

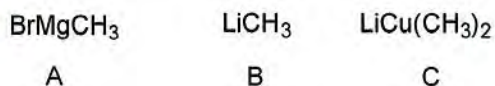
1 point each

Midterm 1, Chem 51C, Jarvo, Spring 19

Initials: A

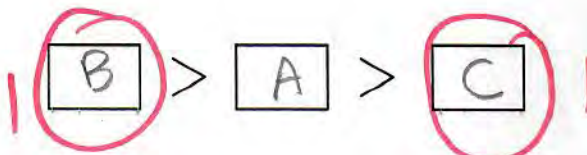
1. (15 points)

a. Most to least nucleophilic organometallic reagent



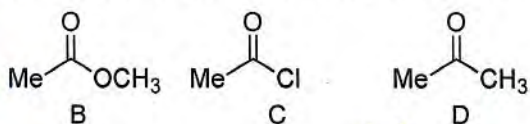
Caper card  
Lecture 5

WS 2 # 1c



4

b. Rank fastest to slowest reaction with  $\text{LiAlH}_4$



Caper card  
Lecture 3

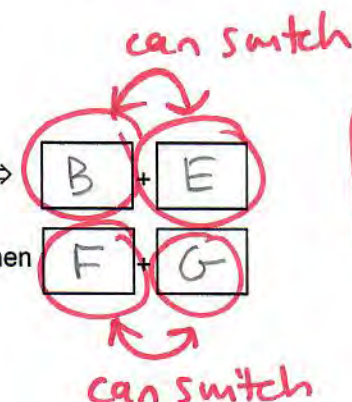
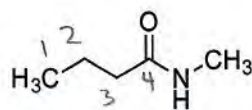
WS 1, # 1a; Quiz A # 1



c. Fill in the correct compounds from the table to complete the retrosynthesis. You can use the same compound more than once.

Compounds	
A	$\text{NH}_3$
B	
C	
D	PCC
E	NaOH
F	DCC
G	$\text{H}_2\text{NCH}_3$

WS 4 # 2e



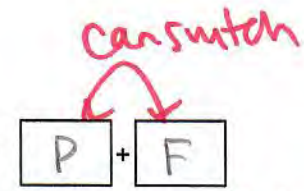
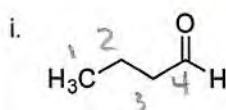
4

MIS 18 # 3d

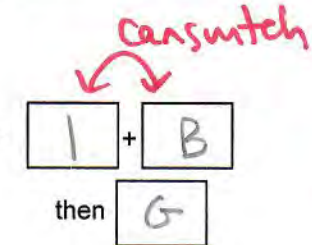
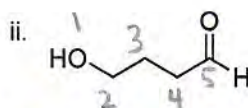
d. Fill in the correct compounds from the table to complete the retrosyntheses. You can use the same compound more than once.

Compounds	
A	$\text{LiAlH}_4$
B	Dibal-H
C	$\text{NaBH}_4$
D	
E	
F	$\text{H}_3\text{O}^+$
G	$\text{H}_2\text{O}$
H	
I	
K	
M	
O	
P	

MIS 18 # 1d  
caper card lecture 11  
WS 4 # 2g

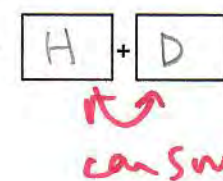
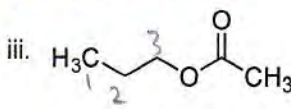


2



3

WS 1 # 2e  
WS 2 # 3a



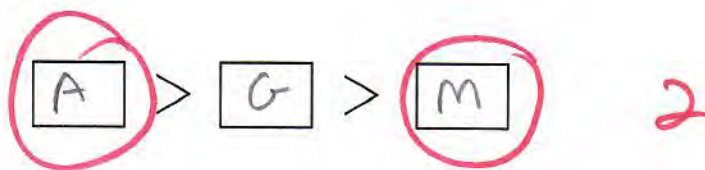
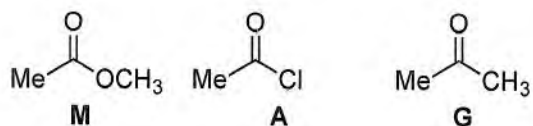
2

WS 4 # 2c

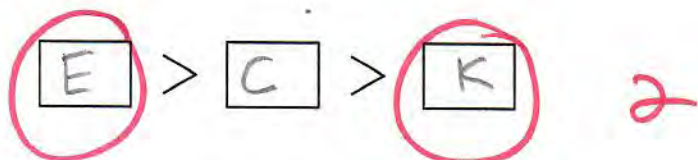
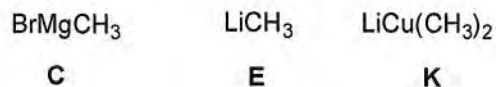
Initials: B

2. (15 points)

a. Rank fastest to slowest reaction with  $\text{LiAlH}_4$



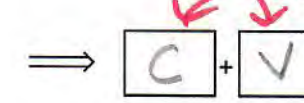
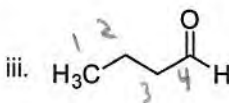
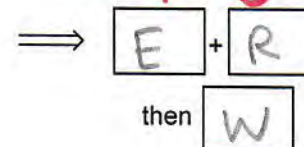
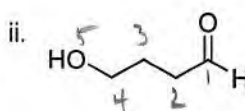
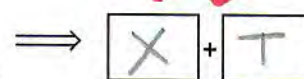
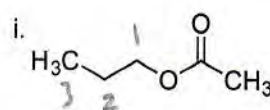
b. Most to least nucleophilic organometallic reagent



c. Fill in the correct compounds from the table to complete the retrosyntheses. You can use the same compound more than once.

