritten reagents: LDA 1, THF 1, -78°C 1.



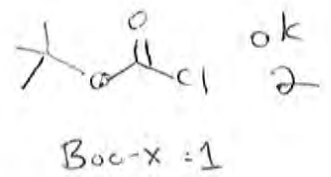
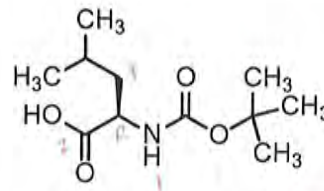
Is the product the kinetic or thermodynamic enolate?

Box containing the handwritten answer: Kinetic 2.

c.



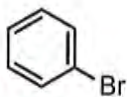
Box containing handwritten reagents: (Boc)₂O 2, Et₃N 1.



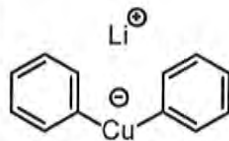
Is this amino acid D or L?

Box containing the handwritten answer: D 2.

d.

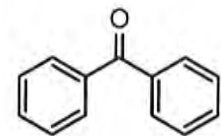


Box containing handwritten reagents: 1. 4 eq Li 2, 2. 1 eq CuI 1.



What type of reagent is this?

Box containing handwritten reagent: Ph-Cu-Li-Ph 3.



Box containing the handwritten answer: Cuprate 2.

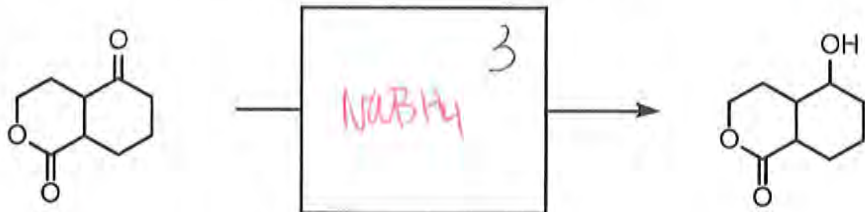
organometallic 1

4. Fill in the boxes with the appropriate starting material, reagent or major product (26 points).
 Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers)

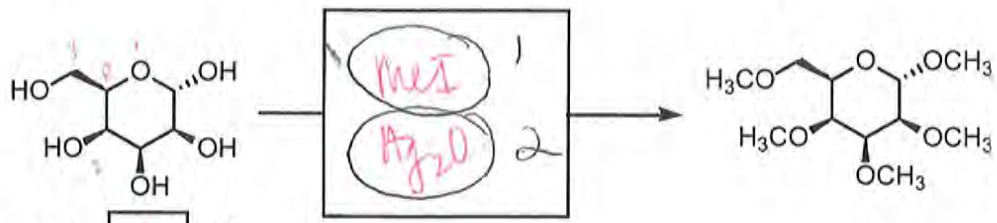
21 points

Initials: _____

a.



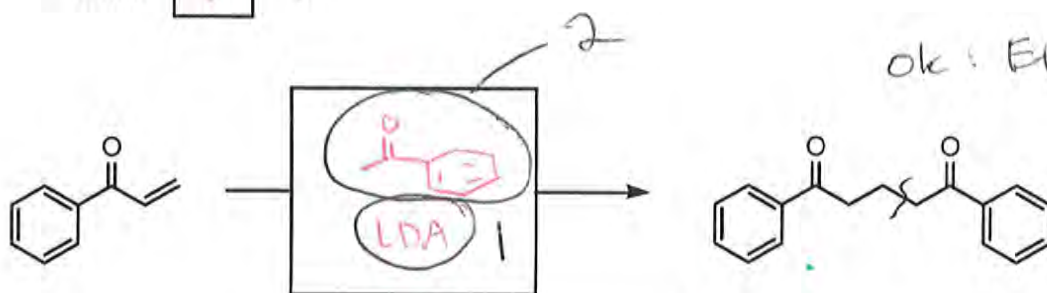
b.



Is this carbohydrate α or β : α 2

D or L: D 2

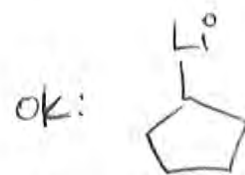
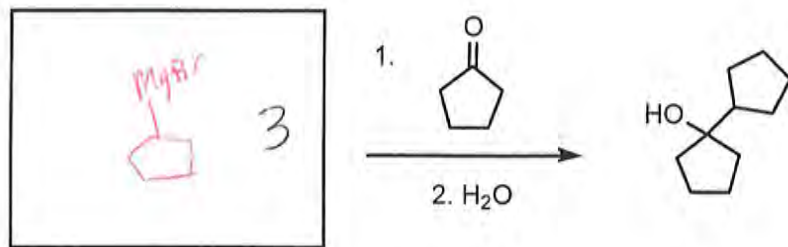
c.



ok: EtOH, NaOEt

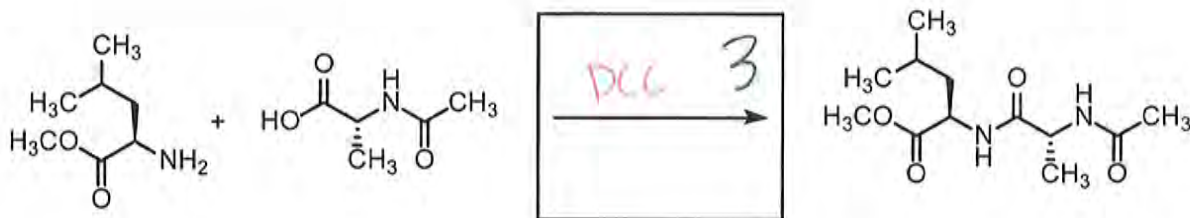
What is the name of this reaction? Michael 2

d.



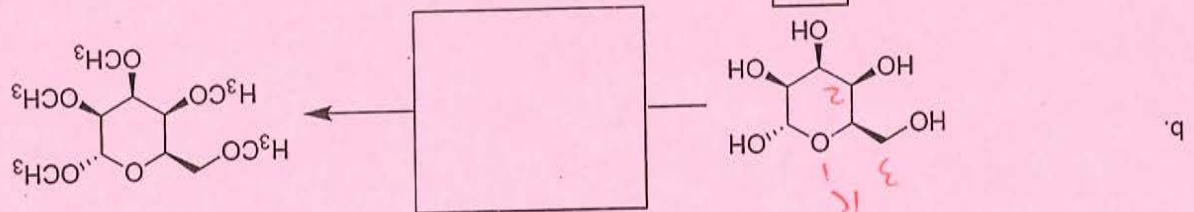
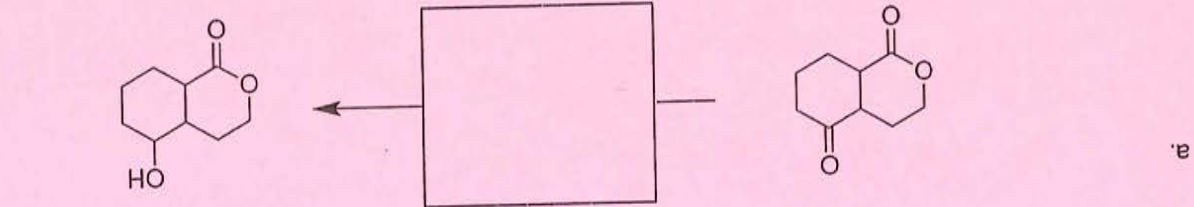
cuprate = 0 pts

e.



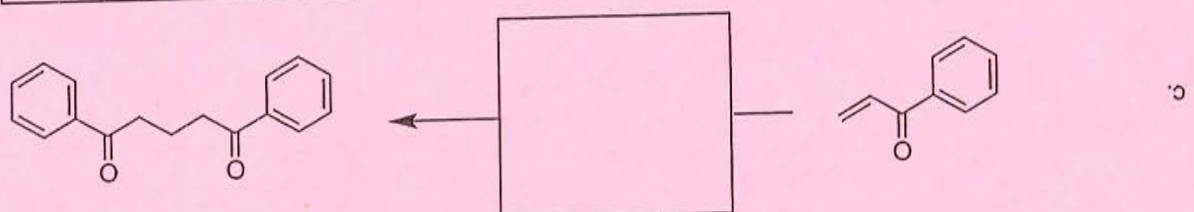
4. Fill in the boxes with the appropriate starting material, reagent or major product (26 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers).

