

CHEM 51C LEC A (40620)



Final Exam (Spring Quarter 2019) - LETTER SIZE

9080 (4344)

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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3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	3
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7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7
8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8
9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	9
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(This space for Instructor/TA use only)

Question	1	2	3	4	5
Score	21+1	18+1	21	21	17
6	7	8	9	10	TOTAL

Do not open your exam until instructed to do so.

Your answers must be neat and legible.

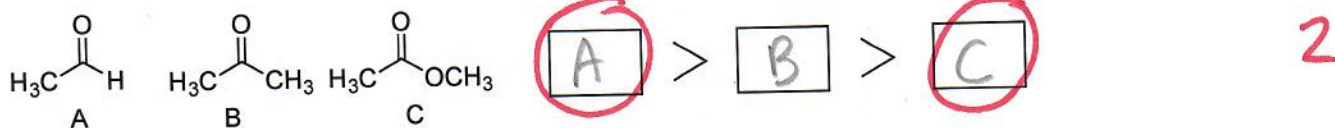
Good luck!

1 (21 points+ 1 point bonus)

Final Exam, Chem 51C, Jarvo, Spring 19

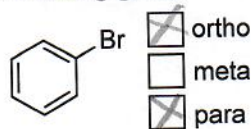
Initials: A

a. Rank fastest to slowest reaction with NaCN

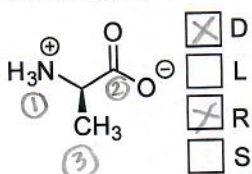


b. Check the appropriate box or boxes.

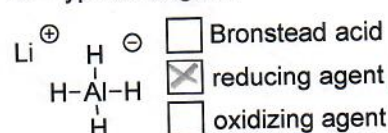
i. Directing group



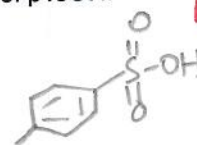
ii. Amino acid



iii. Type of reagent:

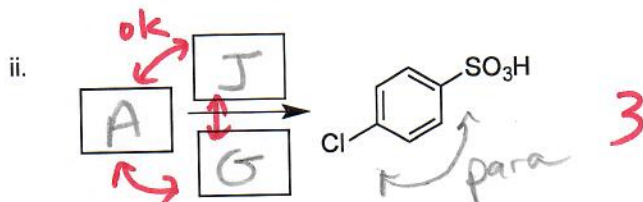
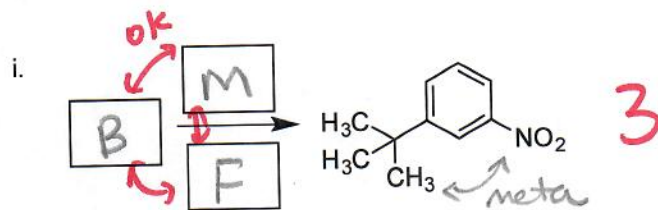
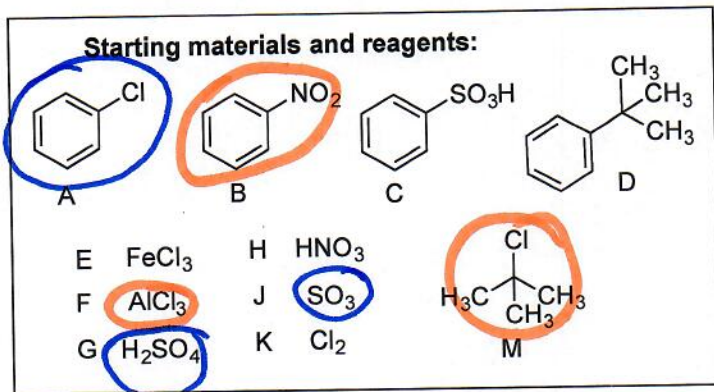


BONUS:
Draw the structure of pTsOH:

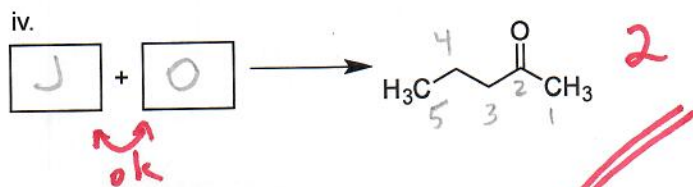
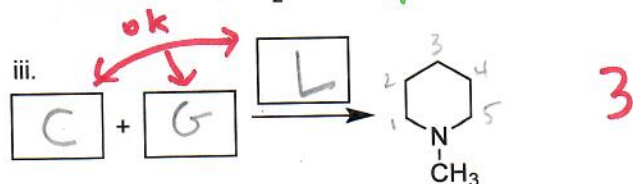
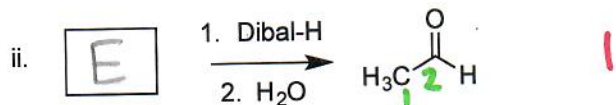
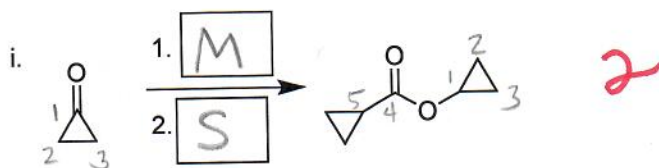
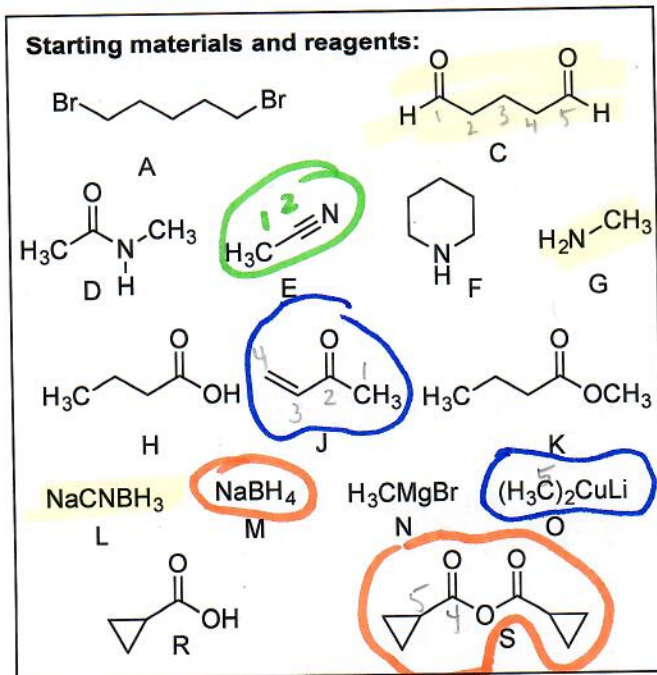


5
+ 1

c. Fill in the starting materials to complete the syntheses



d. Fill in the starting materials to complete the syntheses



21+1

2. (21 points+ 1 point bonus)

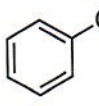
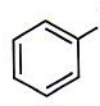
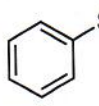
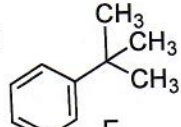
Initials: B

a. Rank fastest to slowest reaction with NaCN

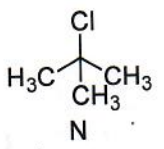


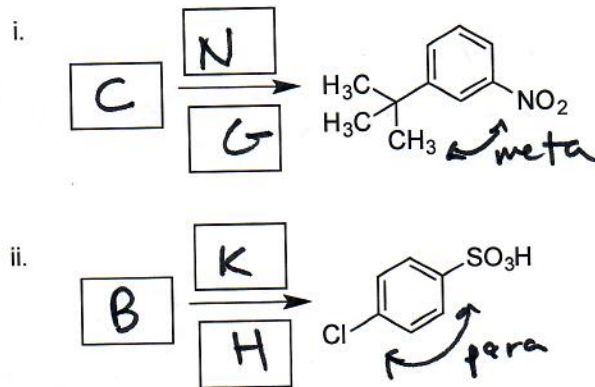
b. Fill in the starting materials to complete the syntheses

Starting materials and reagents:


B 
C 
D 
E

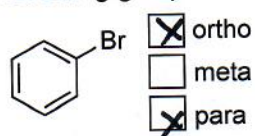
F FeCl_3 J HNO_3
 G AlCl_3 K SO_3
 H H_2SO_4 M Cl_2


N

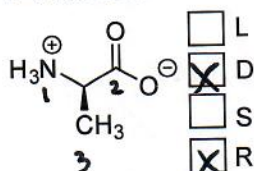


c. Check the appropriate box or boxes.

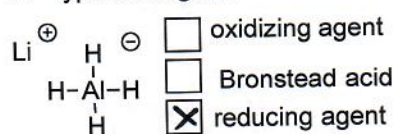
i. Directing group



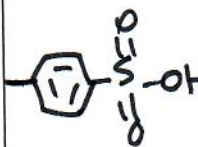
ii. Amino acid



iii. Type of reagent:


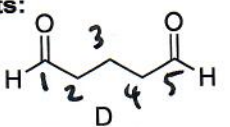


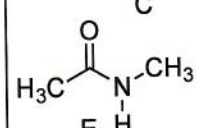
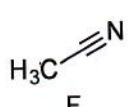
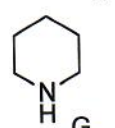
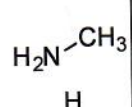
BONUS:
Draw the structure of pTsOH:

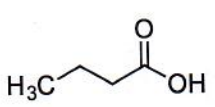
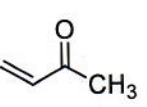
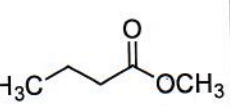


d. Fill in the starting materials to complete the syntheses

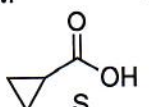
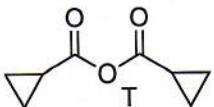
Starting materials and reagents:

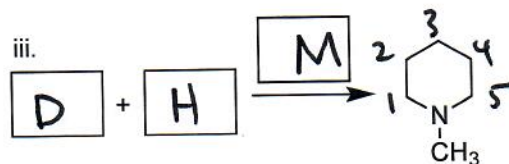
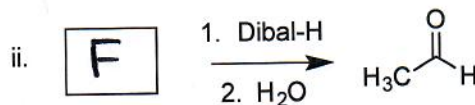
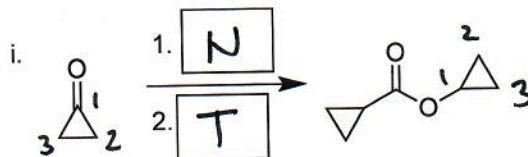

C 
D


E 
F 
G 
H


J 
K 
L

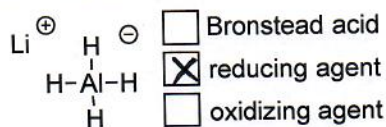
M NaCNBH_3 N NaBH_4 O H_3CMgBr R $(\text{H}_3\text{C})_2\text{CuLi}$


S 
T

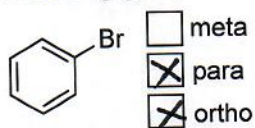


a. Check the appropriate box or boxes.