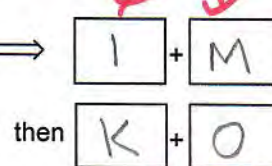
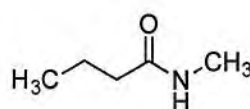
Compounds	
Q	$\text{LiAlH}_4$
R	Dibal-H
S	$\text{NaBH}_4$
T	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$
<del>U</del>	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_3$
V	$\text{H}_3\text{O}^+$
W	$\text{H}_2\text{O}$
X	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{OH}$
Z	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{N}(\text{CH}_3)_2$
A	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$
C	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-\text{O}$
E	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-\text{O}$
K	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-\text{O}$

Products



d. Fill in the correct compounds from the table to complete the retrosynthesis. You can use the same compound more than once.

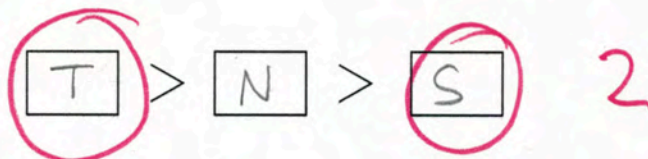
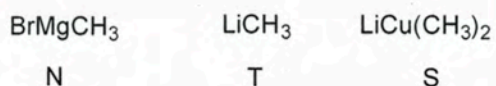
Compounds	
H	$\text{NH}_3$
I	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{OCH}_3$
J	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{N}(\text{H})-\text{CH}_3$
K	DCC
M	$\text{NaOH}$
N	PCC
O	$\text{H}_2\text{NCH}_3$



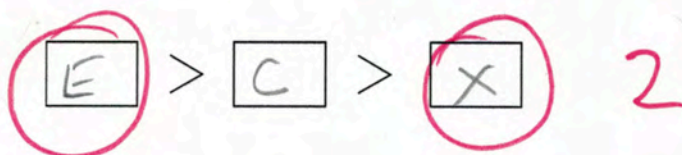
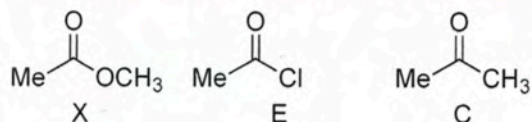
15 //

1. (15 points)

a. Most to least nucleophilic organometallic reagent

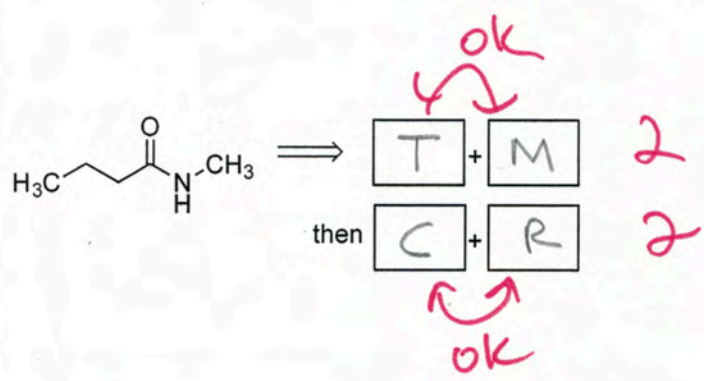


b. Rank fastest to slowest reaction with  $\text{LiAlH}_4$



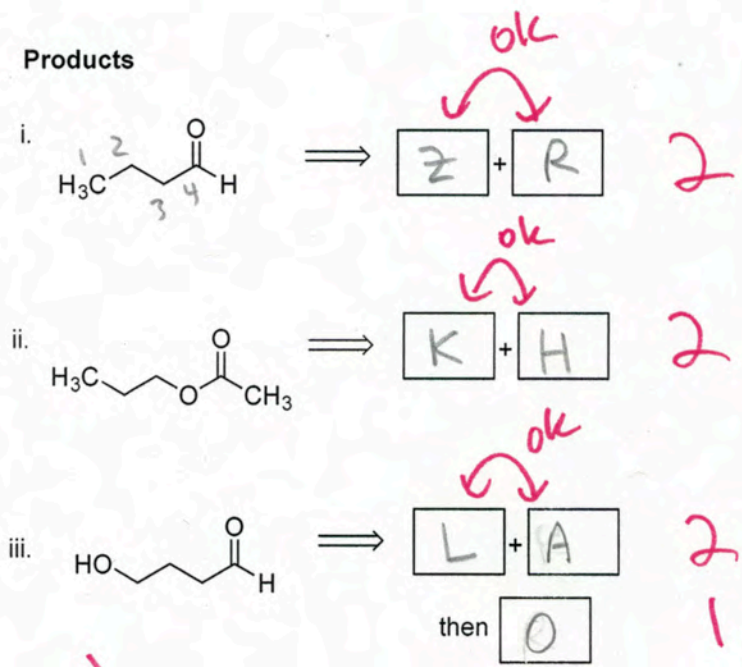
c. Fill in the correct compounds from the table to complete the retrosynthesis. You can use the same compound more than once.

Compounds			
N	$\text{NH}_3$	X	PCC
T	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{OCH}_3$	M	NaOH
S	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{N}(\text{H})-\text{CH}_3$	C	DCC
		R	$\text{H}_2\text{NCH}_3$



d. Fill in the correct compounds from the table to complete the retrosyntheses. You can use the same compound more than once.

Compounds			
M	$\text{LiAlH}_4$	L	
A	Dibal-H	E	
G	$\text{NaBH}_4$	D	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{N}(\text{CH}_3)_3$
H	$\text{H}_3\text{C}-\text{C}(=\text{O})-\text{O}-\text{C}(=\text{O})-\text{CH}_3$	X	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$
W	$\text{H}_3\text{C}-\text{C}(=\text{O})-\text{O}-\text{CH}_3$	Z	
R	$\text{H}_3\text{O}^+$		
O	$\text{H}_2\text{O}$		
K	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{OH}$		

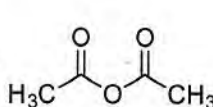
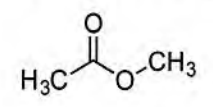
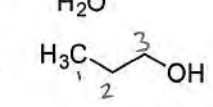
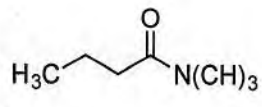
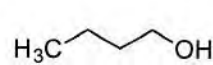
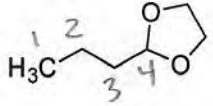
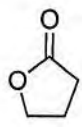
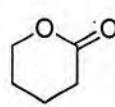