Initials: _____

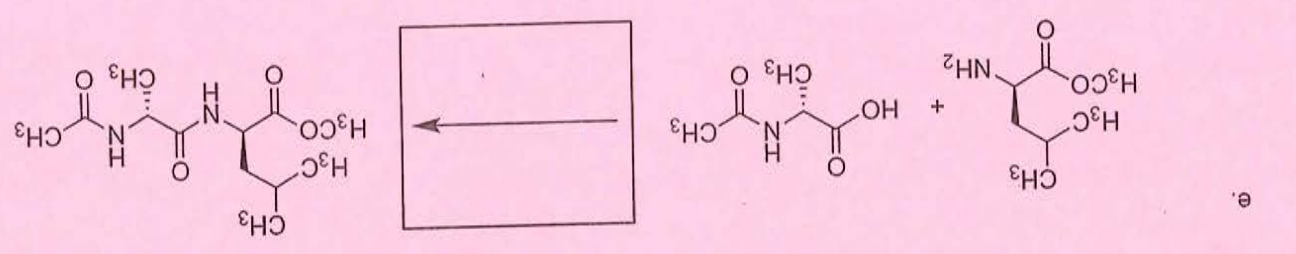
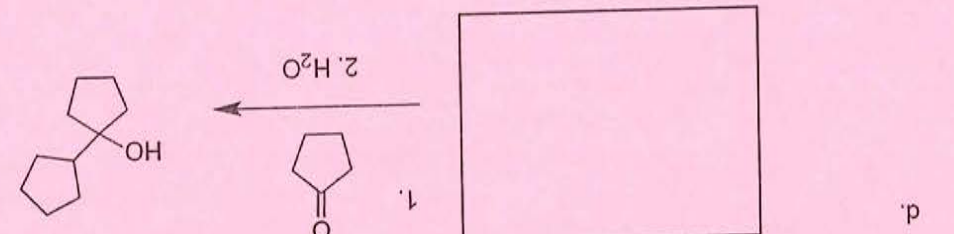


Is this carbohydrate α or β : 7

D or L: D



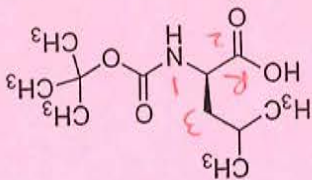
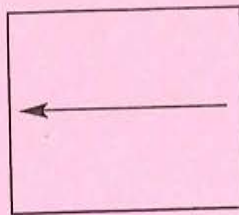
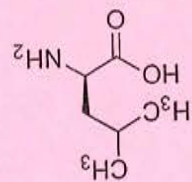
What is the name of this reaction?



3. Fill in the boxes with the appropriate starting material, reagent or major product (31 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers).

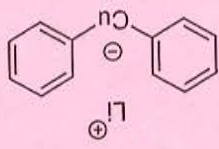
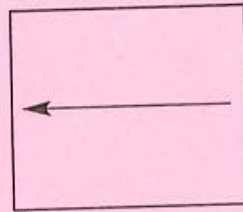
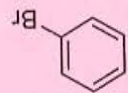
Initials: _____

a.

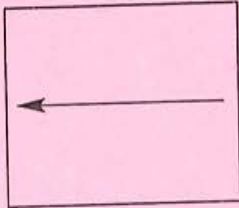
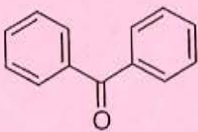
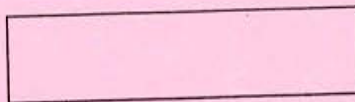


Is this amino acid D or L? D

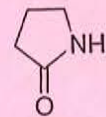
b.



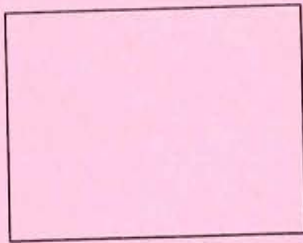
What type of reagent is this?



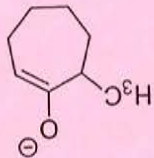
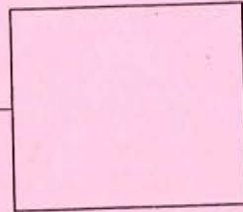
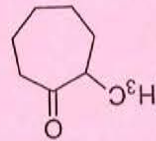
c.



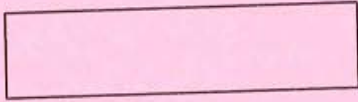
1. LiAlH_4
2. H_2O



d.



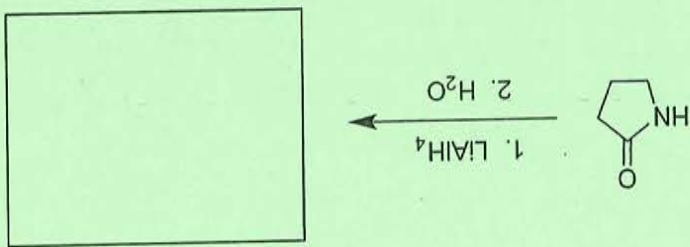
Is the product the kinetic or thermodynamic enolate?



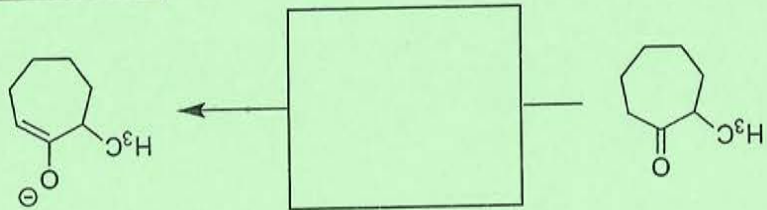
4. Fill in the boxes with the appropriate starting material, reagent or major product (31 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers).

Initials: _____

a.

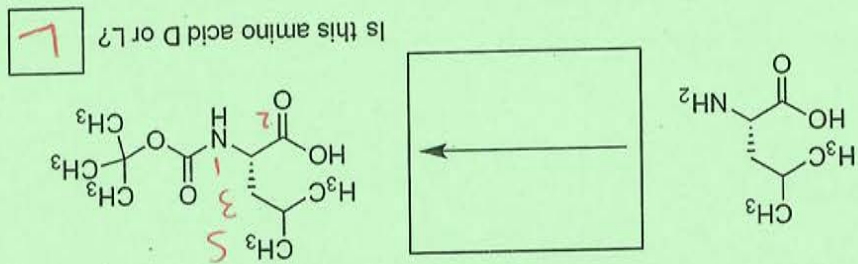


b.



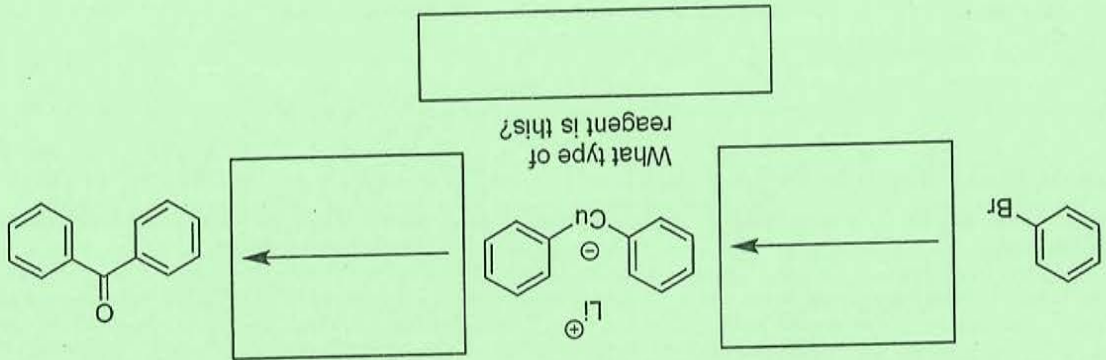
Is the product the kinetic or thermodynamic enolate?