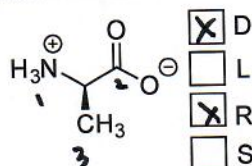
i. Type of reagent:



ii. Directing group



iii. Amino acid


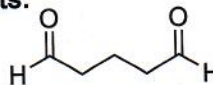
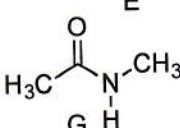
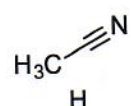
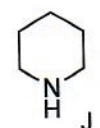
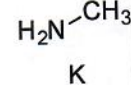
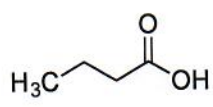
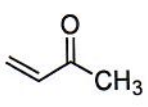
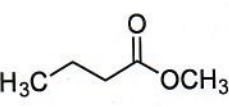
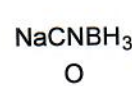
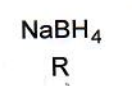
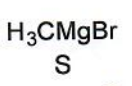
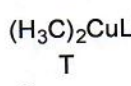
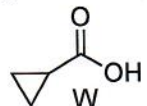
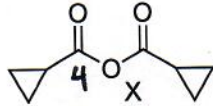


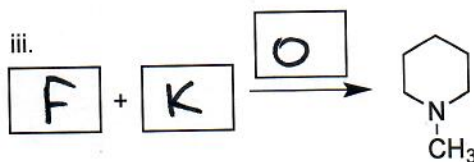
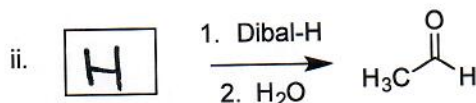
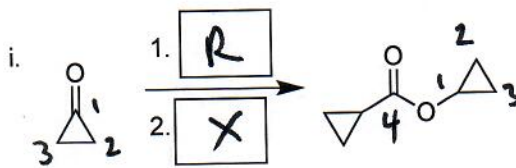
BONUS:
Draw the structure of pTsOH:



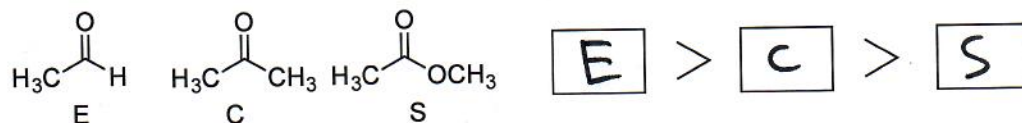
d. Fill in the starting materials to complete the syntheses

Starting materials and reagents:

 E
 F
 G
 H
 J
 K
 L
 M
 N
 O
 R
 S
 T
 W
 X

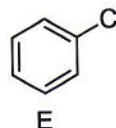
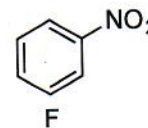
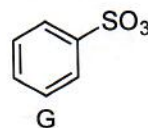
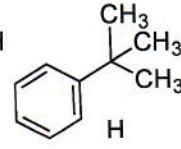


a. Rank fastest to slowest reaction with NaCN

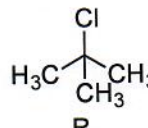


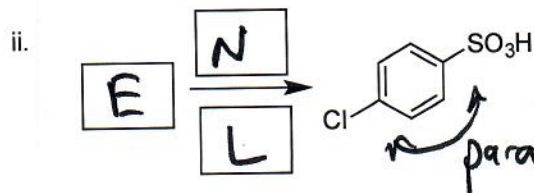
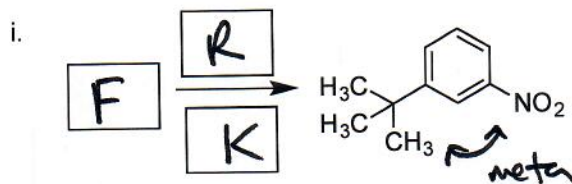
c. Fill in the starting materials to complete the syntheses

Starting materials and reagents:

 E
 F
 G
 H

 J FeCl₃ M HNO₃
 K AlCl₃ N SO₃
 L H₂SO₄ O Cl₂

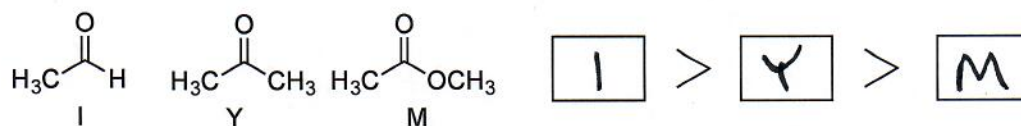
 R



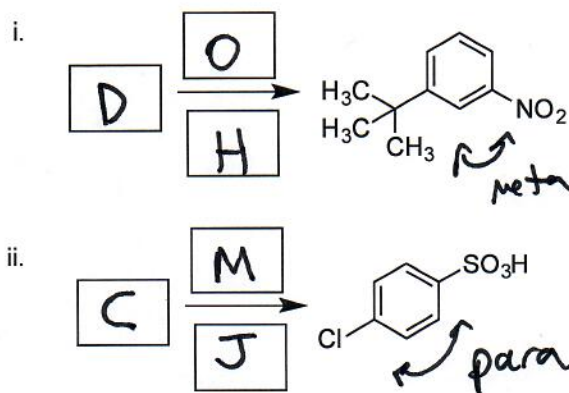
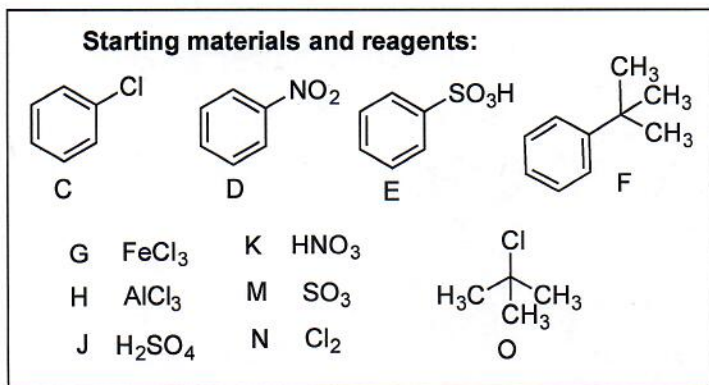
2. (21 points+ 1 point bonus)

Initials: D

a. Rank fastest to slowest reaction with NaCN

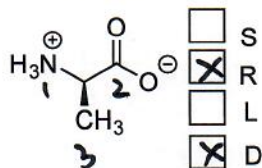


b. Fill in the starting materials to complete the syntheses

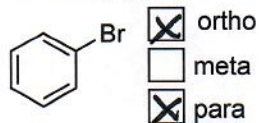


c. Check the appropriate box or boxes.

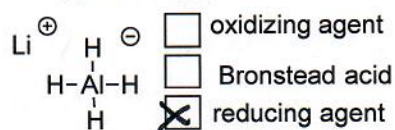
i. Amino acid



ii. Directing group



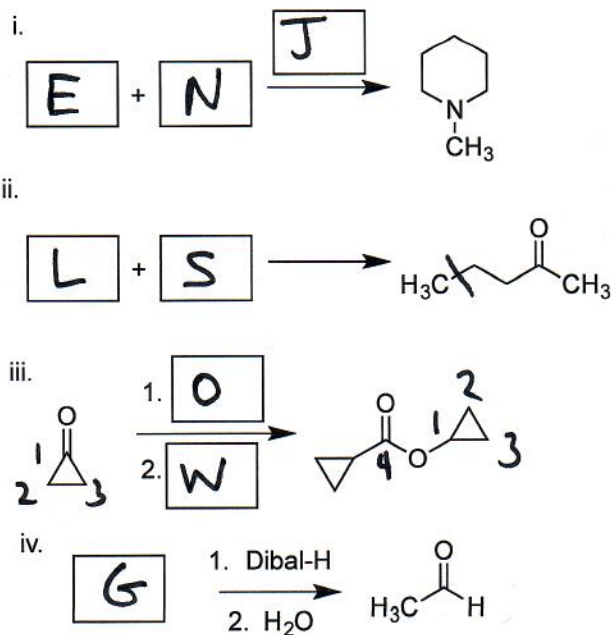
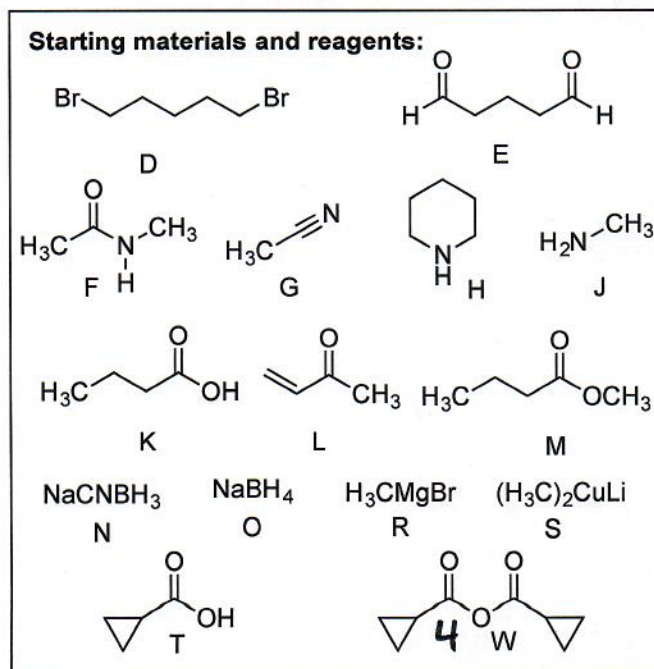
iii. Type of reagent:



BONUS:
Draw the structure of pTsOH:



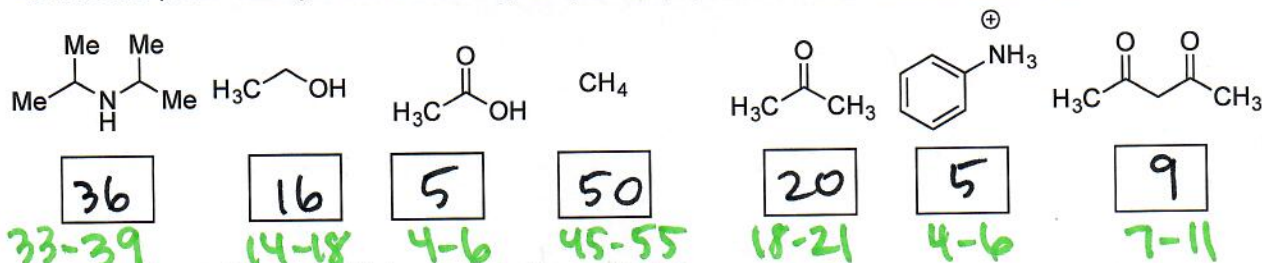
d. Fill in the starting materials to complete the syntheses



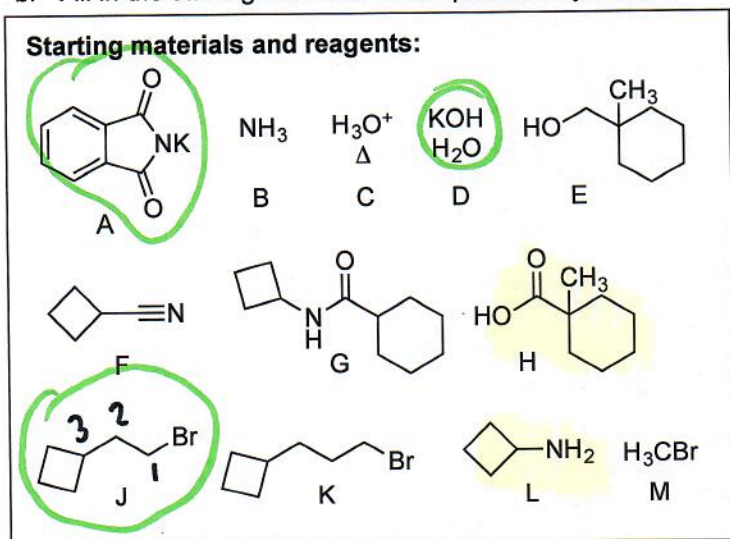
2 (18 points + 1 point bonus)

Initials: A

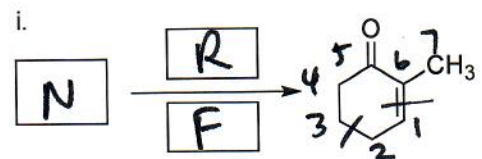
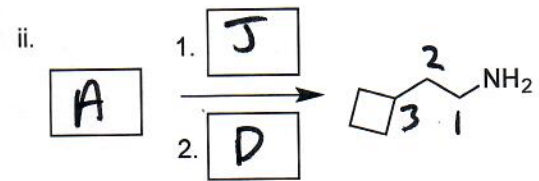
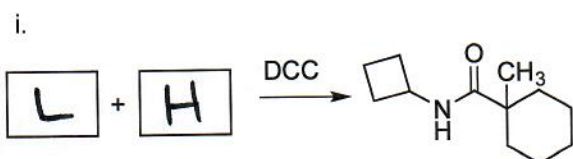
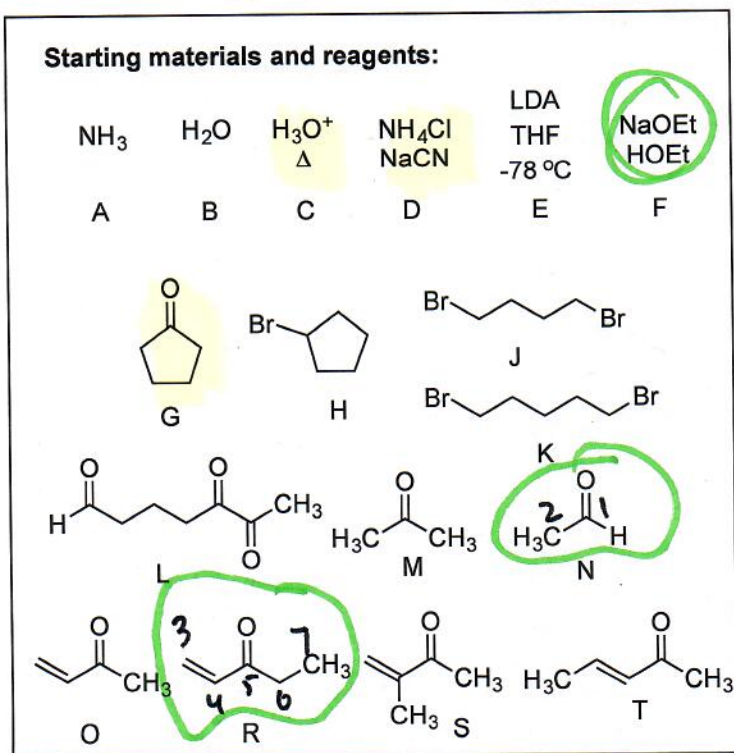
a. Provide pKa's for **any 6** of the following compounds (if you do them all, we will count your best 6).