15

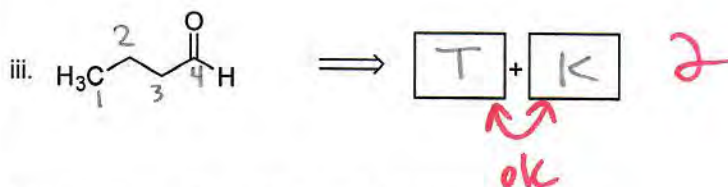
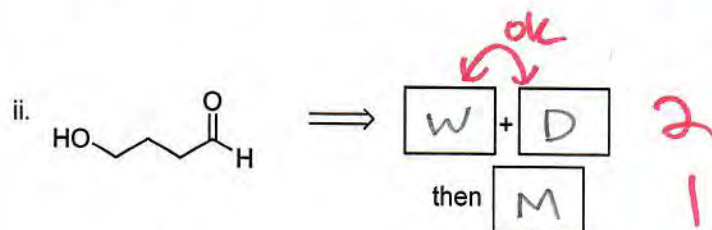
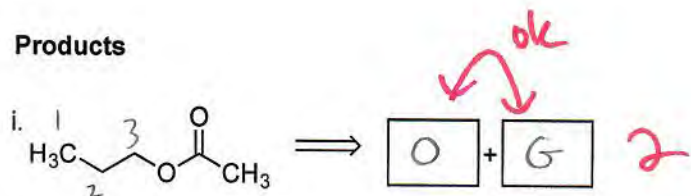
Initials: D

2. (15 points)

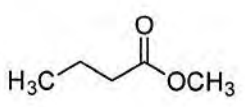
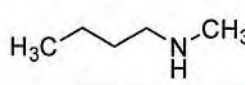
a. Fill in the correct compounds from the table to complete the retrosyntheses. You can use the same compound more than once.

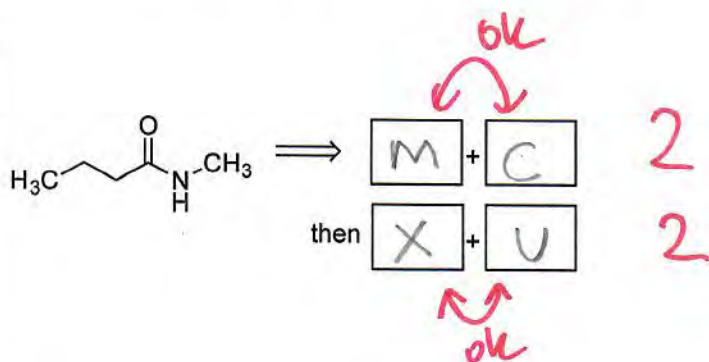
Compounds	
B	LiAlH <sub>4</sub>
D	Dibal-H
E	NaBH <sub>4</sub>
G	
H	
K	H <sub>3</sub> O <sup>+</sup>
M	H <sub>2</sub> O
O	
Q	
S	
T	
W	
X	

Products

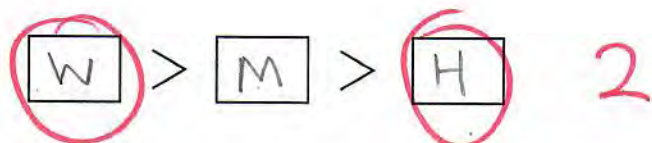
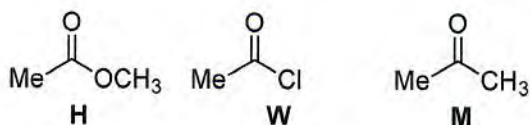


b. Fill in the correct compounds from the table to complete the retrosynthesis. You can use the same compound more than once.

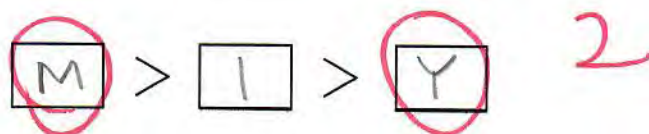
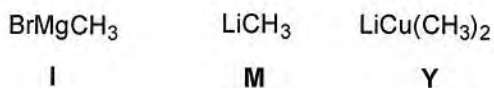
Compounds	
O	NH <sub>3</sub>
M	
E	
X	DCC
C	NaOH
K	PCC
U	H <sub>2</sub> NCH <sub>3</sub>



c. Rank fastest to slowest reaction with LiAlH<sub>4</sub>



y. Most to least nucleophilic organometallic reagent



15/11

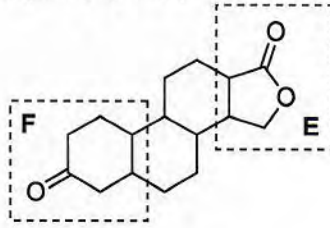
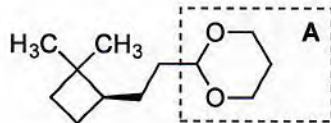
13

2. (15 points)

a. Match the names of the functional groups with labeled examples (3 points).

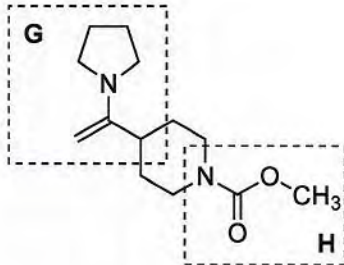
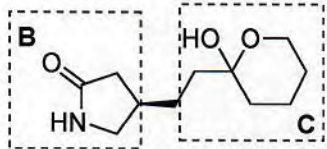
Initials: A

hemiacetal C



Synth review, page 3

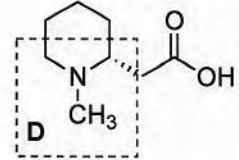
enamine G



MI 518 #26

lactone E

1 pt each



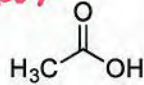
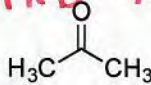
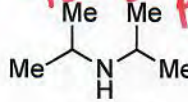
Lecture 7, p. 4  
MI 518 #26

b. Provide pKa's for any 5 of the following compounds (if you do them all, we will count your best 5).