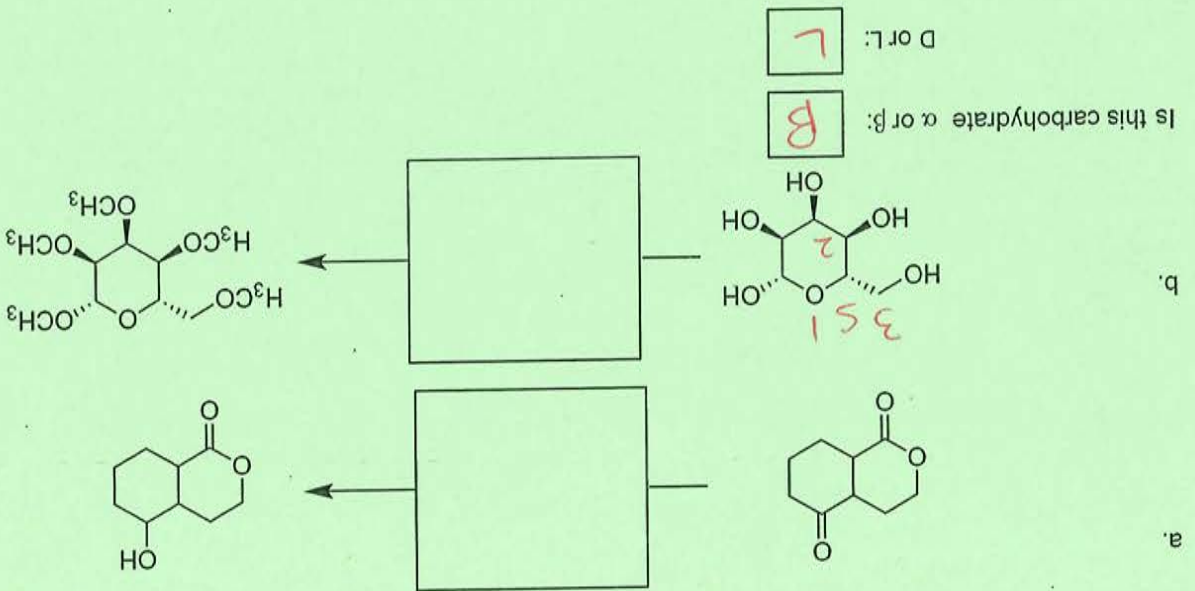
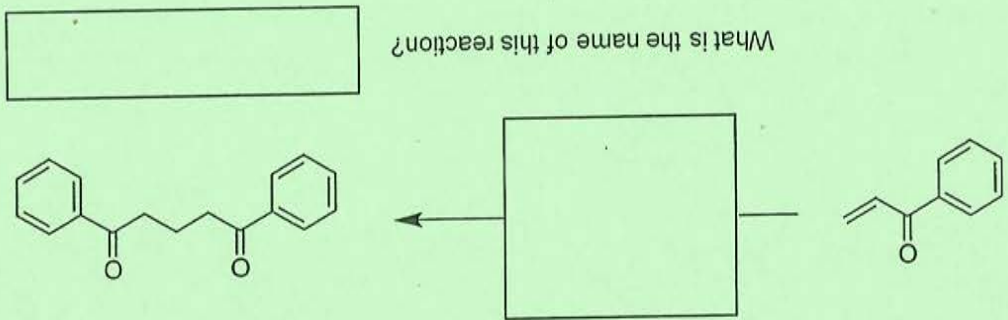
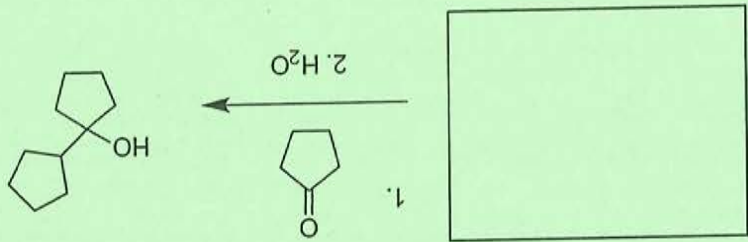
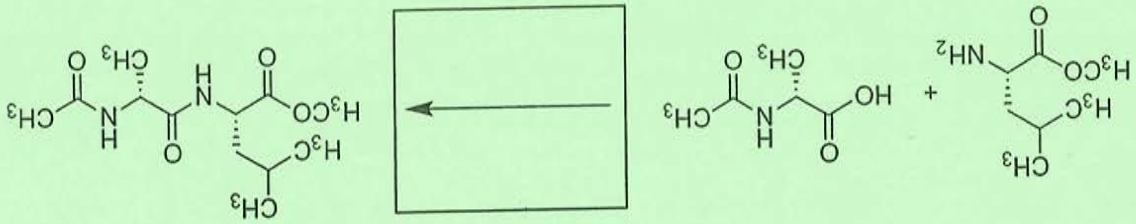
c.



Is this amino acid D or L? L

d.

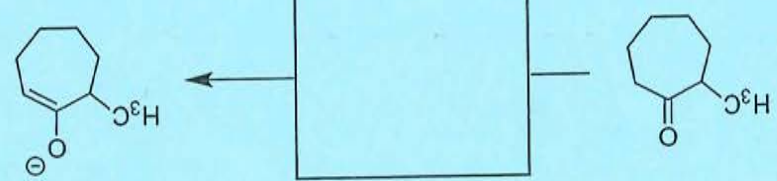




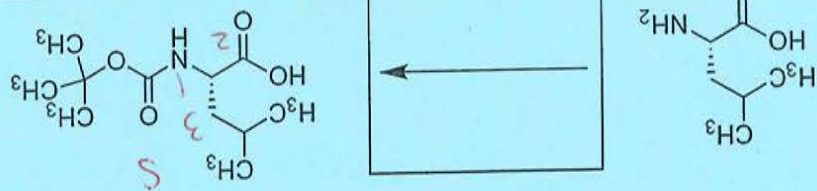
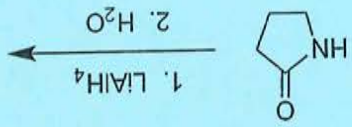
3. Fill in the boxes with the appropriate starting material, reagent or major product (26 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers).
Initials: _____

3. Fill in the boxes with the appropriate starting material, reagent or major product (31 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers)

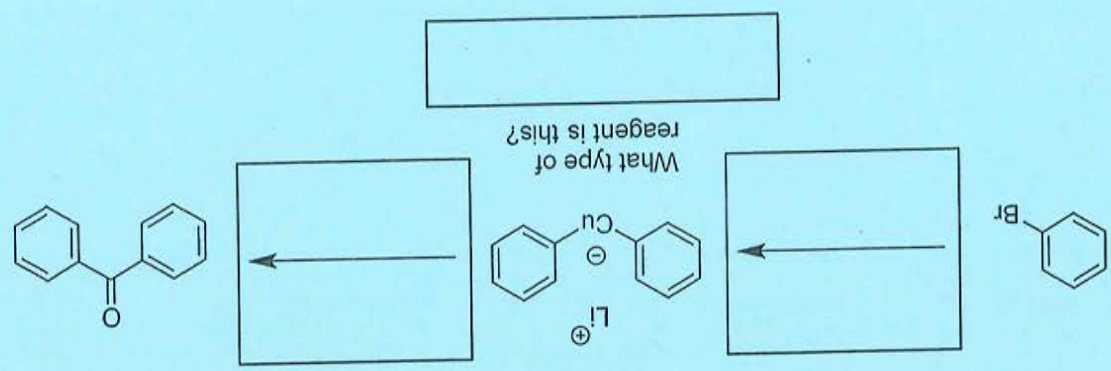
Initials: _____

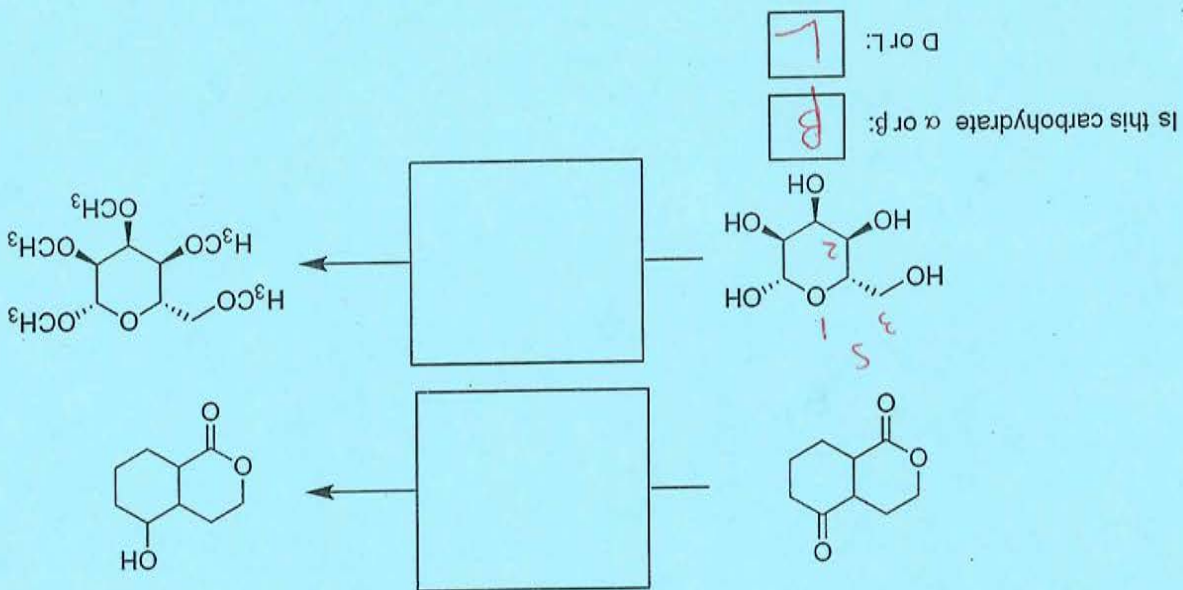
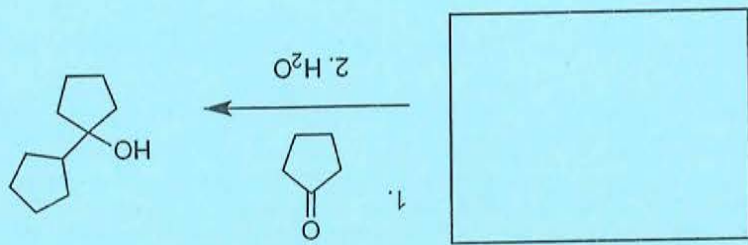
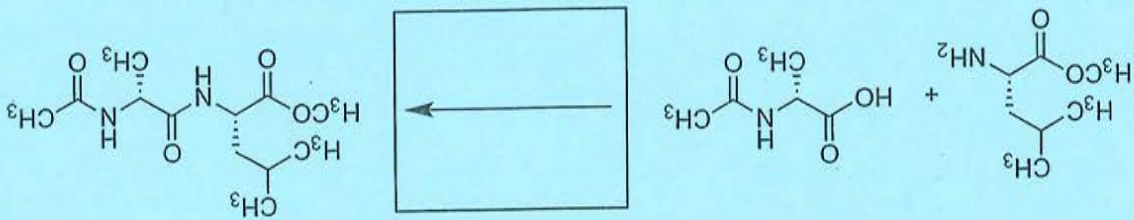


Is the product the kinetic or thermodynamic enolate?