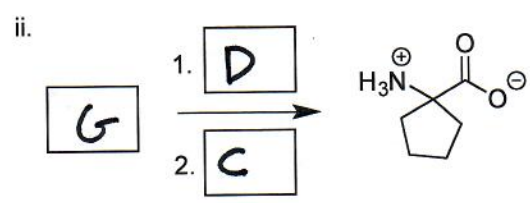
b. Fill in the starting materials to complete the syntheses



c. Fill in the starting materials to complete the syntheses



Name of reaction: Robinson annulation

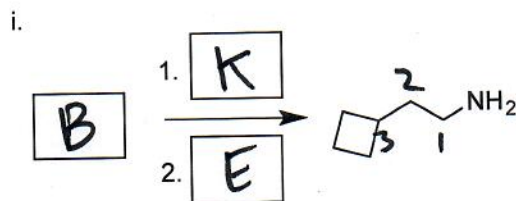
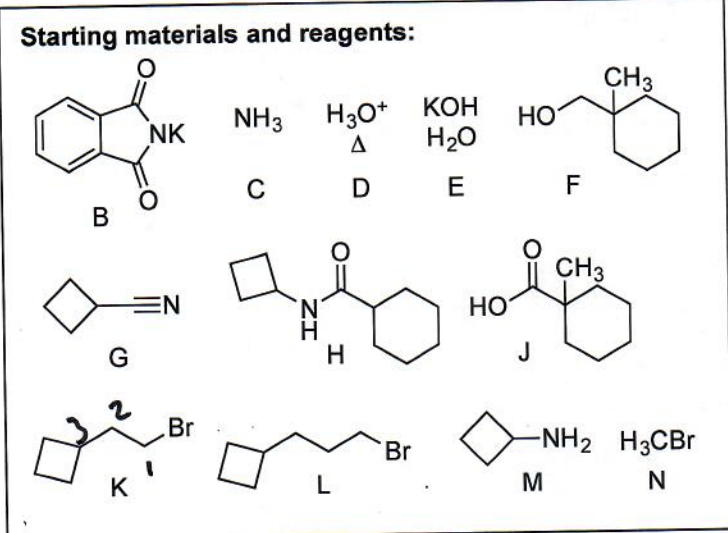


BONUS: What was your favorite song played at the beginning of lecture:

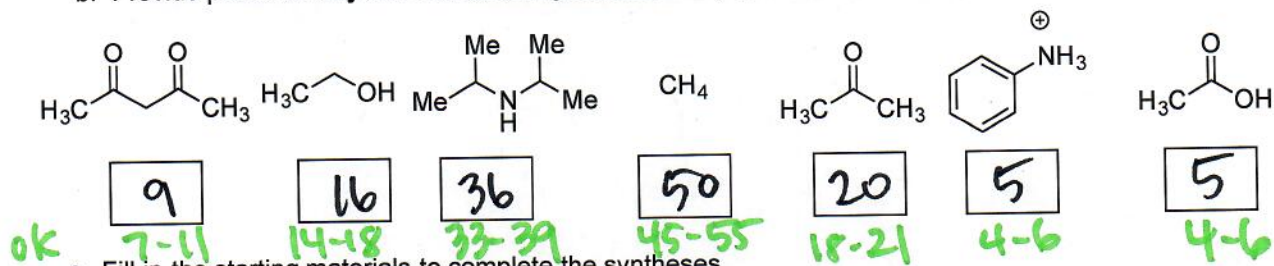
see list

1 (18 points + 1 point bonus)

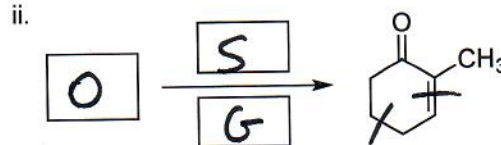
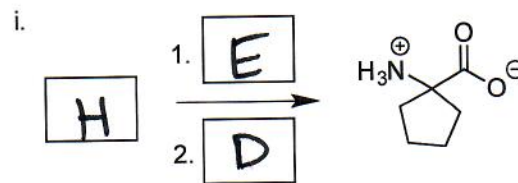
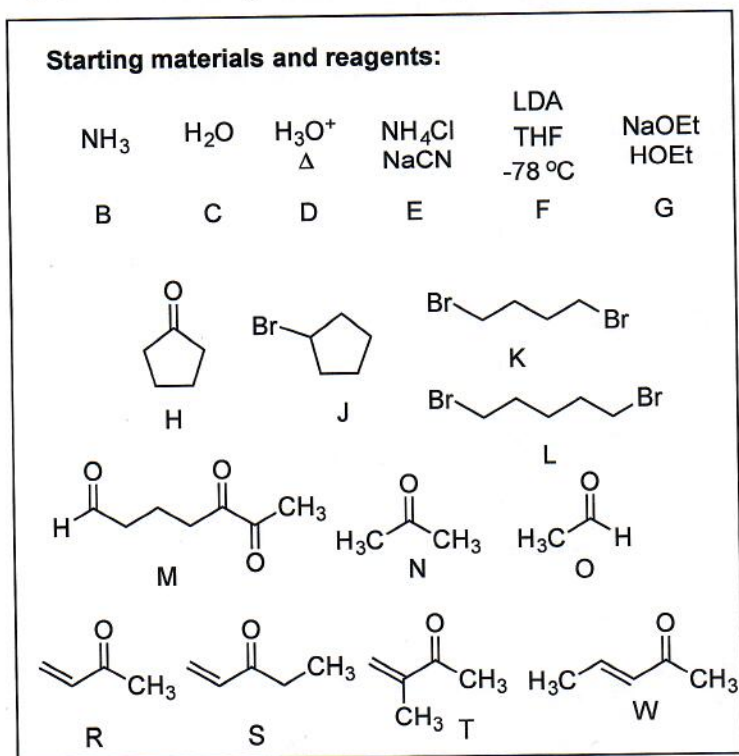
a. Fill in the starting materials to complete the syntheses



b. Provide pKa's for any 6 of the following compounds (if you do them all, we will count your best 6).



c. Fill in the starting materials to complete the syntheses



Name of reaction:

Robinson annulation

BONUS: What was your favorite song played at the beginning of lecture:

see list

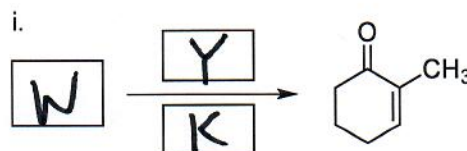
2 (18 points + 1 point bonus)

Initials: C

a. Fill in the starting materials to complete the syntheses

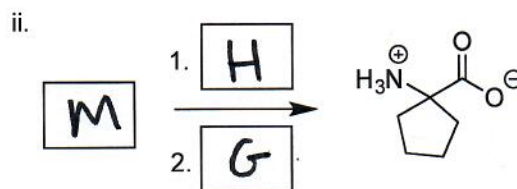
Starting materials and reagents:

NH ₃	H ₂ O	H ₃ O ⁺ Δ	NH ₄ Cl NaCN	LDA THF -78 °C	NaOEt HOEt
E	F	G	H	J	K



Name of reaction:

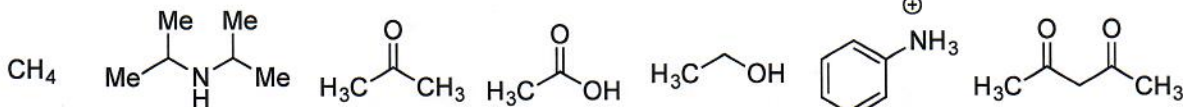
Robinson annulation



BONUS: What was your favorite song played at the beginning of lecture:

see list

b. Provide pKa's for any 6 of the following compounds (if you do them all, we will count your best 6).



50

36

20

5

16

5

9

45-55

33-39

18-21

4-6

14-18

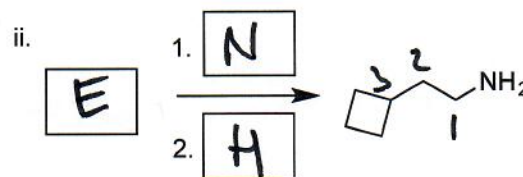
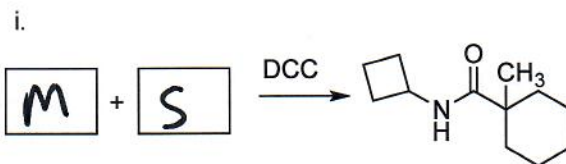
4-6

7-11

c. Fill in the starting materials to complete the syntheses

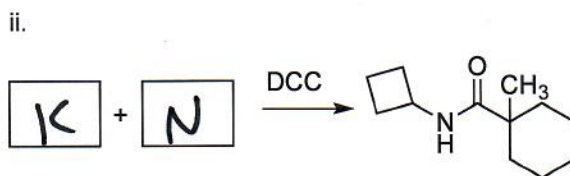
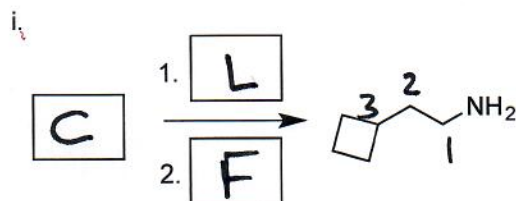
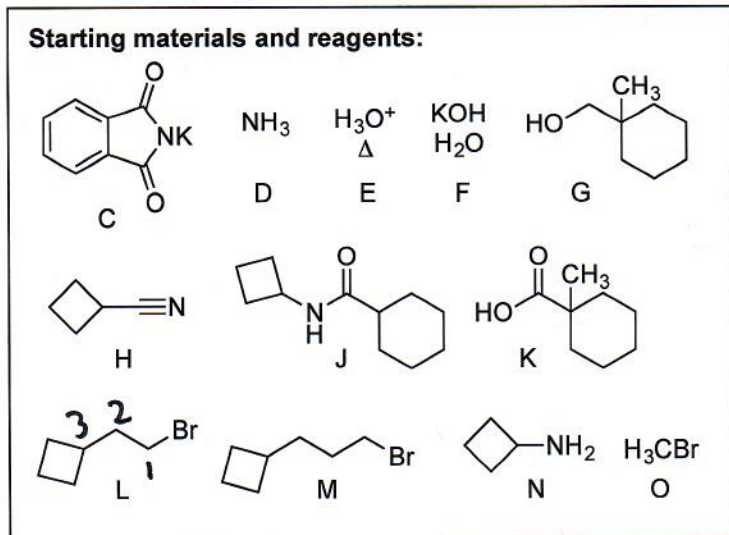
Starting materials and reagents:

	NH ₃	H ₃ O ⁺ Δ	KOH H ₂ O	
F	G	H	J	



1 (18 points + 1 point bonus)