1 pt each up to 5 points max

HOTs

CH<sub>4</sub>



H<sub>3</sub>C-CH<sub>2</sub>-OH

H<sub>2</sub>SO<sub>4</sub>

WSO, p1  
Quiz C #2  
WS4, #16

-7

50

36

20

5

16

-10

acceptable -10 to -5

60-40

39-35

22-18

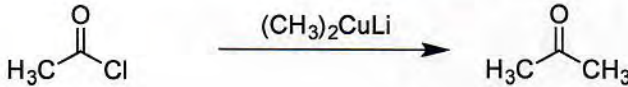
6-4

17-15

-11 to -9

c. Provide an arrow-pushing mechanism (5 points).

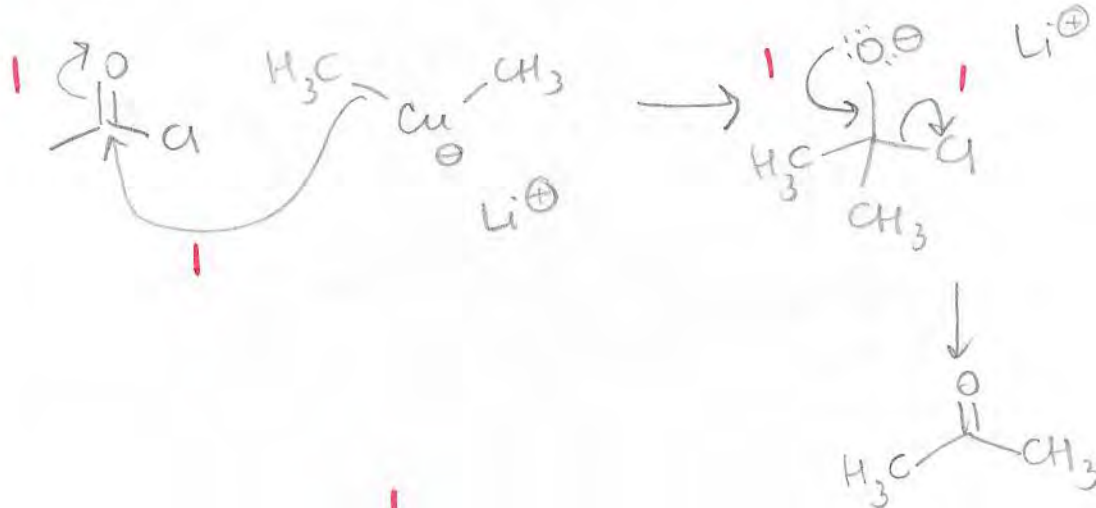
What is the name of this type of reagent?



cuprate or Gilman

Quiz B #3

Mechanism:



acceptable:  
organo-metallic

WS2 #36  
WS3 #1dii  
MI 518 #2c

1 point each arrow (misw, wrong charge, start or end -0.5)

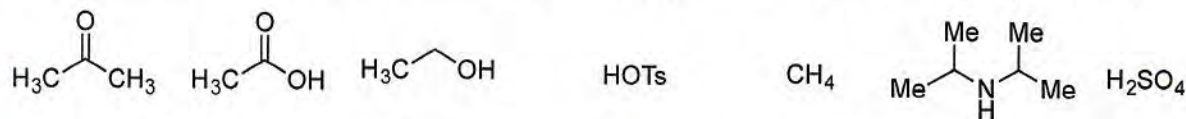
5

13

1. (13 points)

a. Provide pKa's for **any 5** of the following compounds (if you do them all, we will count your best 5).

max  
5



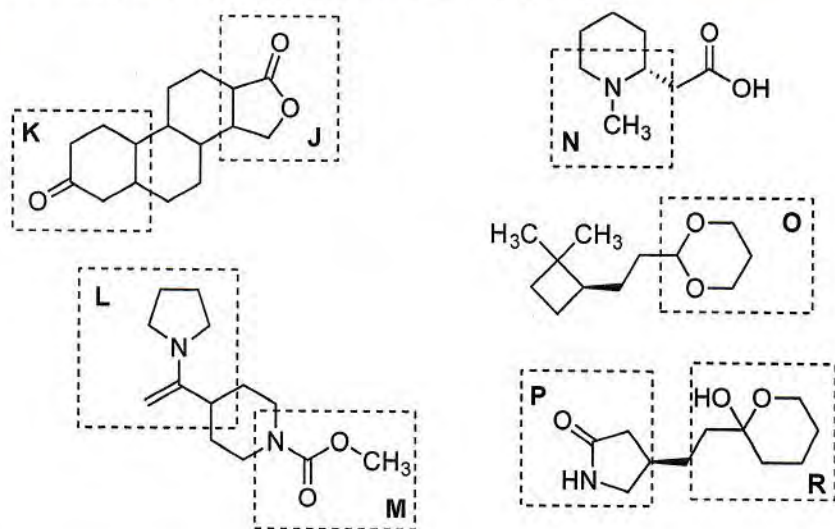
20    5    16    -7    50    36    -10

acceptable 22-18    6-4    17-15    ~~10 to -5~~    60-40    39-35    -11 to -9

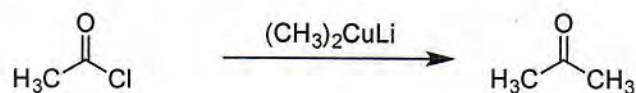
b. Match the names of the functional groups with labeled examples (3 points).

3

hemiacetal R  
 enamine L  
 lactone J



c. Provide an arrow-pushing mechanism (5 points).



What is the name of this type of reagent?