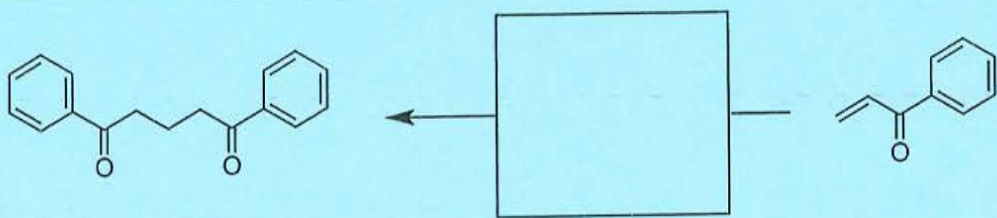


Is this amino acid D or L?





What is the name of this reaction?



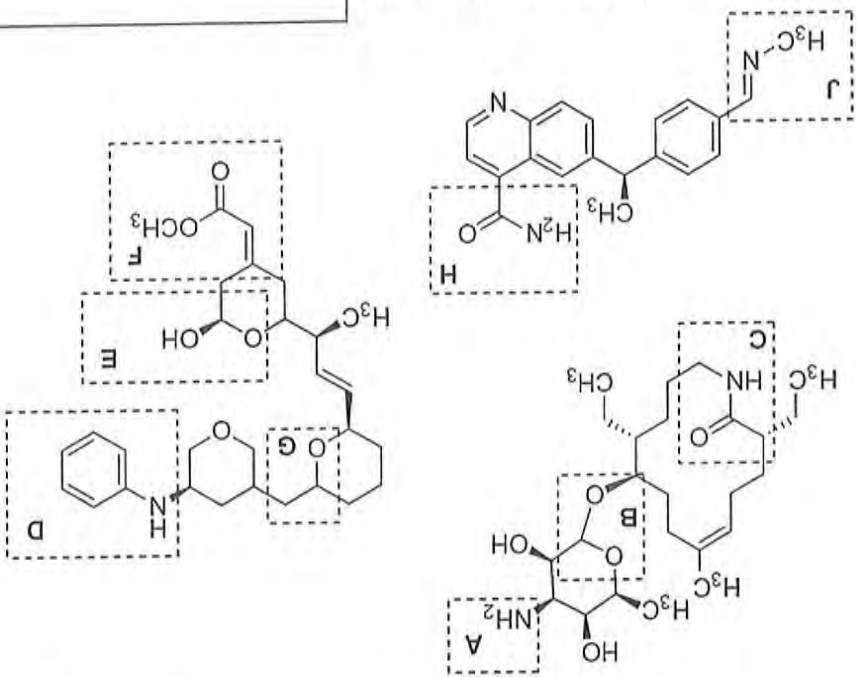
4. Fill in the boxes with the appropriate starting material, reagent or major product (26 points). Show stereochemistry where appropriate (you must DRAW the enantiomers/diastereomers)

Initials: _____

12 + 1 bonus

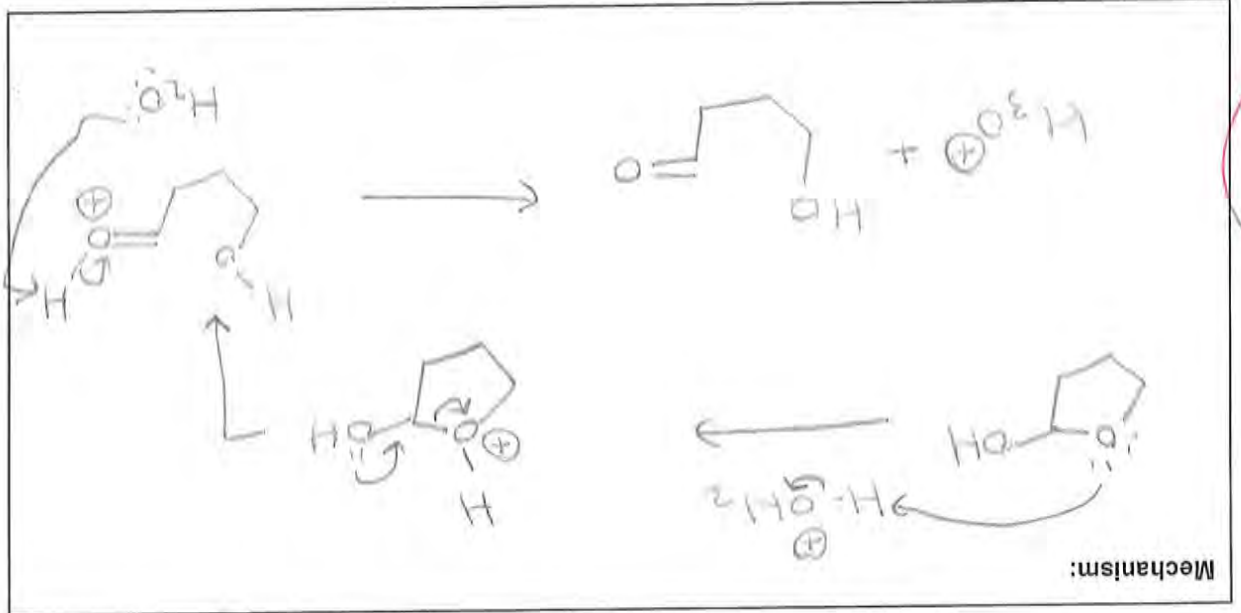
What was your favorite song that was played at the beginning of a lecture?

BONUS (1 point):



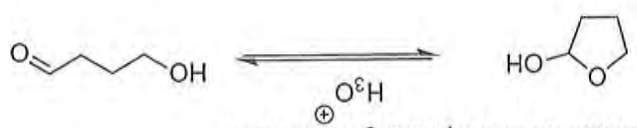
- J imine
- E hemiacetal
- D aniline
- B acetal

b. Match the names of the functional groups with labeled examples from the compounds.



(12 + 0.5)

6



2

a. Provide an arrow-pushing mechanism.

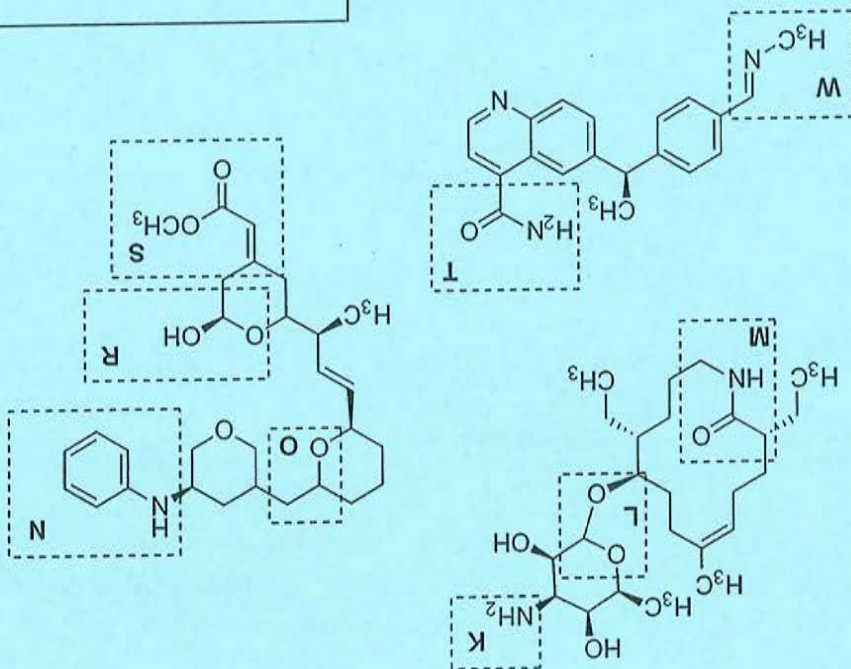
5. (8 points)

Is this reaction an oxidation, reduction, or neither?

neither

Initials: kg

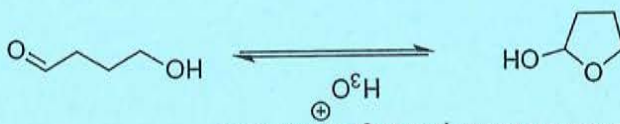
BONUS (1 point):
What was your favorite song that was played at the beginning of a lecture?



- W imine
- R hemiacetal
- N aniline
- L acetal

b. Match the names of the functional groups with labeled examples from the compounds.