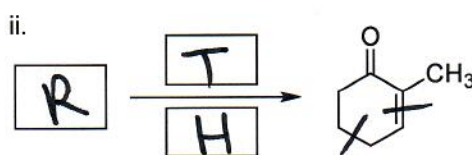
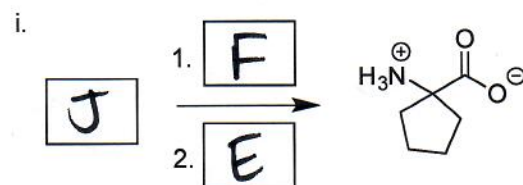
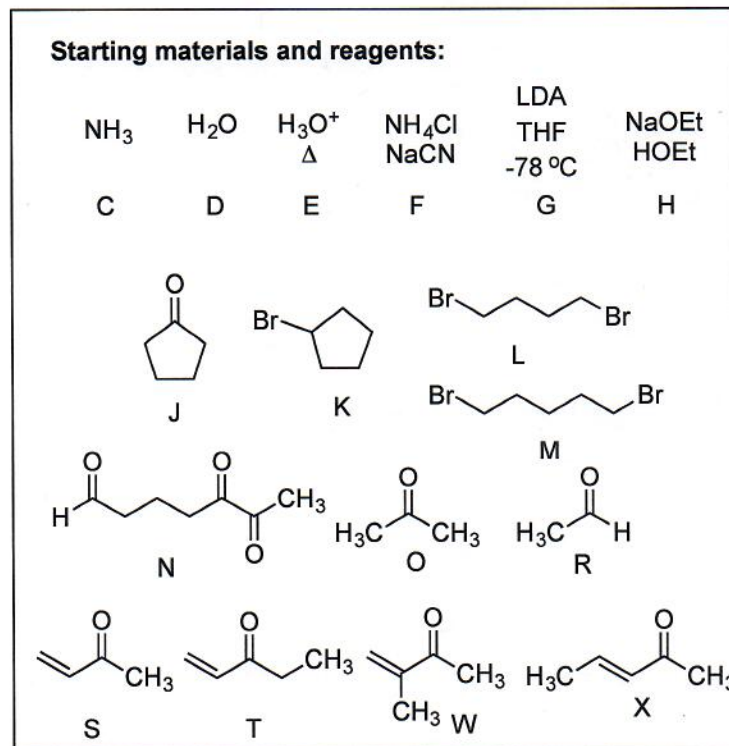
a. Fill in the starting materials to complete the syntheses



BONUS: What was your favorite song played at the beginning of lecture:

see list

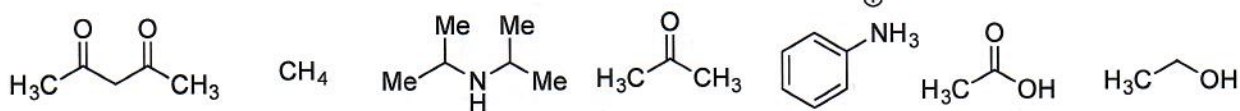
b. Fill in the starting materials to complete the syntheses



Name of reaction:

Robinson annulation

c. Provide pKa's for any 6 of the following compounds (if you do them all, we will count your best 6).



9
50
36
20
5
5
16

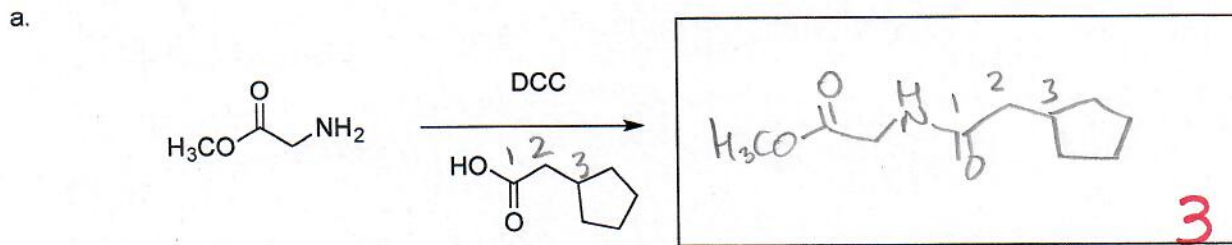
ok
7-11
45-55
33-39
18-21
4-6
4-6
14-18

4. Fill in the boxes with the appropriate starting material, reagent or major product (35 points).
Show stereochemistry where appropriate