Mechanism:

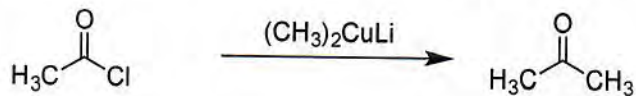
See A

13

2. (13 points)

Initials: C

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

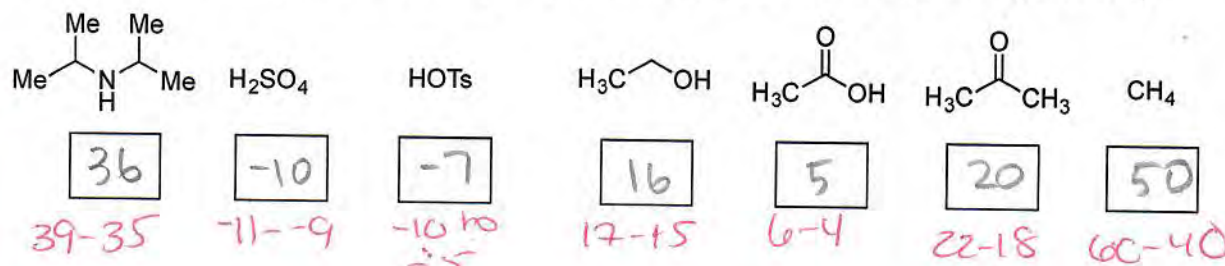


What is the name of this type of reagent?

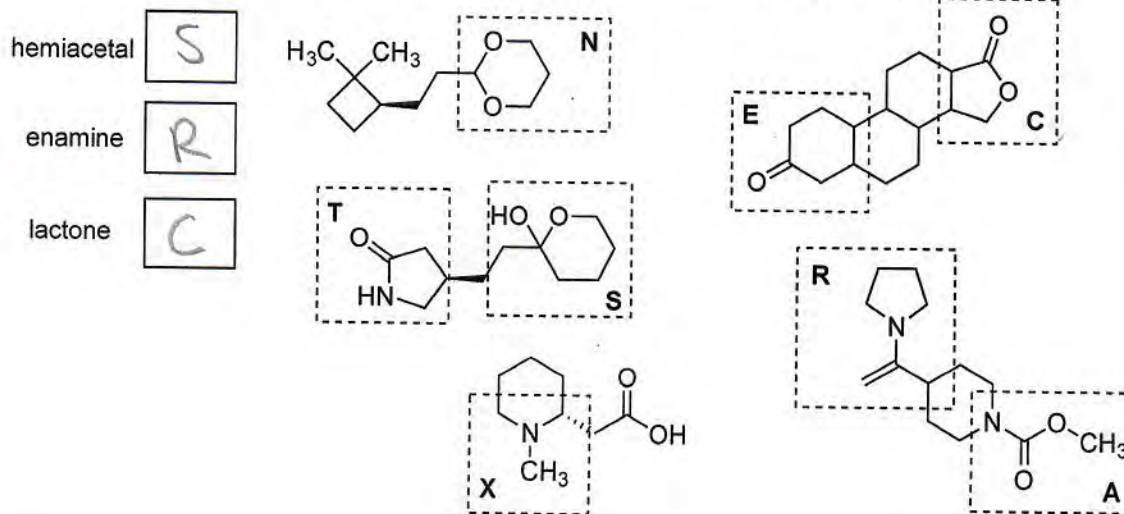
Mechanism:

See A

b. Provide pKa's for **any 5** of the following compounds (if you do them all, we will count your best 5).



c. Match the names of the functional groups with labeled examples (3 points).

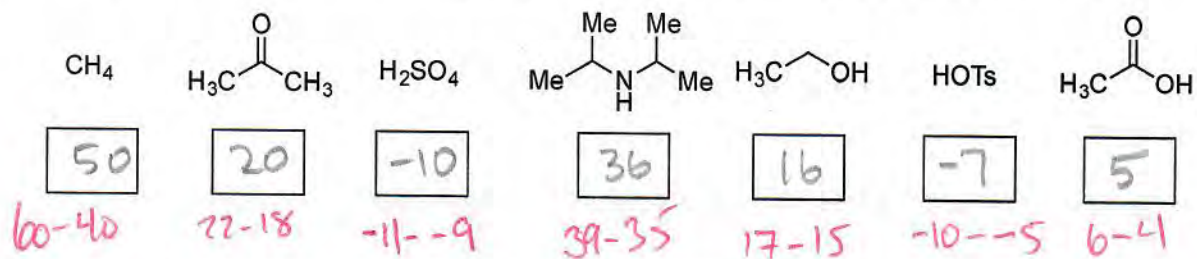


13 //

1. (13 points)

a. Provide pKa's for **any 5** of the following compounds (if you do them all, we will count your best 5).

5

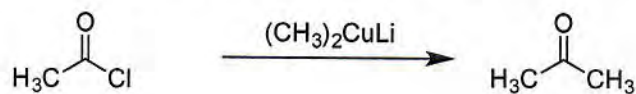


b. Match the names of the functional groups with labeled examples (3 points).

3

hemiacetal	<span style="border: 1px solid black; padding: 2px;">O</span>		
enamine	<span style="border: 1px solid black; padding: 2px;">M</span>		
lactone	<span style="border: 1px solid black; padding: 2px;">K</span>		

c. Provide an arrow-pushing mechanism (5 points).



What is the name of this type of reagent?

Mechanism:

See A

5

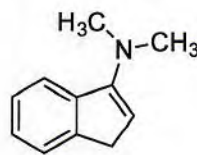
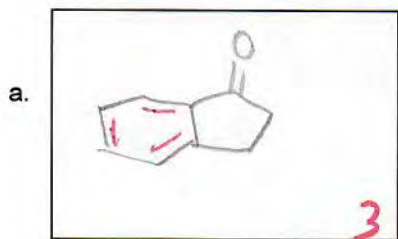
13 //



~~20~~

3. (20 points) Fill in the boxes with the appropriate starting material, reagent or major product. Show stereochemistry where appropriate.