Mechanism:



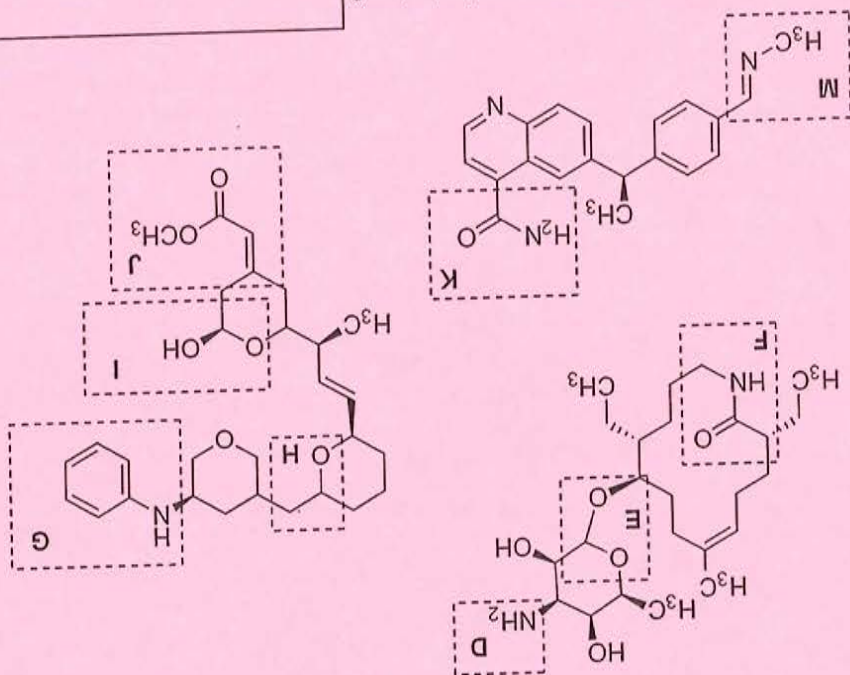
5. (8 points)
a. Provide an arrow-pushing mechanism.

Is this reaction an oxidation, reduction, or neither?

Initials: _____

BONUS (1 point):

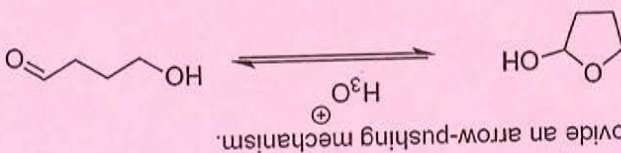
What was your favorite song that was played at the beginning of a lecture?



- W imine
- I hemiacetal
- G aniline
- E acetal

b. Match the names of the functional groups with labeled examples from the compounds.

Mechanism:



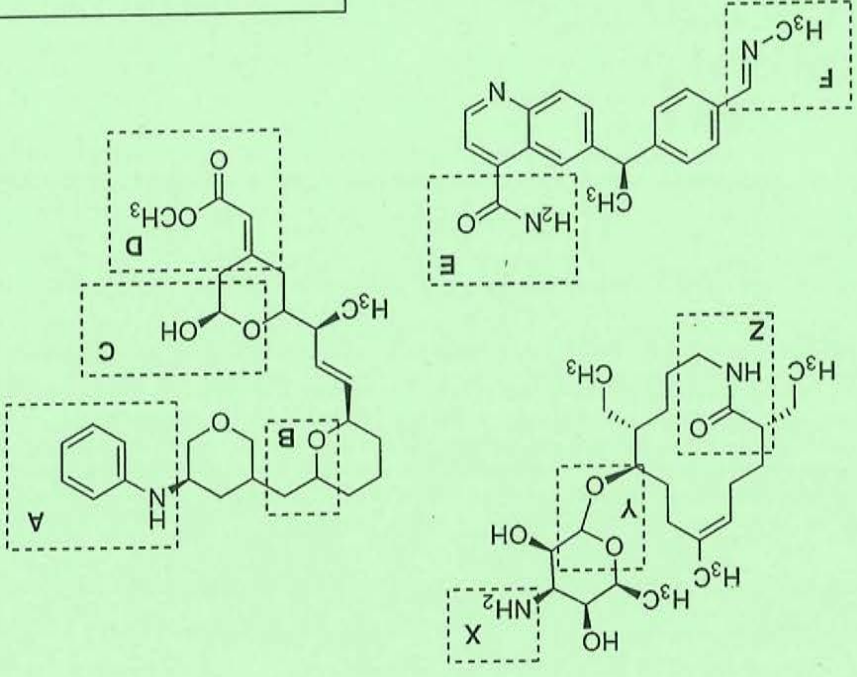
a. Provide an arrow-pushing mechanism.

(8 points)

Is this reaction an oxidation, reduction, or neither?

Initials: _____

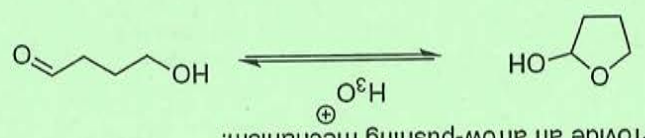
BONUS (1 point): What was your favorite song that was played at the beginning of a lecture?



- F imine
- C hemiacetal
- A aniline
- Y acetal

b. Match the names of the functional groups with labeled examples from the compounds.

Mechanism:



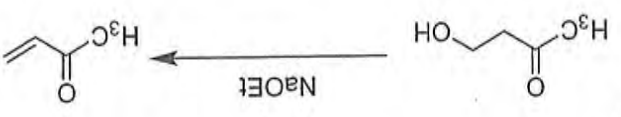
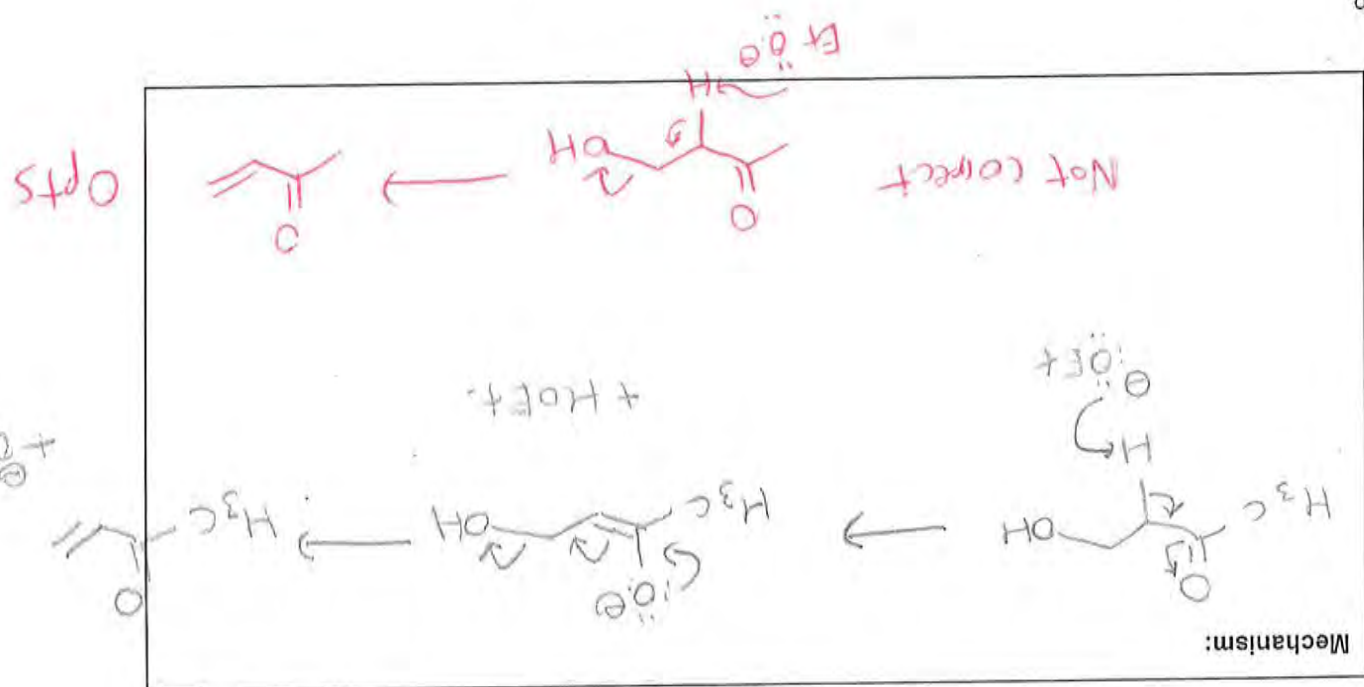
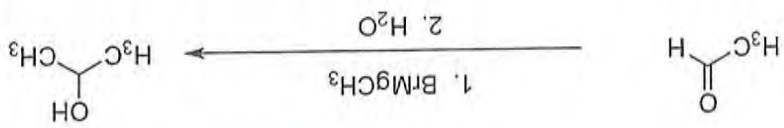
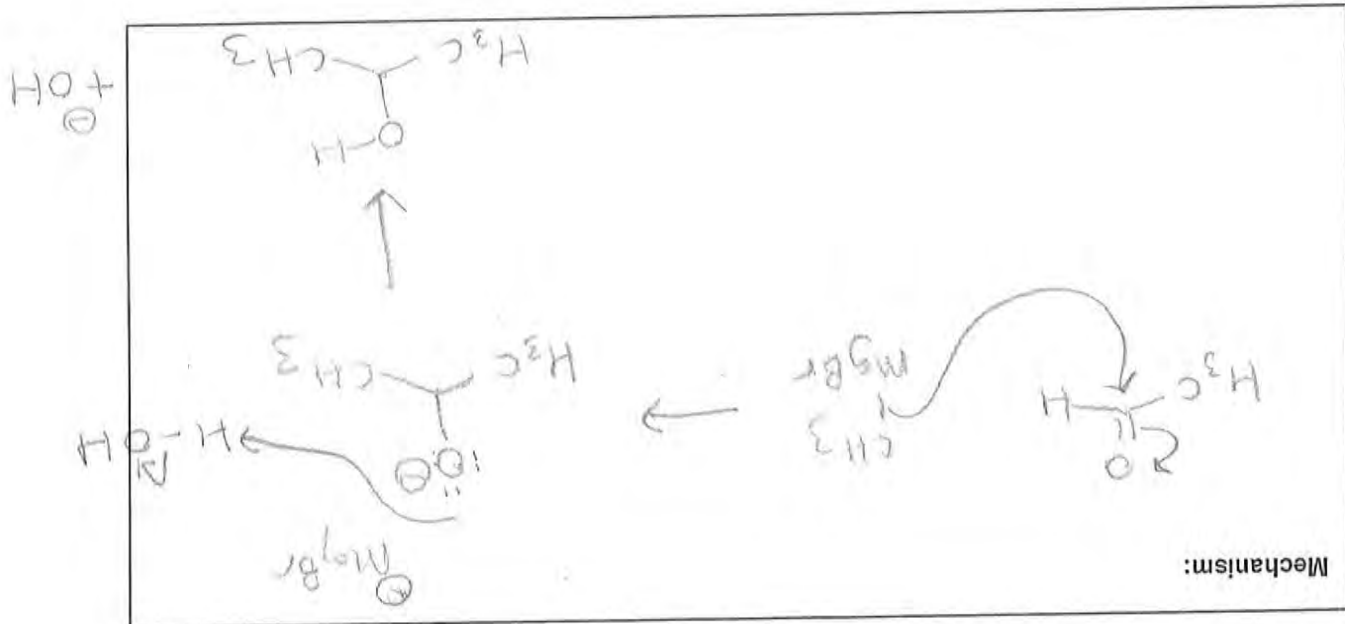
a. Provide an arrow-pushing mechanism. (8 points)