Initials: A+C

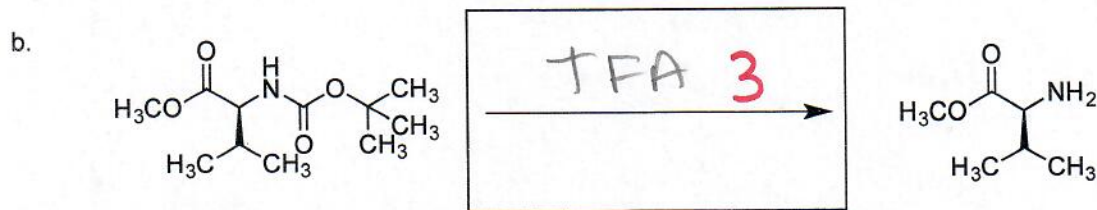
21

3

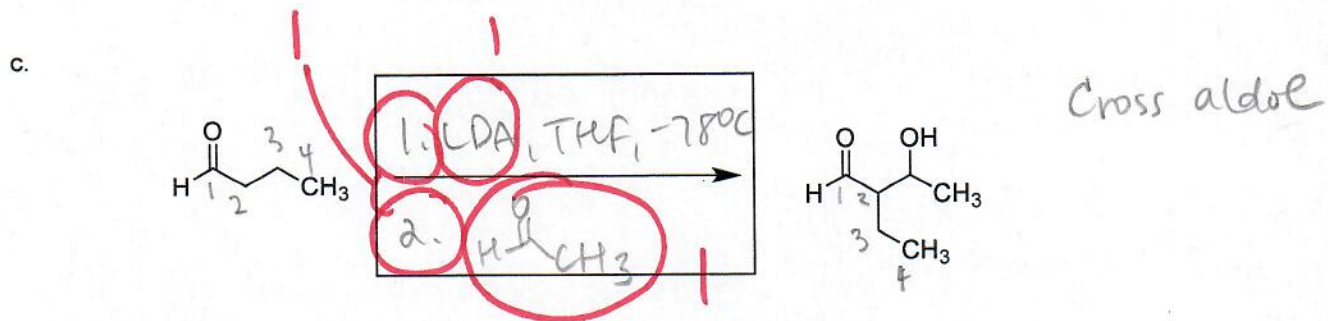


3

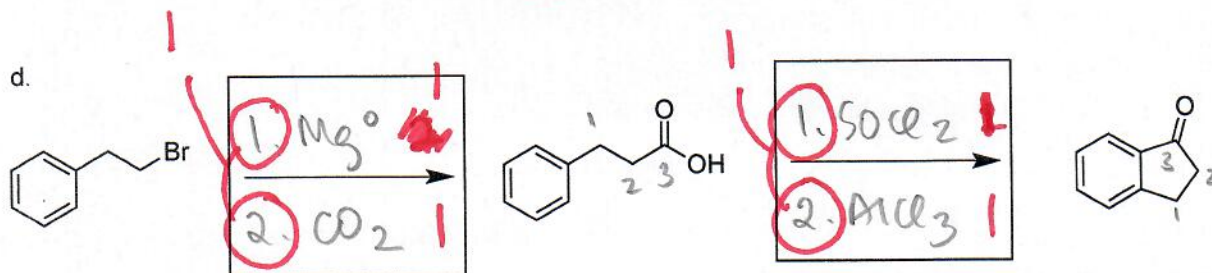
3



3

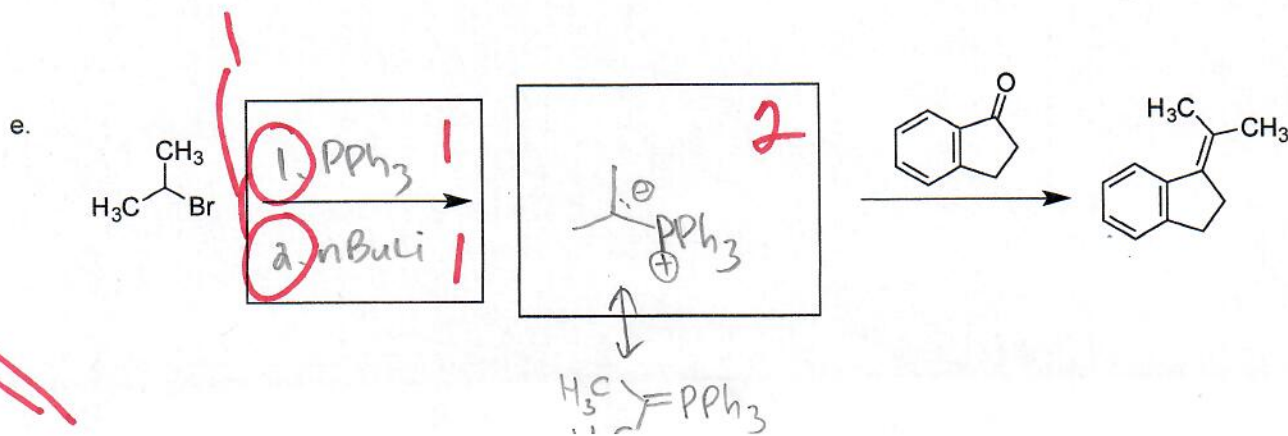


7



Name of this reaction? Friedel Crafts acylation

5

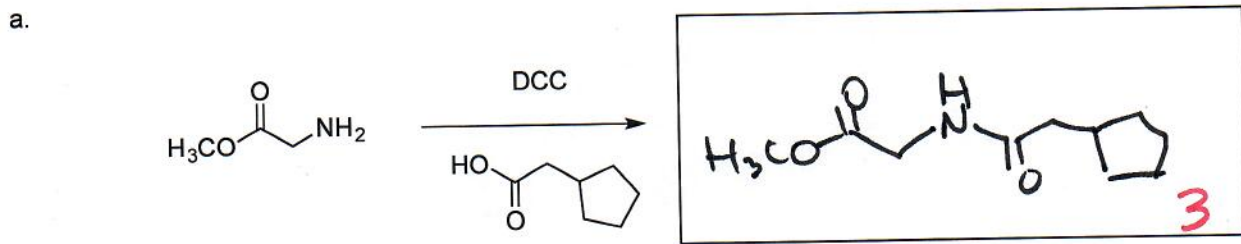


21

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

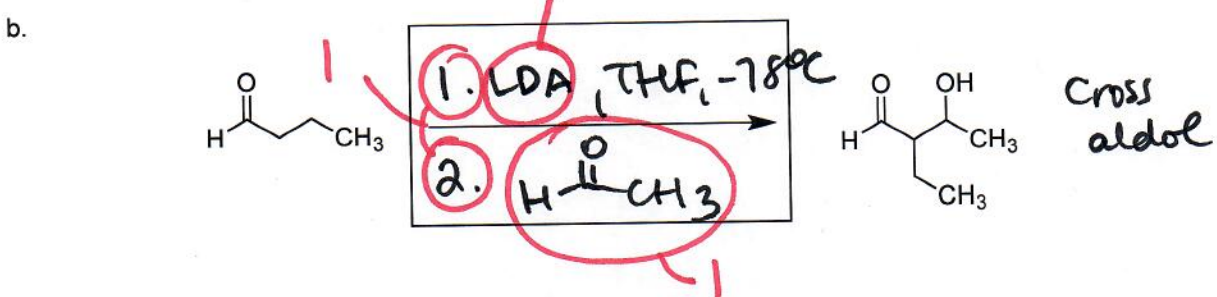
Initials: B+D

3

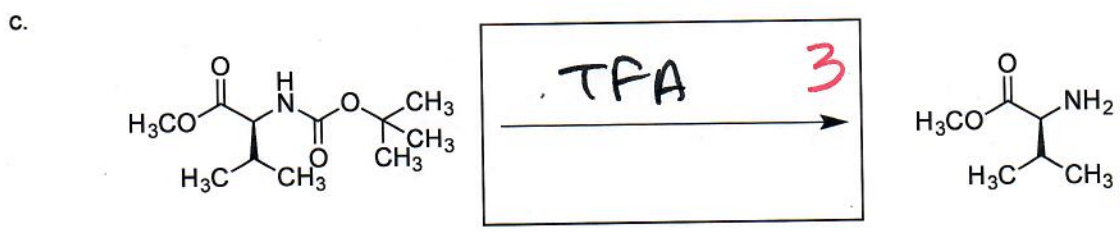


Wrong
Carbon
count = 1

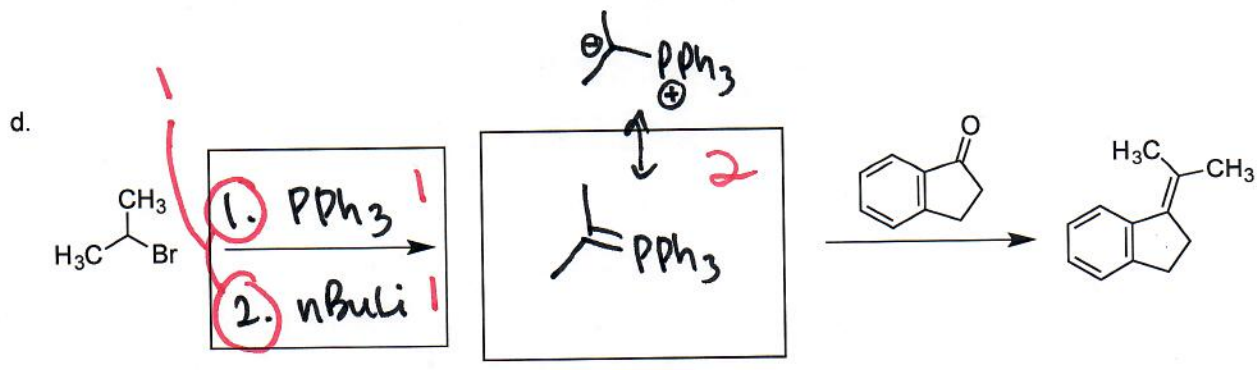
3



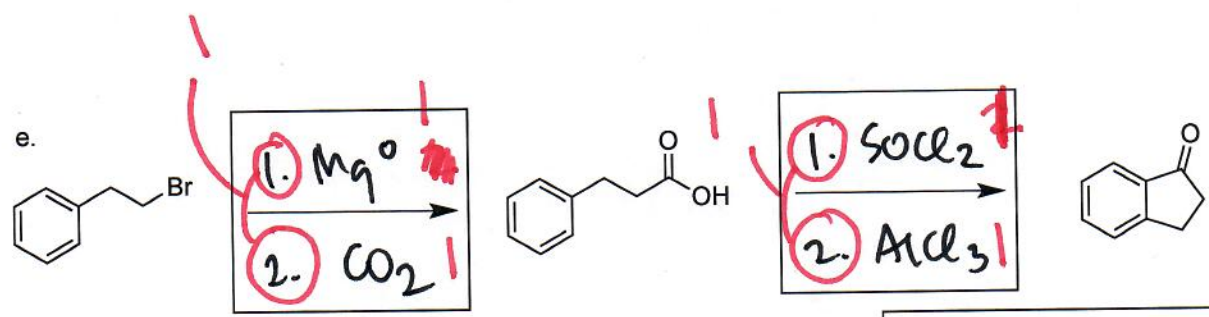
3



5



7



Name of this reaction? Friedel Crafts
acylation

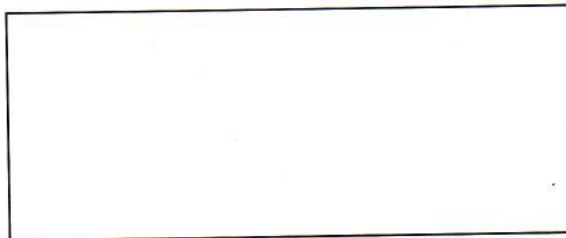
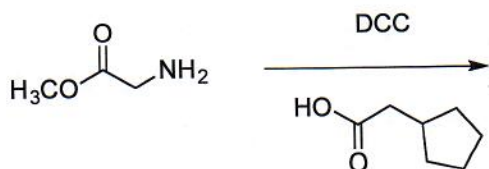
21

Partial / incorrect

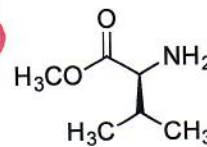
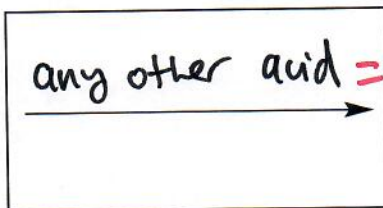
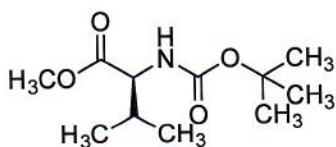
4. Fill in the boxes with the appropriate starting material, reagent or major product (21 points).
Show stereochemistry where appropriate

Initials:

a.

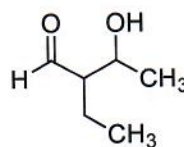
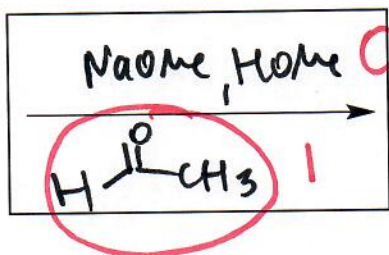
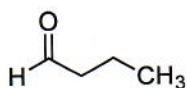


b.



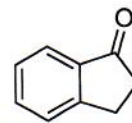
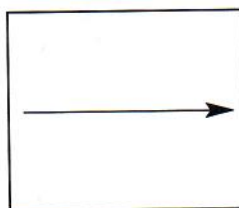
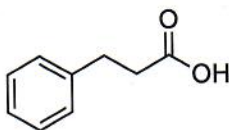
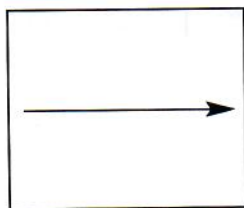
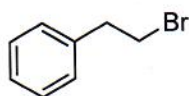
Stepwise with NaOMe, H₂O = 0

c.



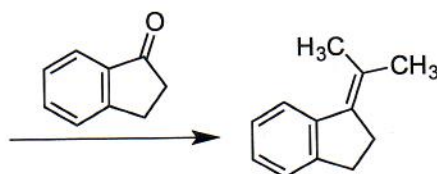
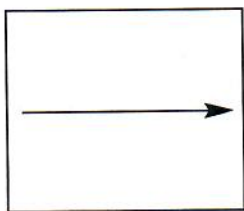
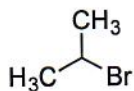
would give mixtures of products

d.



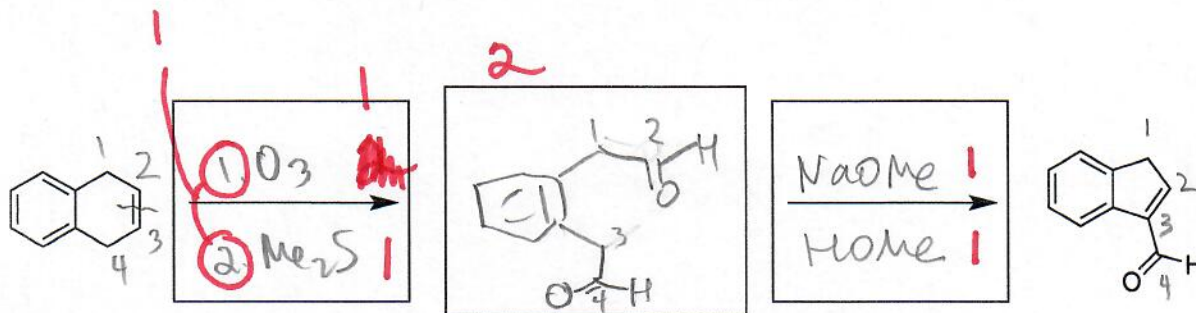
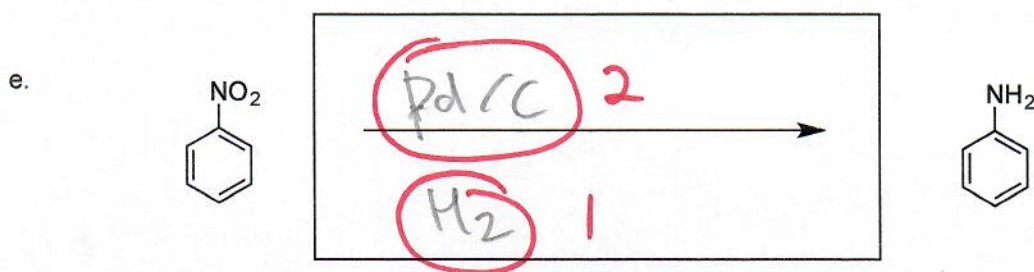
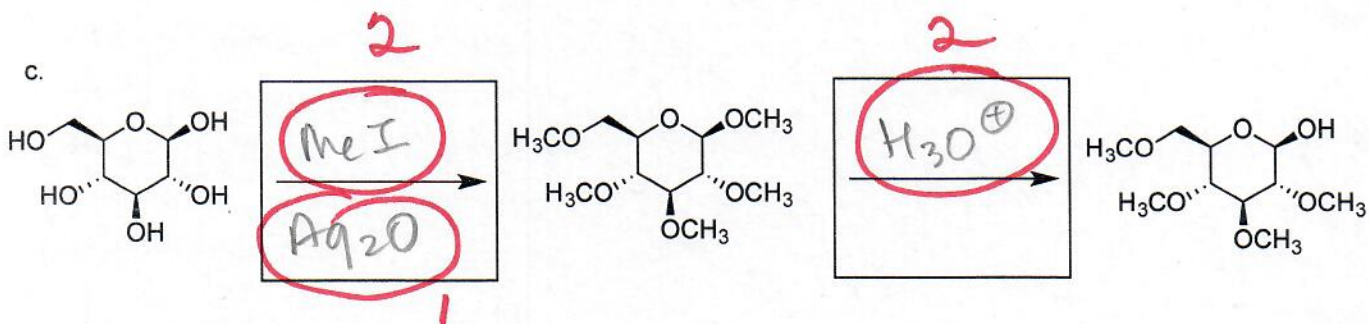
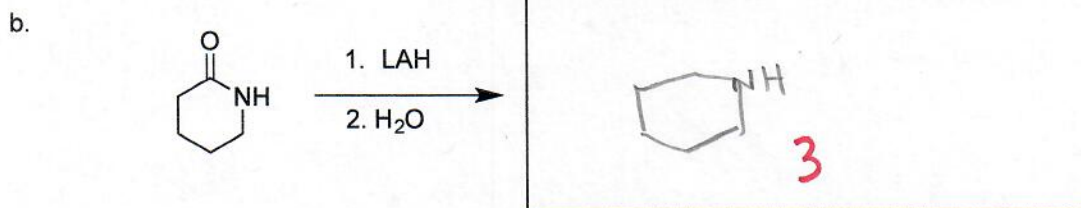
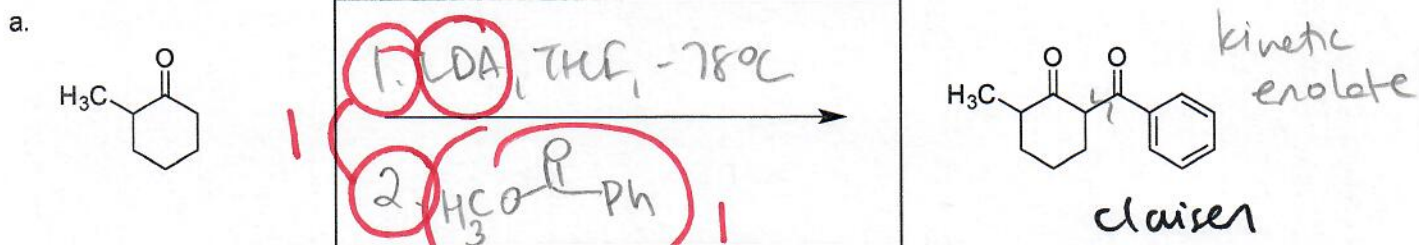
Name of this reaction?

e.