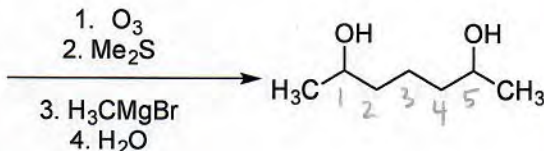
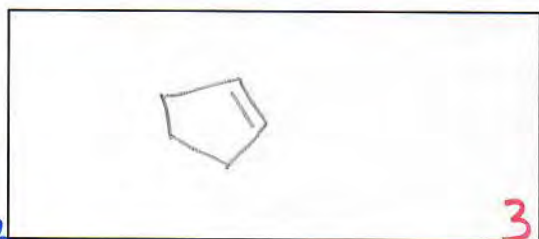
Initials: A



Cupercard  
Lecture 9

WS 3 # 2b

WS 3 # 3b

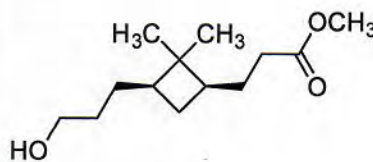
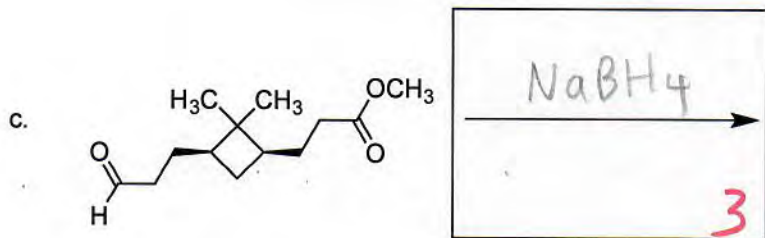


WS 4, # 5c

MI S18 # 3e

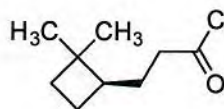
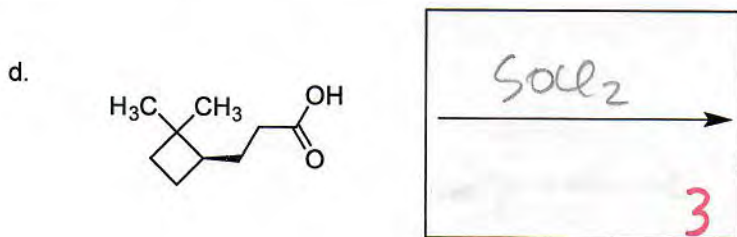
MI S14 4a

Lecture 13  
P15



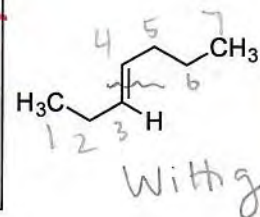
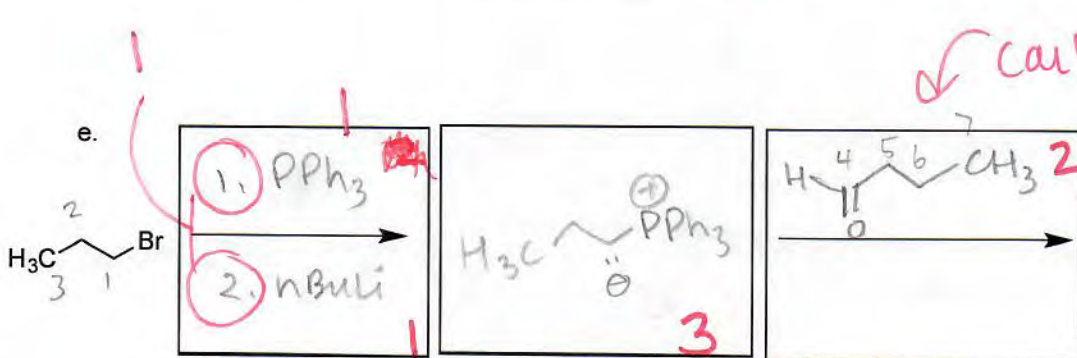
Cupercard  
Lecture 4

WS 3 # 2h



WS 4 # 2b

MI S18 # 3b



WS 3  
# 2c

MI  
S18  
# 1d  
iii

~~20~~

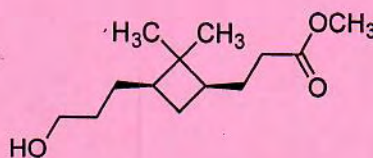
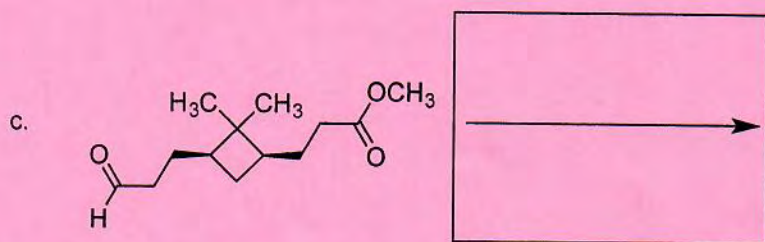
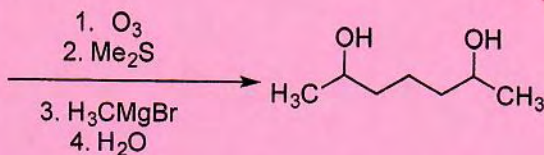
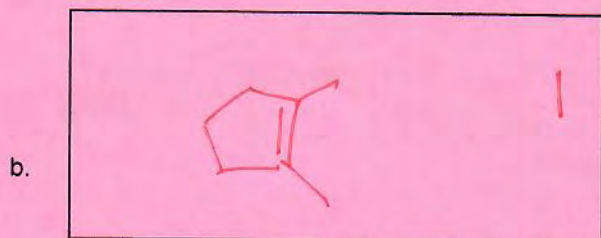
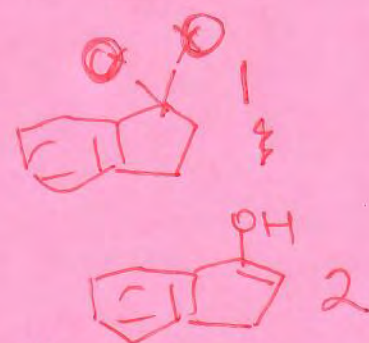
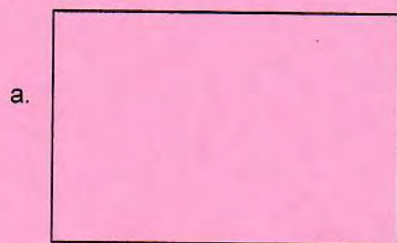