Is this reaction an oxidation, reduction, or neither?

Initials: _____

12 //

4



Field 2

What is the name of this mechanism? aldo1=0pts

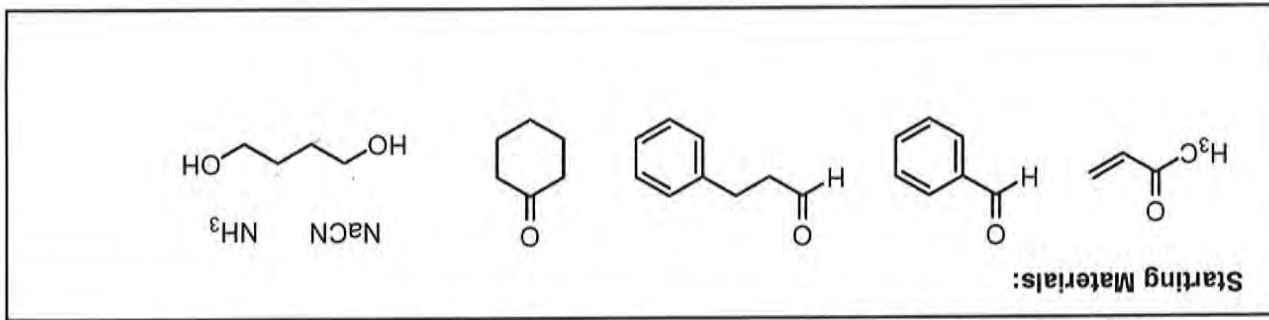
6. (13 points) Provide an arrow-pushing mechanism.

Initials: Key

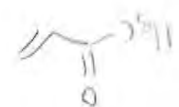
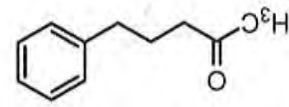
- lot each arrow -

Initials: _____

7. (16 points) Propose syntheses of the targets below. All carbons must come from the starting materials provided, you can use any reagent you wish. YOU CAN IGNORE STEREOCHEMISTRY.

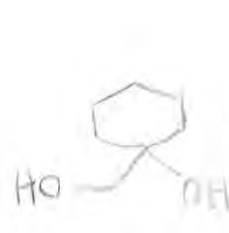
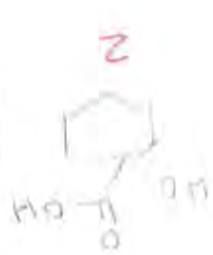
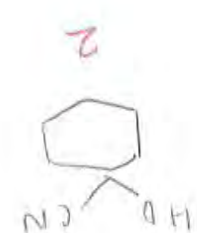
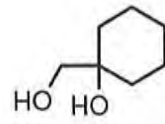


Target A.



8

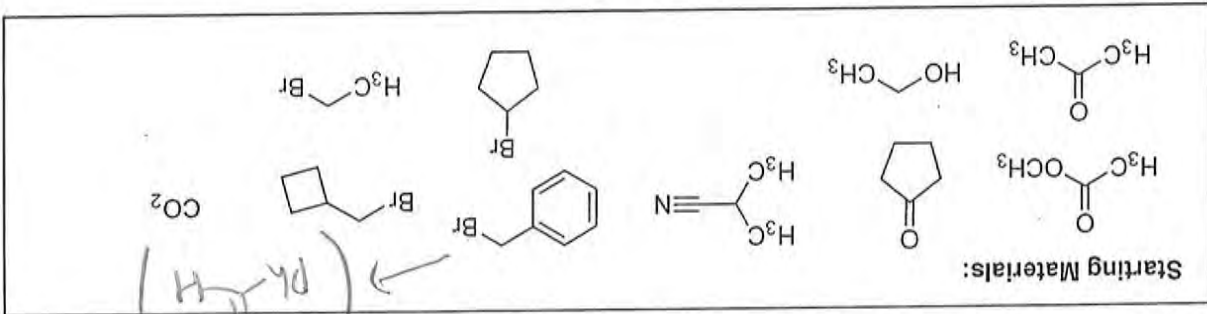
Target B.



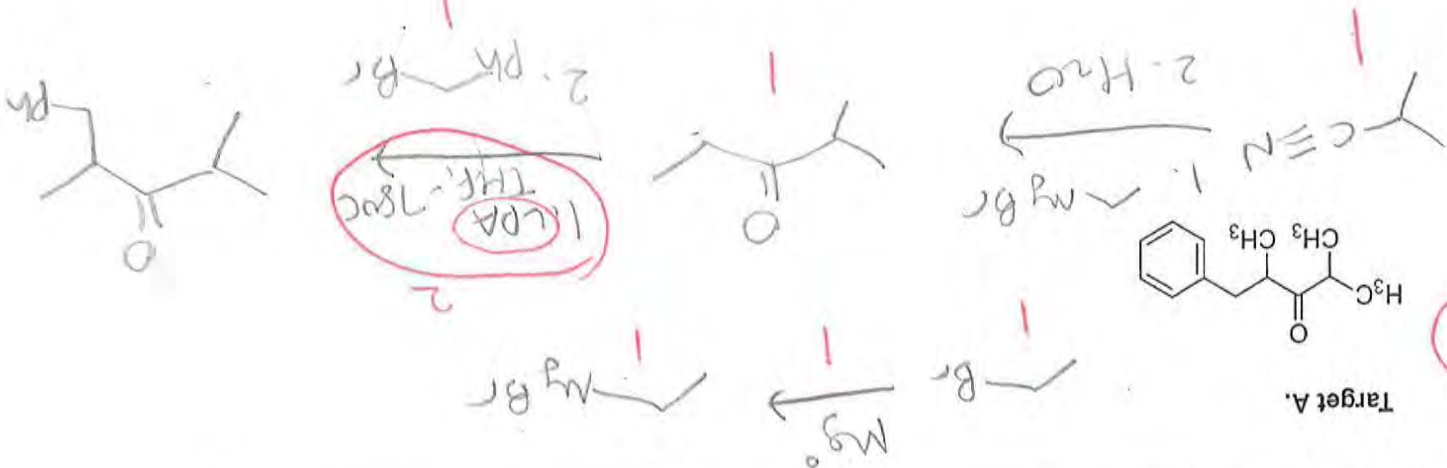
8

8. (16 points) Propose syntheses of the targets below. All carbons must come from the starting materials provided. YOU CAN IGNORE STEREOCHEMISTRY.

