

Sign Name Key Print Name _____
 (3 pts name above print & sign, 3 pt scantron name) (100 pts, 11 pages + periodic table + scantron sheet)

Please show work on all questions for partial credit even on questions which do not specify. Please write legibly. If I cannot read your answer, I cannot grade your answer. (use back of exam for scratch paper – If you want me to grade something not in the space for the answer, clearly specify in writing. Telling me during the exam where to find the answer does not qualify because I will just vaguely remember someone telling me something during the exam not which one of 200 students told me what to grade on what page.) **Circle answer on this form for backup to the scantron. There is no partial credit for showing work in the multiple choice.** In all questions on all parts of this exam, R is not equal to hydrogen but is an alkyl. Assume standard workup in all reactions even if workup is not explicitly shown. *Color*

Please READ and FOLLOW directions. This is a **TIMED EXAM**. (ex: don't give me 5 structures if I only ask for one or you will lose points on this exam by **RUNNING OUT OF TIME**)

I. Multiple Choice (3 pts each, 27 pts) Choose the **one** best statement in each question.

1. In IUPAC nomenclature the higher priority functional group name shows up most of the time as a suffix. If something higher priority is in the name, then the functional group name would be written as a prefix.

Choose the best statement.

(a) Aldehyde as a suffix is -al, as a prefix is formyl.

(b) Alcohol as a suffix is -ol, as a prefix is hydroxy.

(c) Ketone as a suffix is -one, as a prefix is oxo.

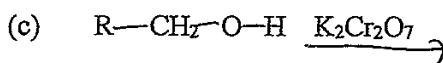
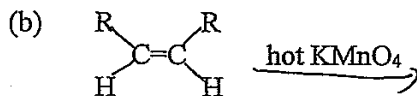
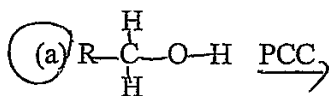
(d) All of the above are correct.

(e) All of the above are incorrect.

NA = not attempted

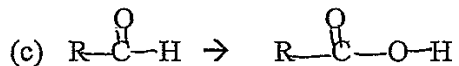
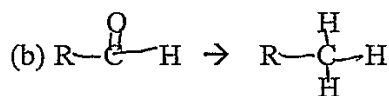
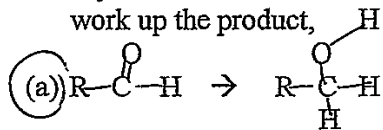
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2. Choose the following reactions which will give aldehyde or ketone products.



(d) All of the above give aldehyde, or ketone products.

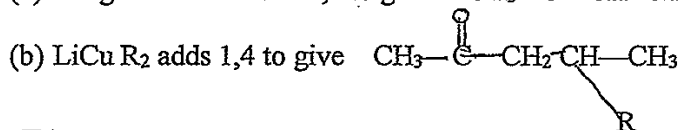
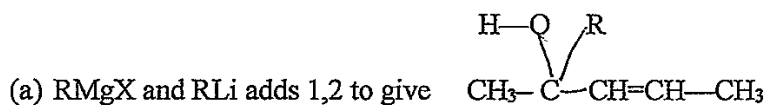
3. If you start with a ketone or aldehyde, and you reduce it using a reducing agent like LiAlH_4 and then work up the product,



(d) (a) and (b) are correct

(e) (a), (b) and (c) are correct.

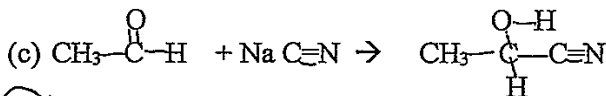
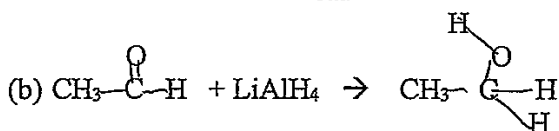
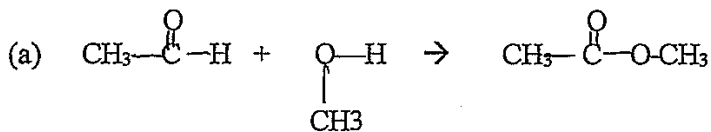
4. To an α, β unsaturated aldehyde or ketone $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}=\text{CH}-\text{CH}_3$



(c) All statements above are true.

(d) All statements above are false.

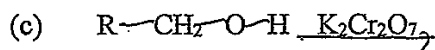
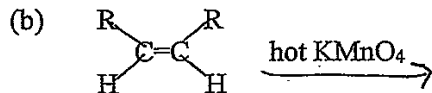
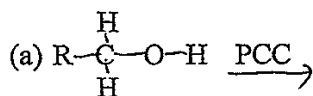
5. By "Nucleophilic Addition" choose the best reaction.



(d) (b) and (c) are correct.

(e) All except (d) are correct.

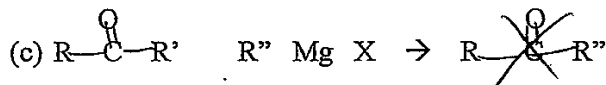
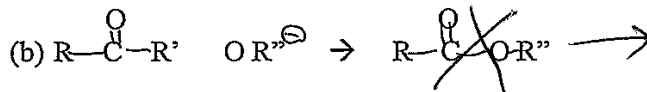
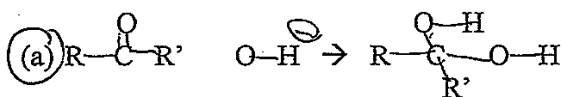
6. Choose the following reactions which will give carboxylic acid products.