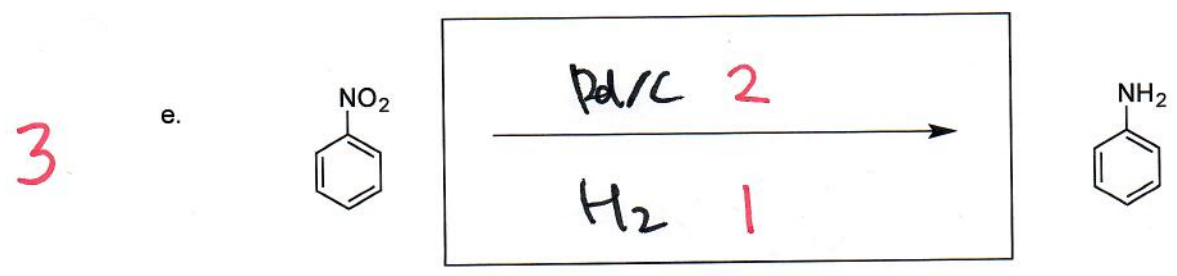
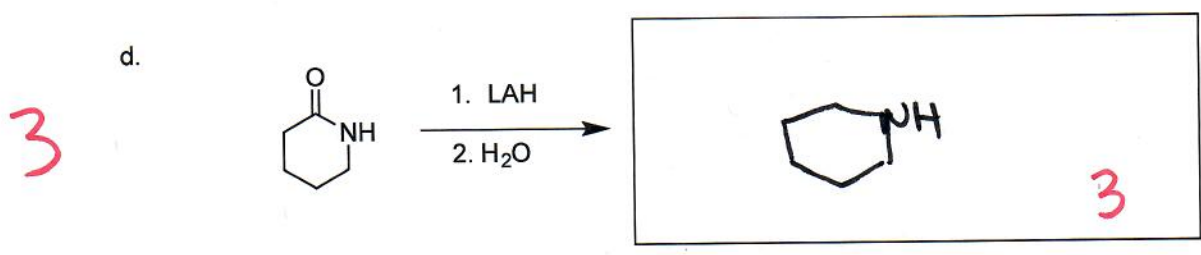
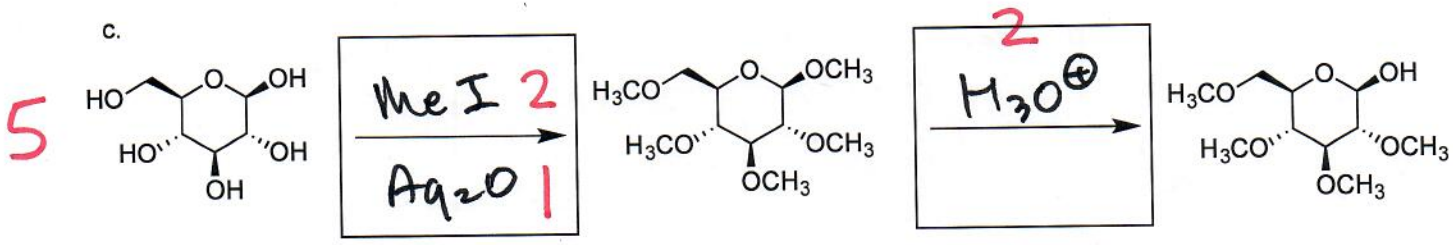
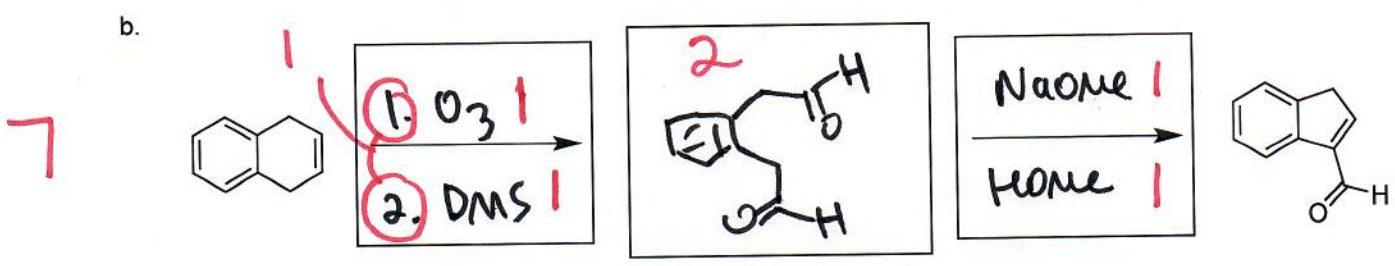
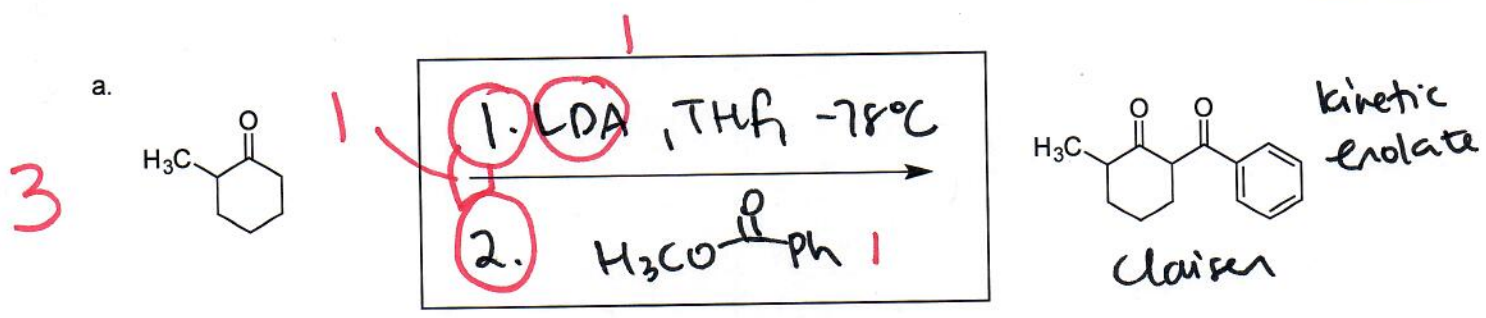
3. Fill in the boxes with the appropriate starting material, reagent or major product (24 points). Show stereochemistry where appropriate

Initials: A+C



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

Initials: B + D



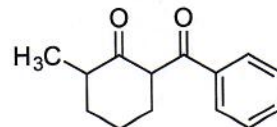
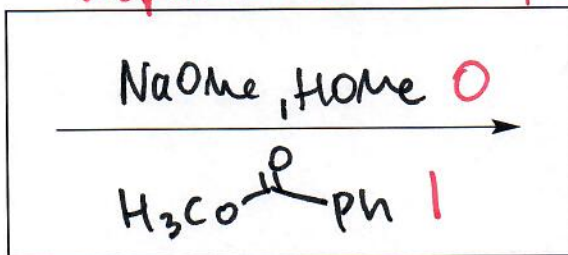
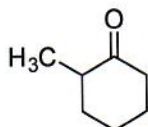
Partial / incorrect

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

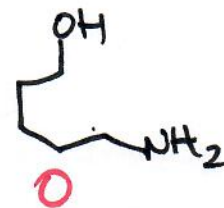
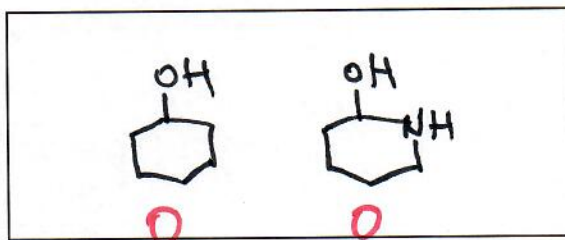
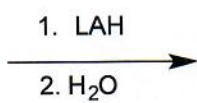
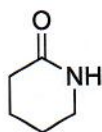
Initials:

stepwise with NaOMe, HOME = 0

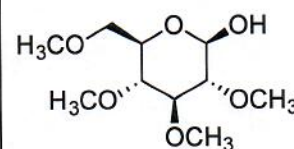
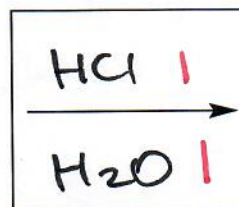
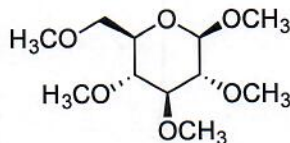
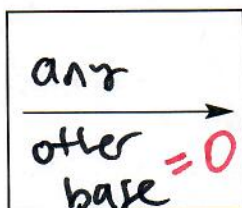
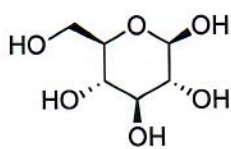
a.



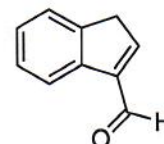
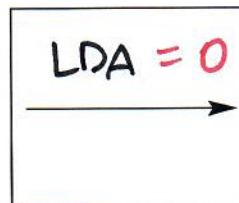
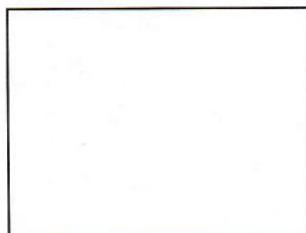
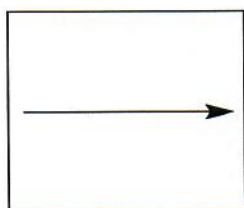
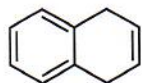
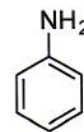
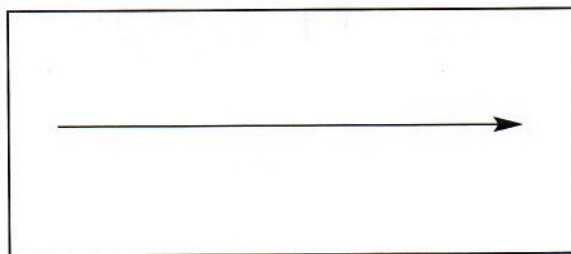
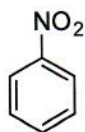
b.



c.



e.

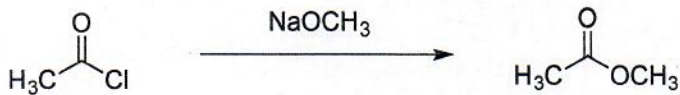


17

5. (14 points) Provide an arrow-pushing mechanism.

Initials: A+C

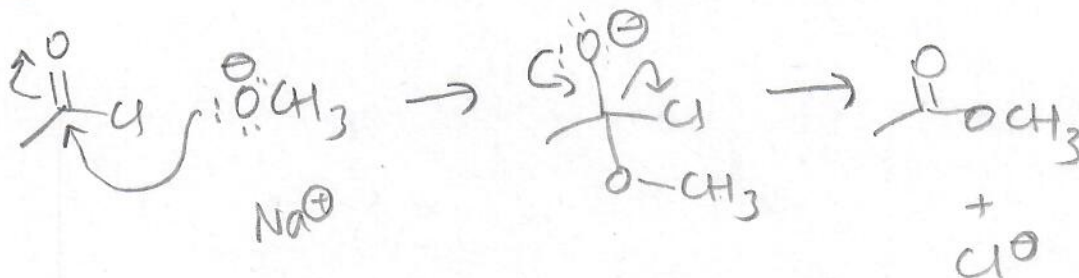
a.



Is this reaction:

- oxidation
 reduction
 neither

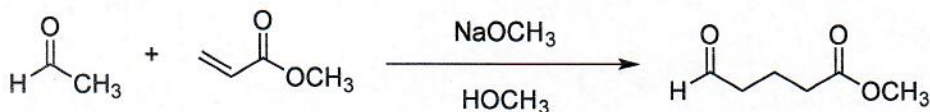
Mechanism:



4 - 1 point per arrow

-0.5 for missing charges, etc

b.