Carbon count = 1  
MI S14

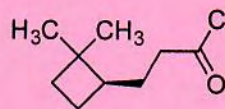
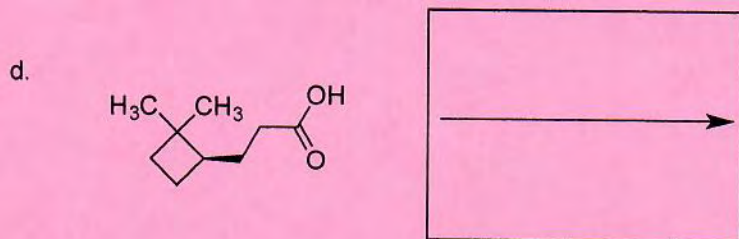
# Partial Credit

3. (21 points) Fill in the boxes with the appropriate starting material, reagent or major product. Show stereochemistry where appropriate.

Initials: \_\_\_\_\_

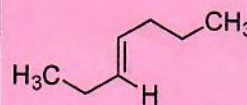
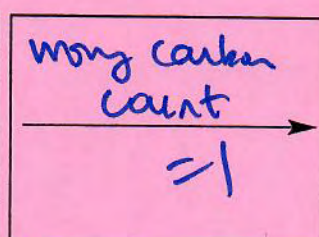
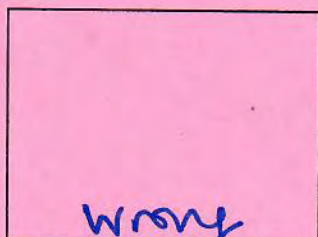
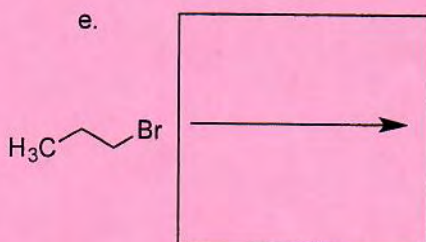


$\text{LiAlH}_4 = 0$



$\text{SOCl}_2 + \text{pyridine}$  } 3

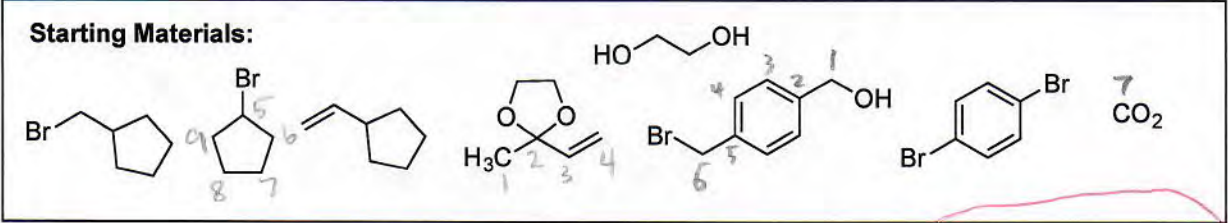
$\text{SOCl}_2 + \text{others} = 1$



Carbon count = 1

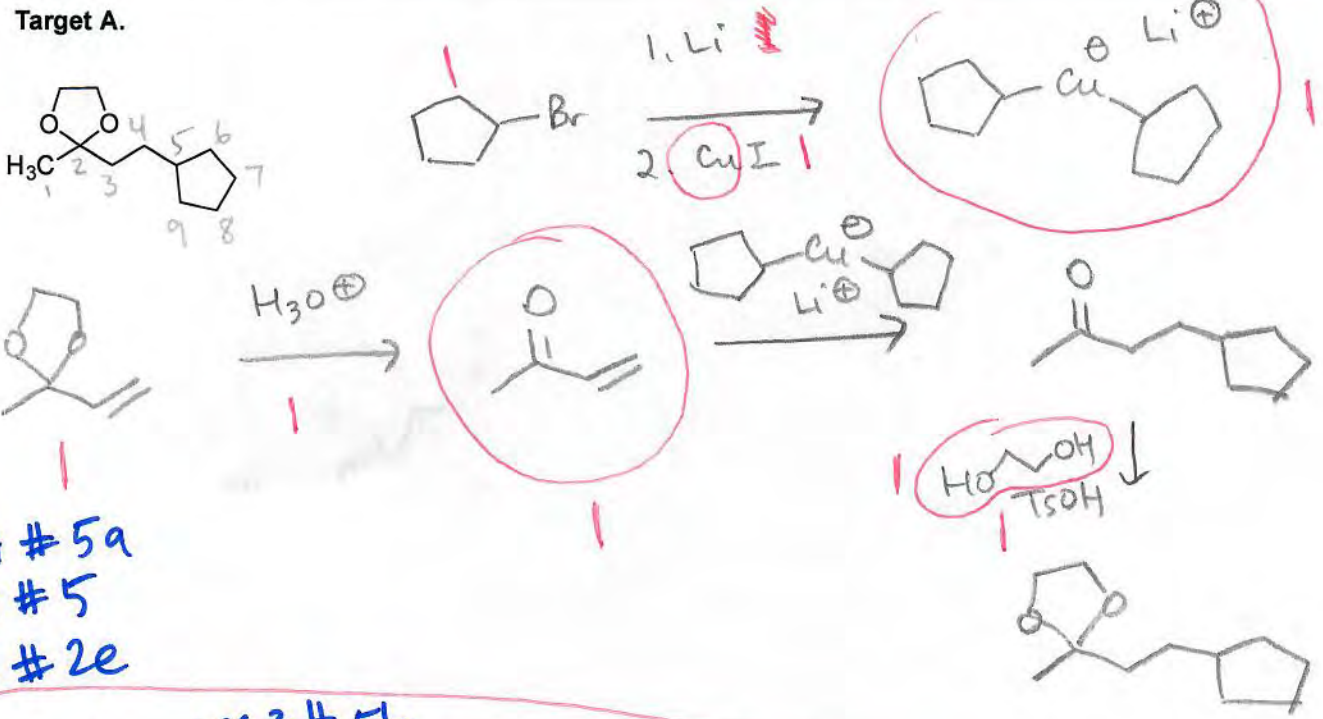
4. Propose syntheses of the targets below (14 points).