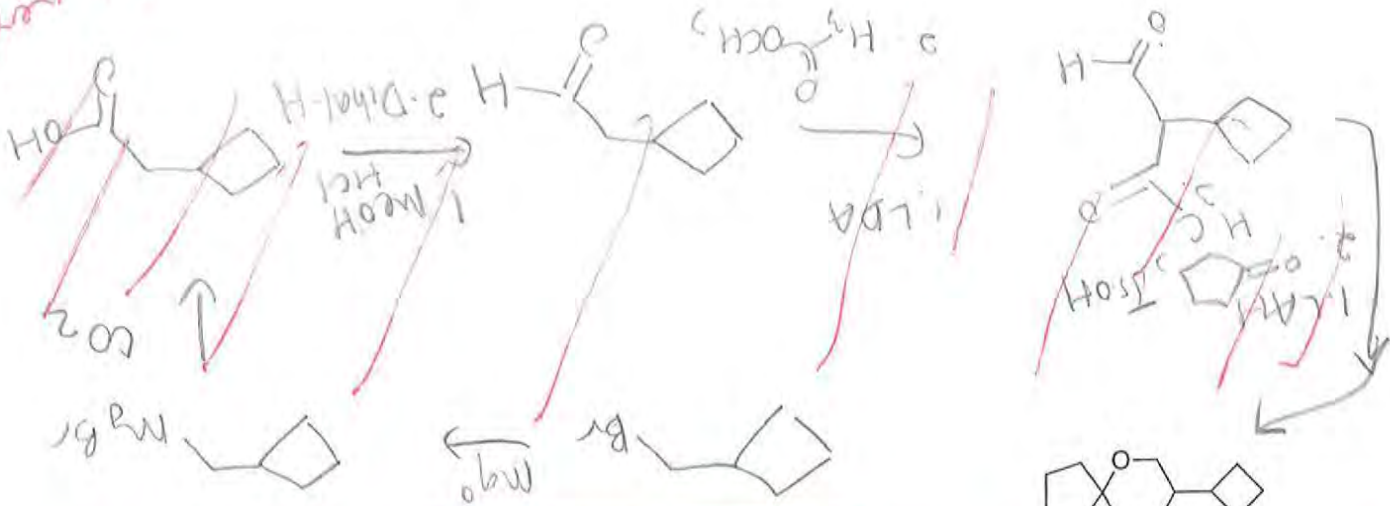
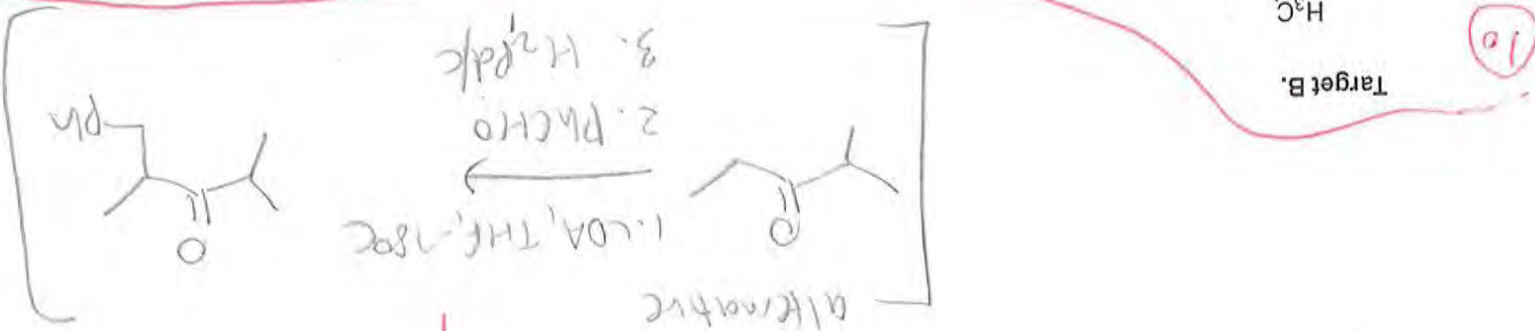
Initials: _____



Target A.

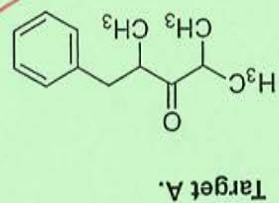
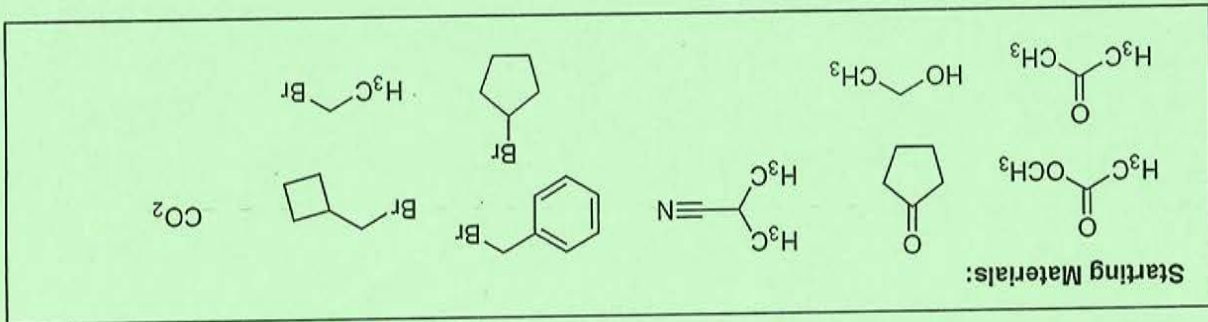


Target B.

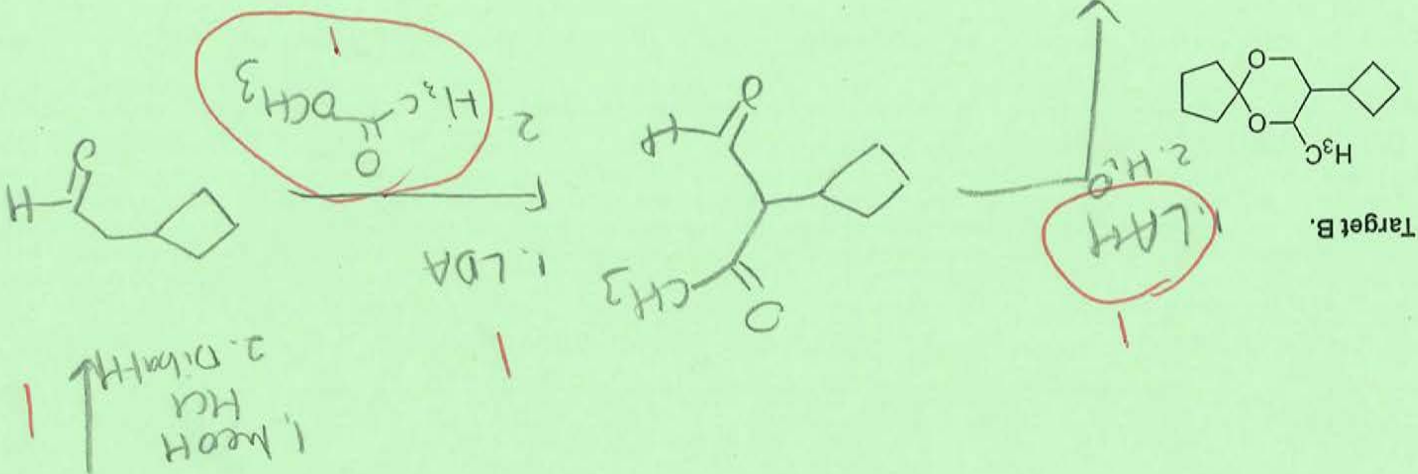
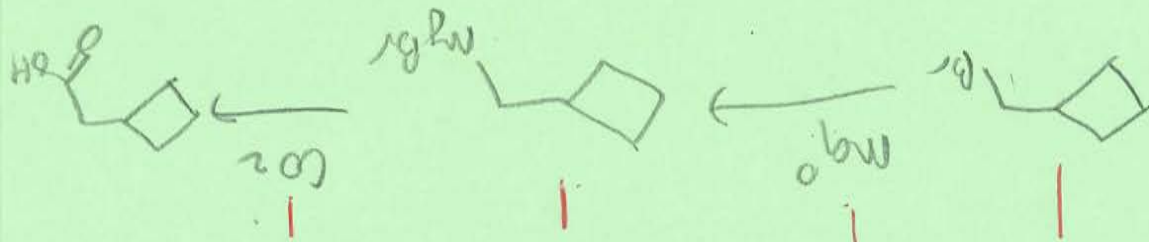


See next page for P/S

8. (16 points) Propose syntheses of the targets below. All carbons must come from the starting materials provided, you can use any reagent you wish. YOU CAN IGNORE STEREOCHEMISTRY.



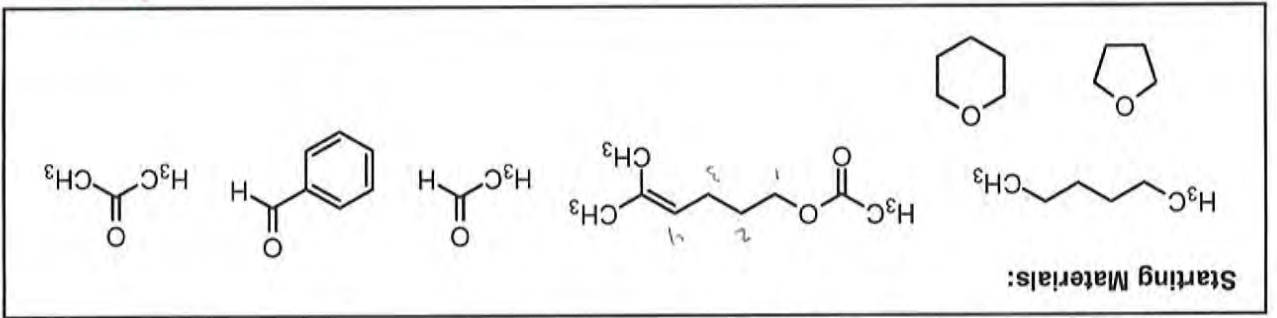
10



10

8. (16 points) Propose syntheses of the targets below. All carbons must come from the starting materials provided, you can use any reagent you wish. YOU CAN IGNORE STEREOCHEMISTRY.