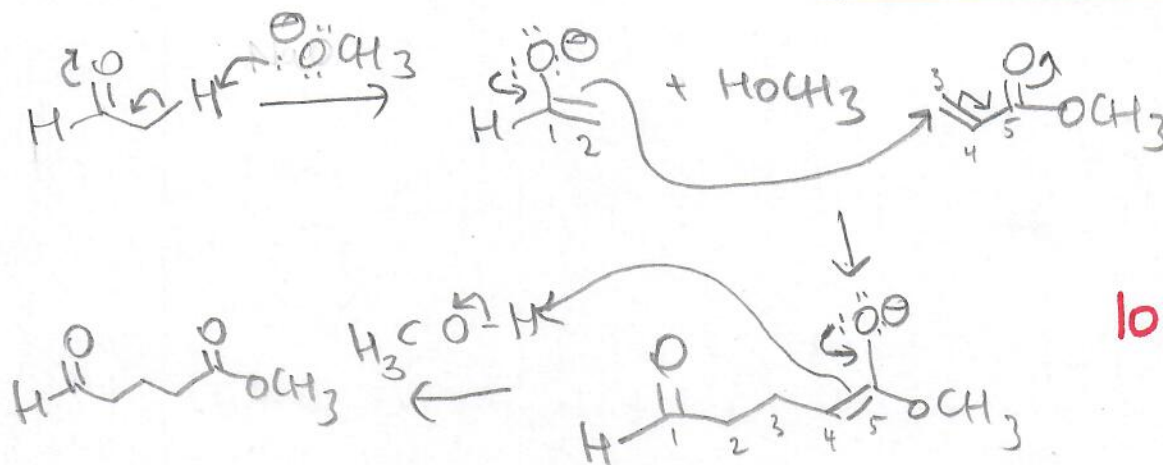


Is this reaction under:

- acidic conditions
 basic conditions
 neither

Mechanism:

Name of this reaction: Michael addition



10 - 1 point per arrow

5

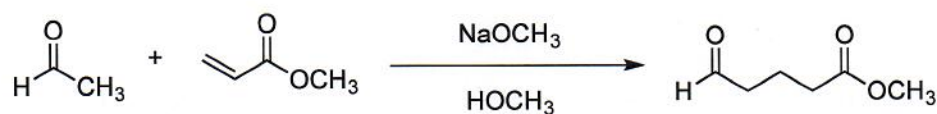
12

17

5. (17 points) Provide an arrow-pushing mechanism.

Initials: B

a.



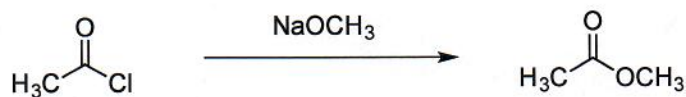
Is this reaction under:

- basic conditions
 acidic conditions
 neither

Mechanism:

Name of this reaction: Michael addition

b.



Is this reaction:

- reduction
 oxidation
 neither

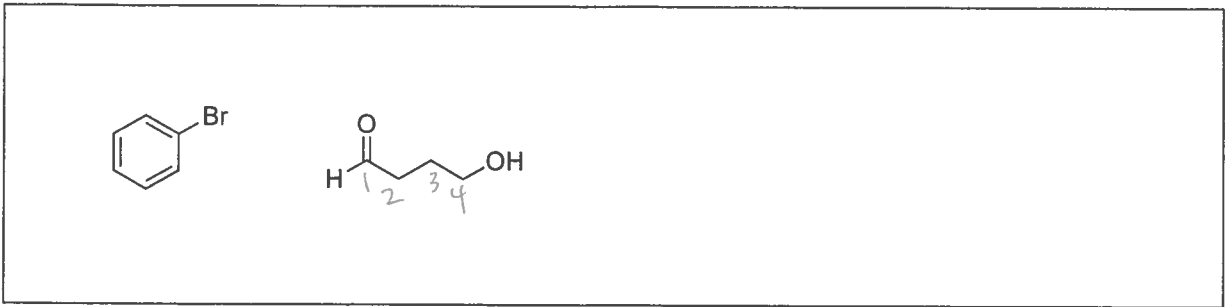
Mechanism:

W5

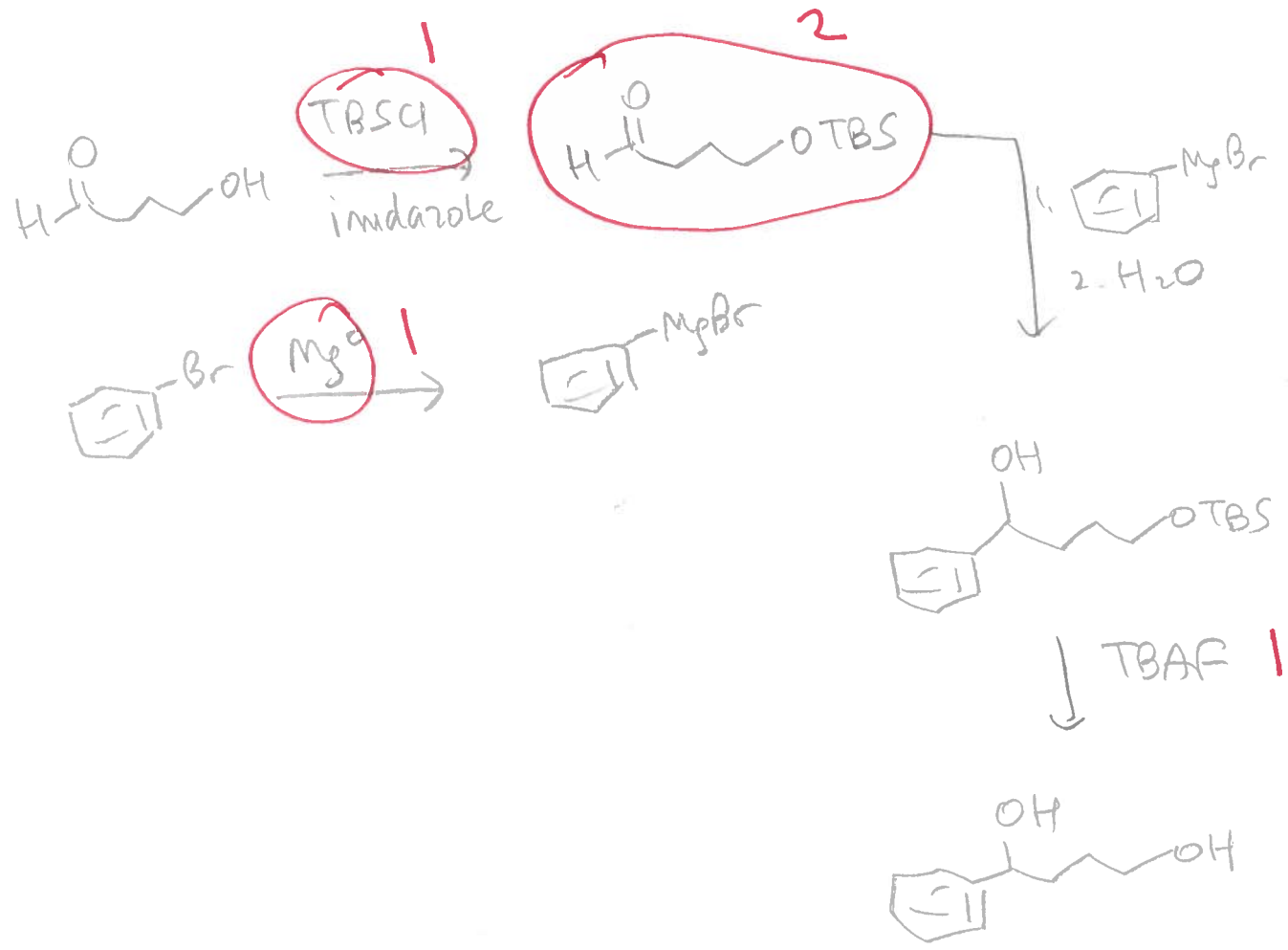
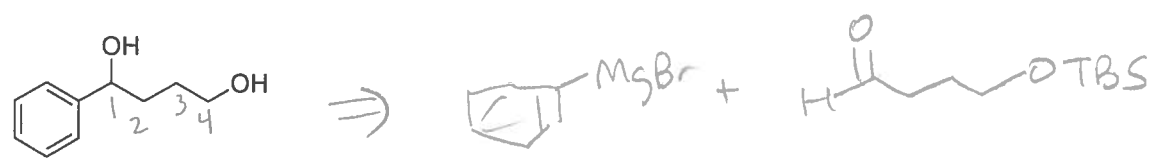
Initials: A

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

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



Target



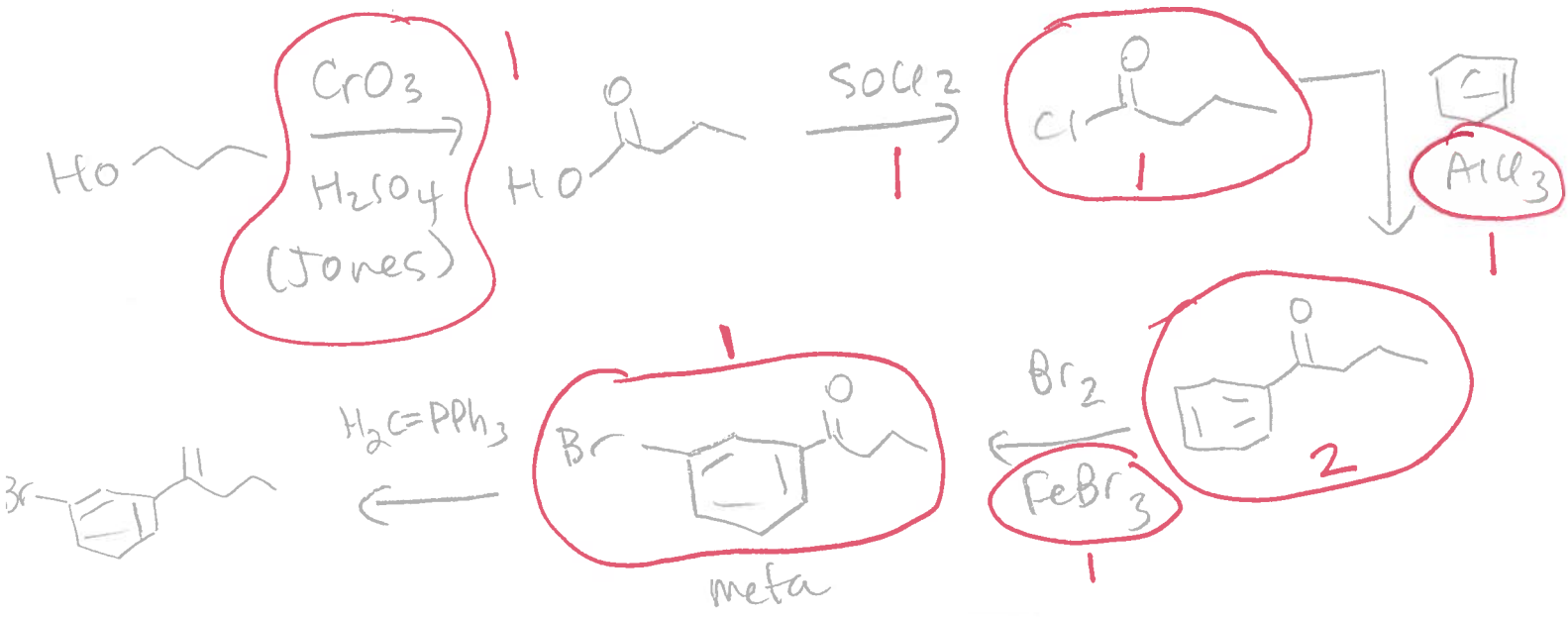
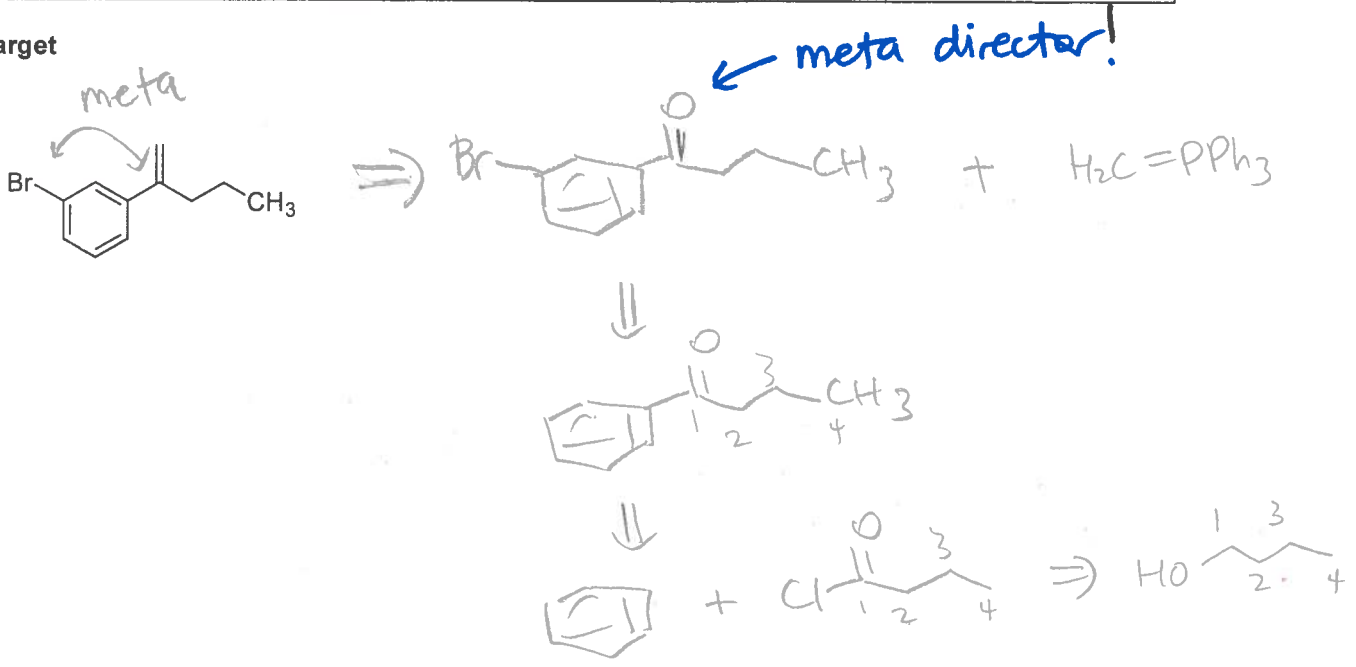
9

Initials: A

7. (6 points) Propose a synthesis of the target below.
 All carbons must come from the starting materials provided, you can use any reagent you wish.
 YOU CAN IGNORE STEREOCHEMISTRY.