All carbons in the product must come from the starting materials provided, you can use any reagent you wish. YOU CAN IGNORE STEREOCHEMISTRY.



Target A.

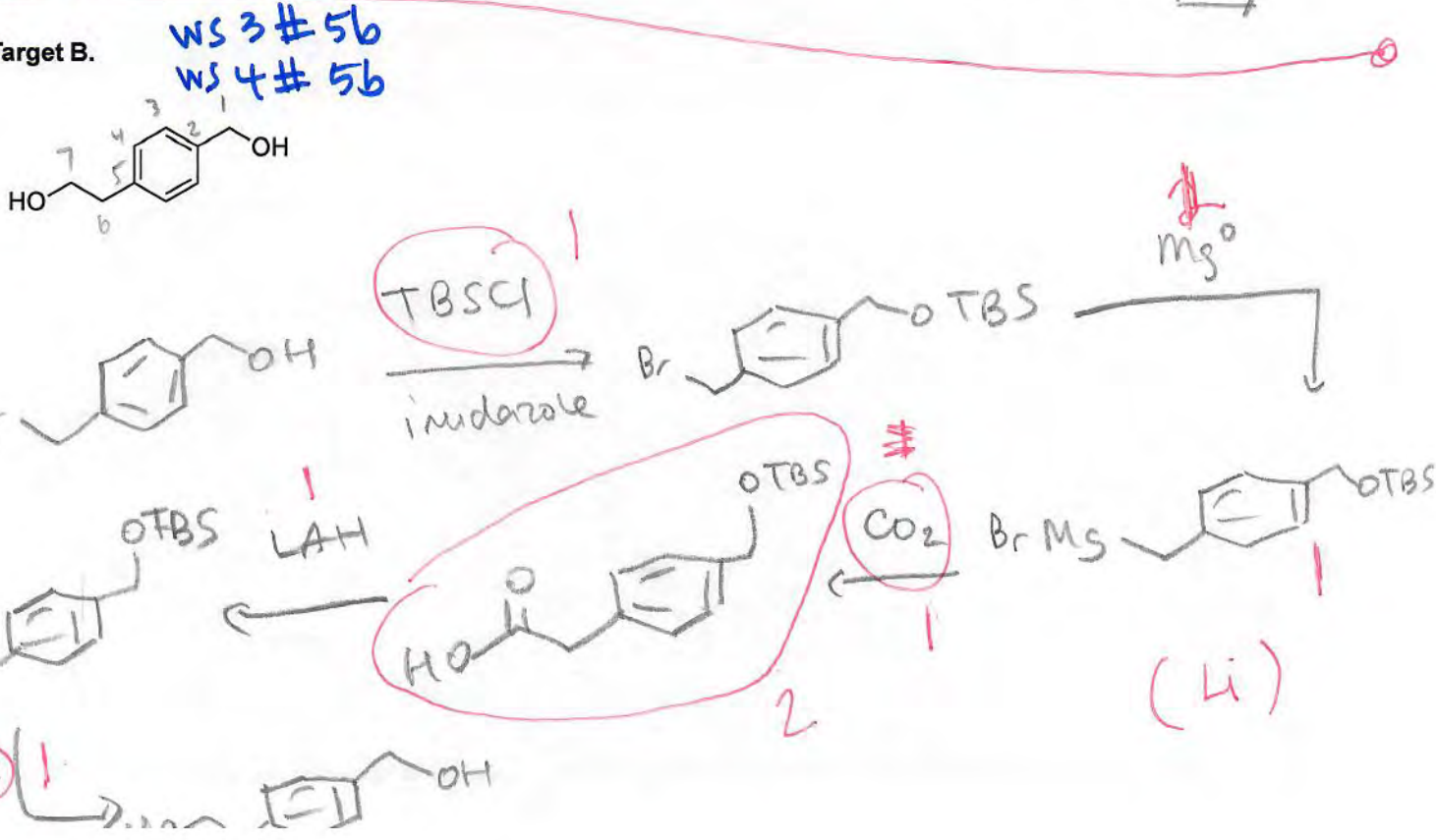
8



MS4 # 5a  
MS18 # 5  
WS2 # 2e

Target B.

8



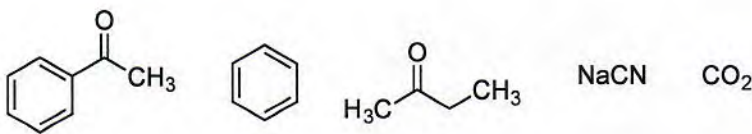
WS 3 # 5b  
WS 4 # 5b

5. Propose a synthesis of the target below (6 points).

Initials: A

All carbons in the product must come from the starting materials provided, you can use any reagent you wish.  
YOU CAN IGNORE STEREOCHEMISTRY.

Starting Materials:

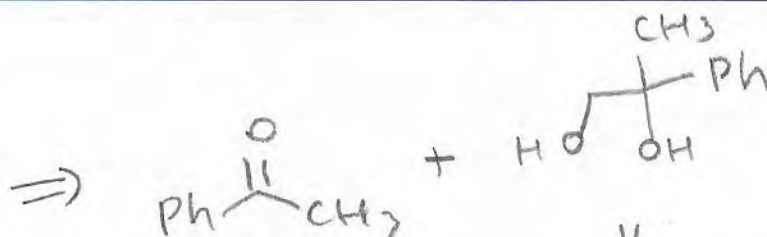
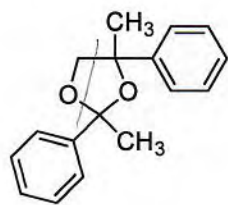


Caspercard  
Lecture 13

WS 4 #1d iii

~~WS 4 #1d iii~~

Target.



Lecture 7,  
take home  
problem  
page 10

cyanohydrin formation ~ 2  
to diol - 3  
to acetal - 2