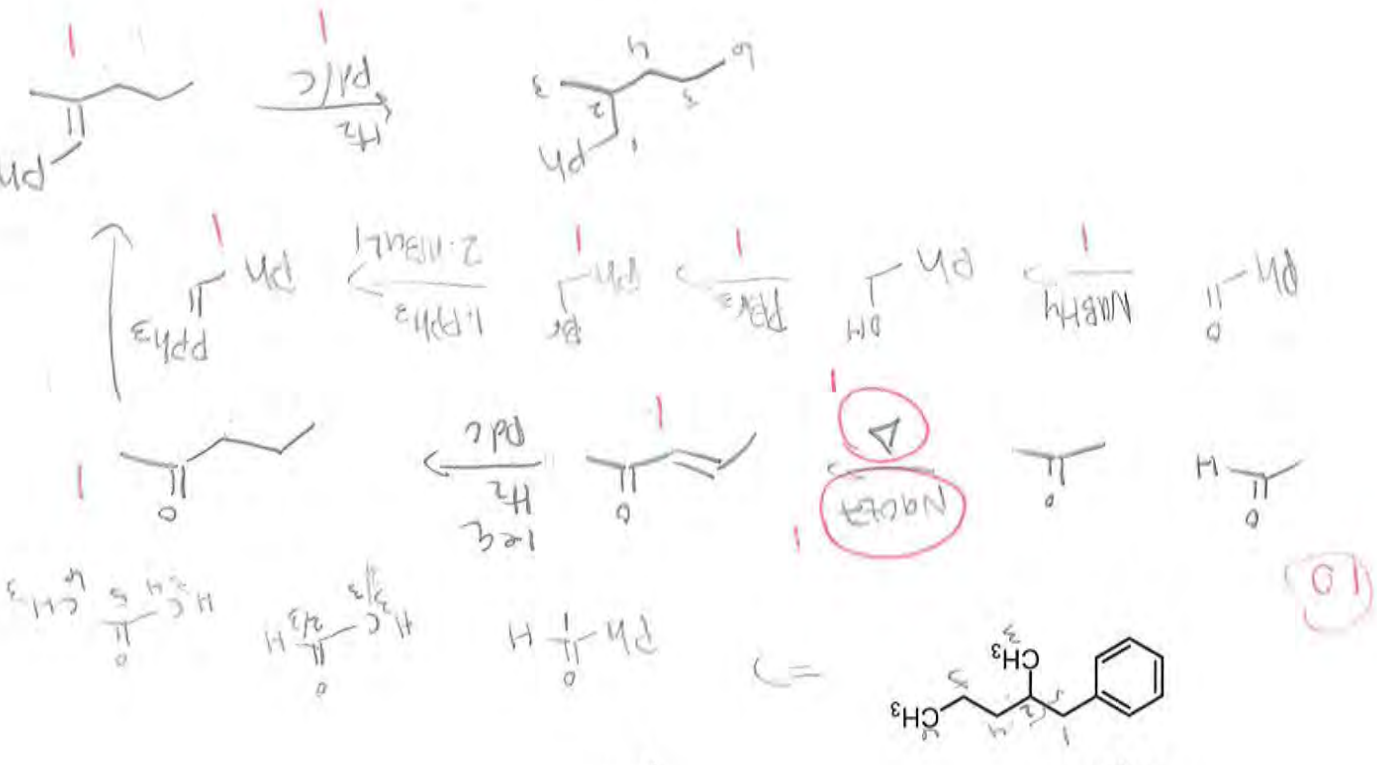
Initials: _____



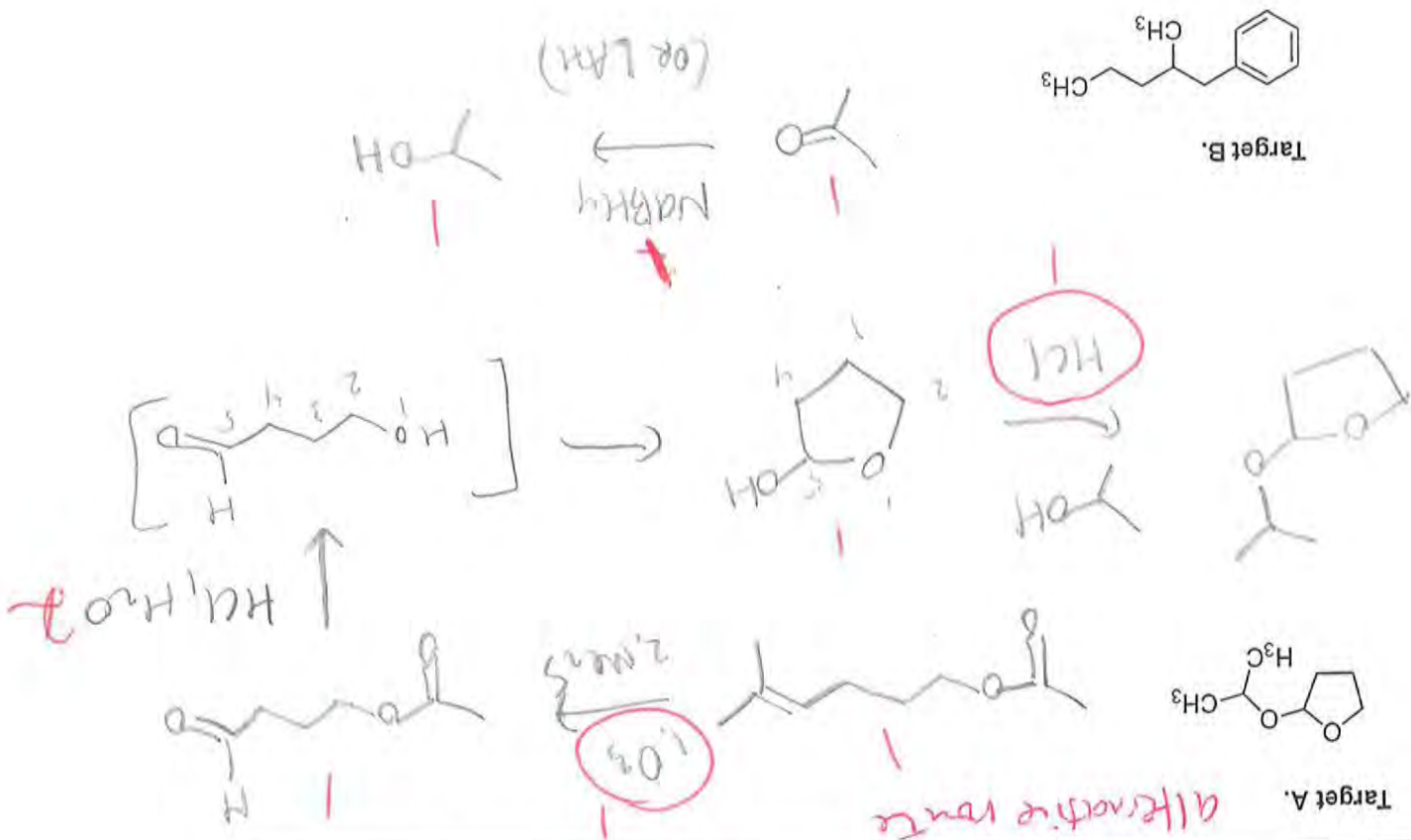
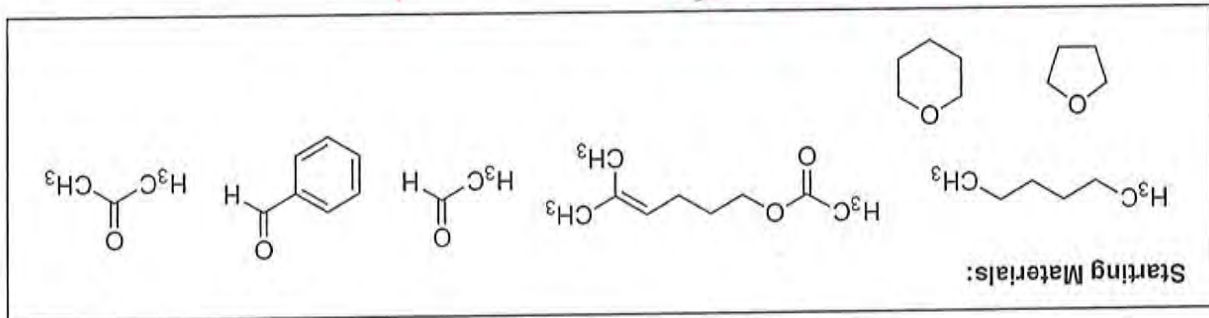
Target A.



Target B.



9. (16 points) Propose syntheses of the targets below. All carbons must come from the starting materials provided, you can use any reagent you wish. YOU CAN IGNORE STEREOCHEMISTRY.



Initials: _____