Starting Materials:

Target

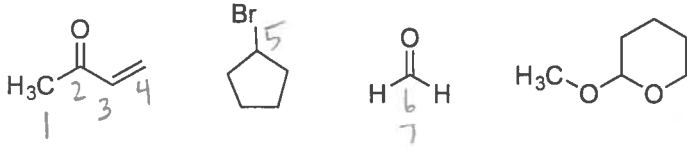


make Wittig reagent: $\text{H}_3\text{C-I} \xrightarrow[2. \text{nBuLi}]{1. \text{PPh}_3} \text{H}_2\text{C=PPh}_3$

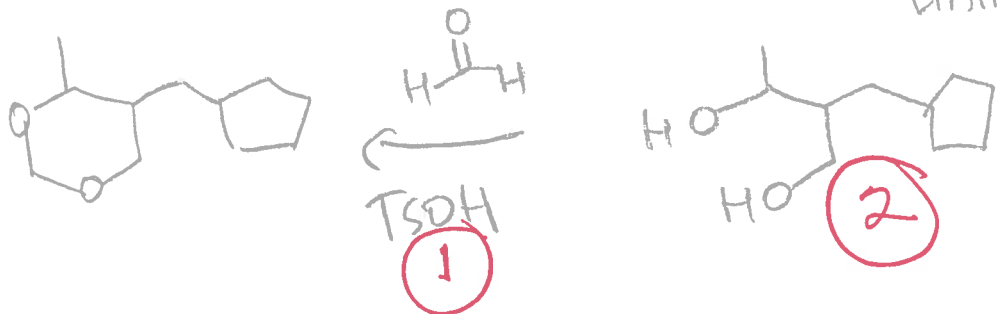
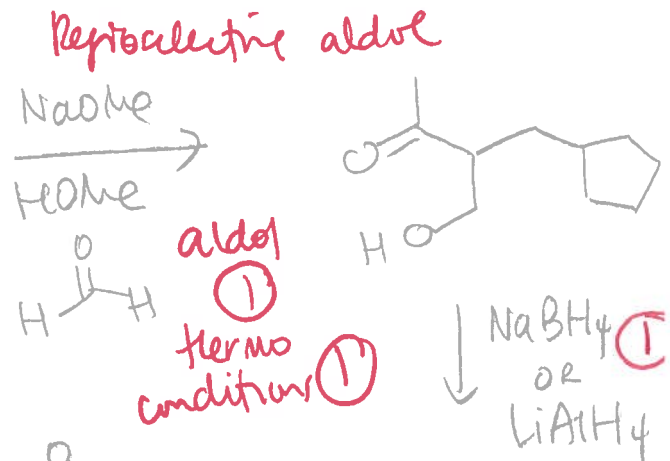
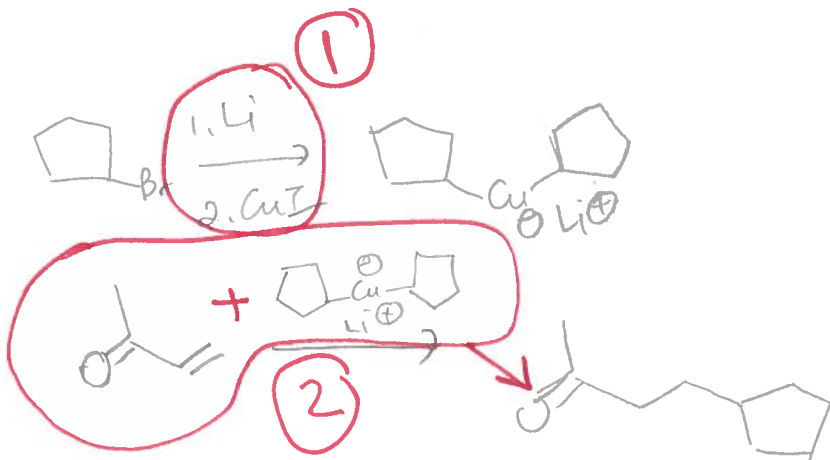
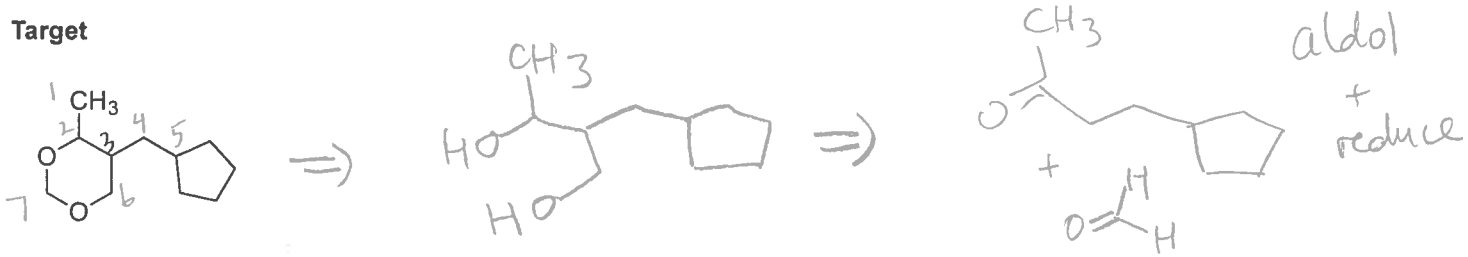
9
 8. (8 points) Propose a synthesis of the target below.
 All carbons must come from the starting materials provided, you can use any reagent you wish.
 YOU CAN IGNORE STEREOCHEMISTRY.

Initials: A

Starting Materials:



Target



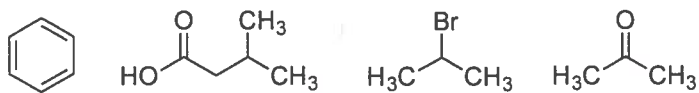
9

Initials: A

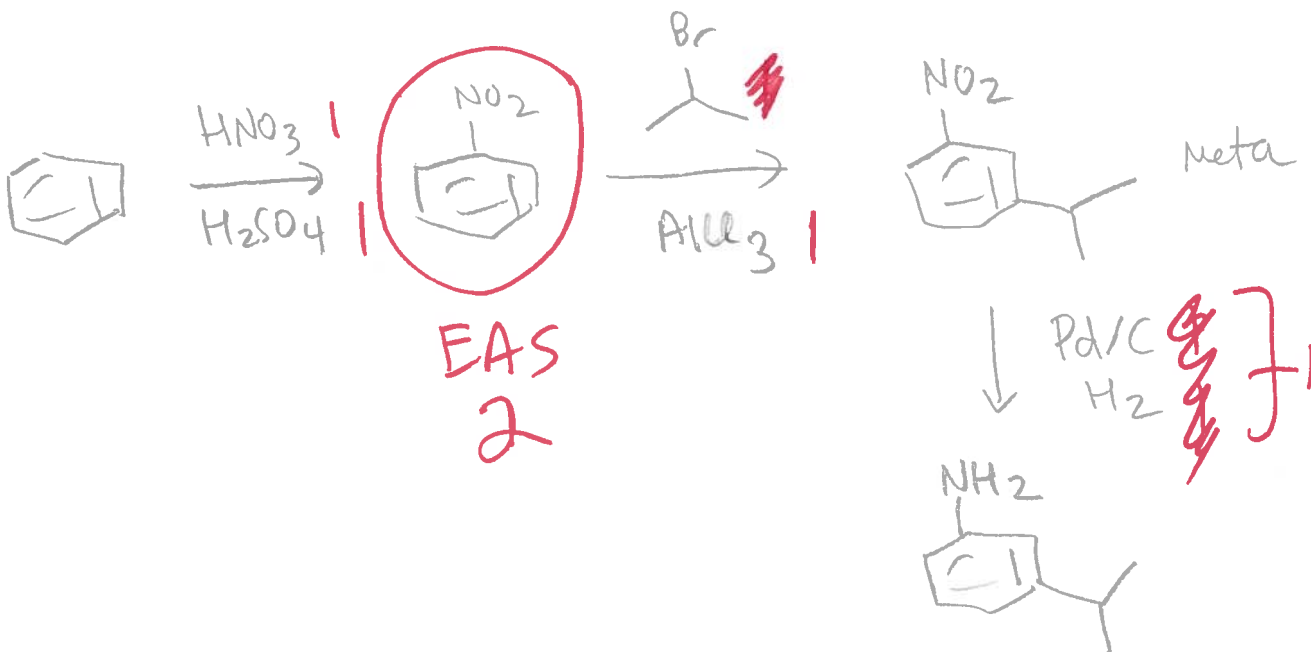
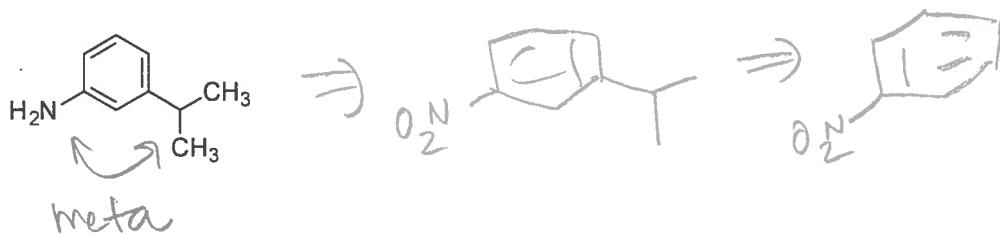
9. (6 points) Propose a synthesis of the target below.

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

Starting Materials:



Target

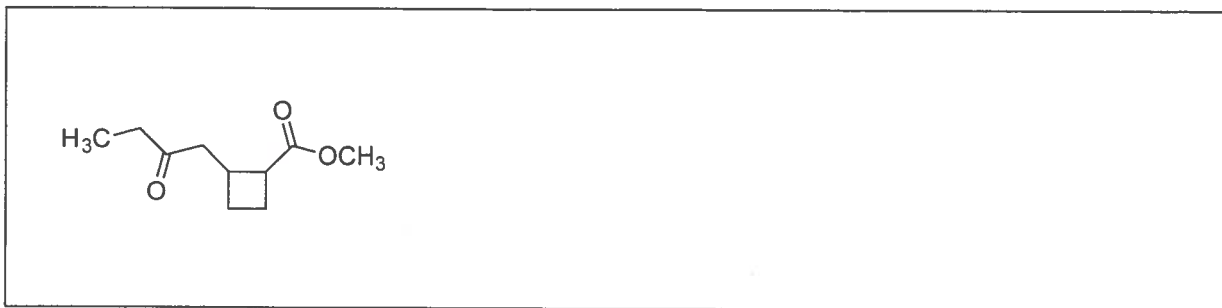


6

Initials: A

10. (6 points) Propose a synthesis of the target below.

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



Target