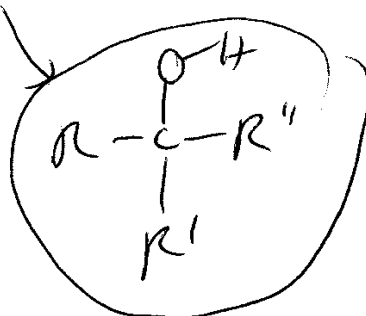
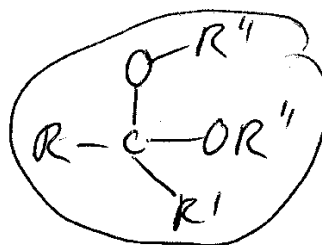
(d) All of the above give carboxylic acid products.

(e) Only (b) and (c) give carboxylic acid products

7. The reaction of $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}'$ with the following results in which of the products shown. Circle the letter of the correct reactions.

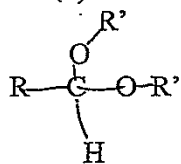


(d) All reactions above are correct.



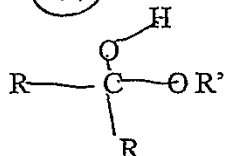
8. Choose the best statement.

(a) The following is a hemiacetal:

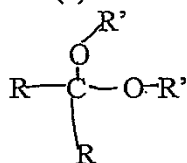


acetal

(b) The following is a hemiketal.



(c) The following is a aetal



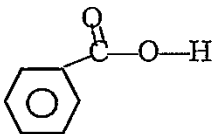
ketal

(d) All statements above are true.

9. Choose the best statement.

(a) $\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{H}$ is formic acid

(b) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ is acetic anhydride

(c)  is benzoic acid

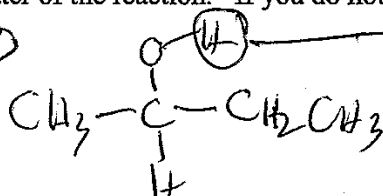
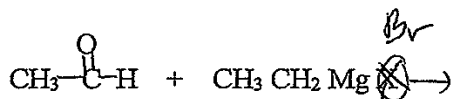
(d) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2\text{CH}_3$ is ethyl acetate

(e) All of the above are correct.

B. Reactions Part of Short Answers: (2 pts per reaction, 16 pts total)

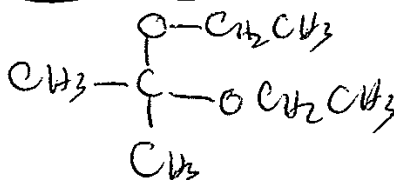
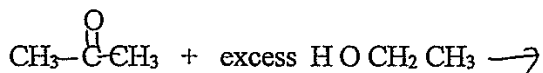
Given the following, what is the the expected organic product? Choose to do 8 of the following reactions you want graded by circling the letter of the reaction. If you do not choose, I will just grade the first SEVEN (3 pts each, 21 pts)

1)

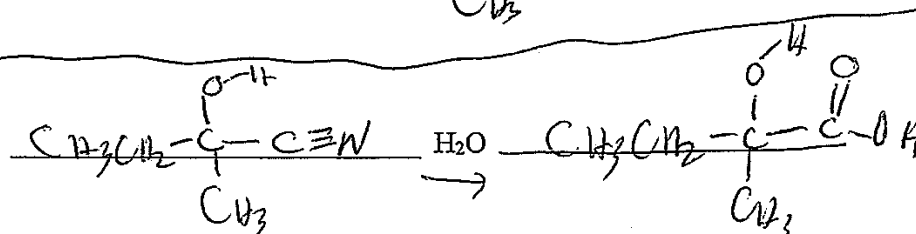
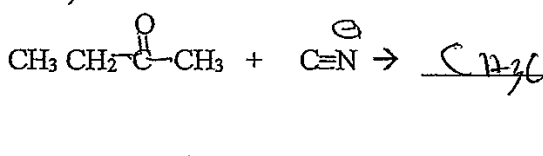


left off H?
OK

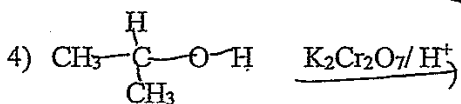
2)



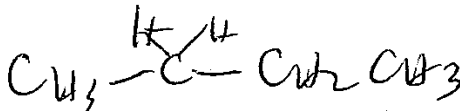
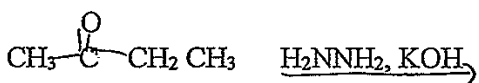
3)



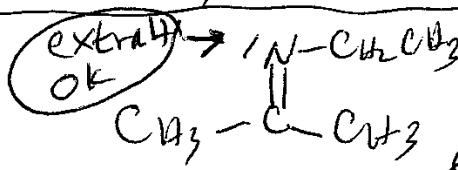
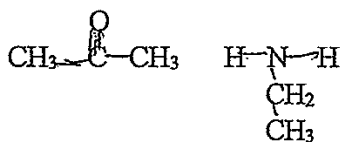
4)



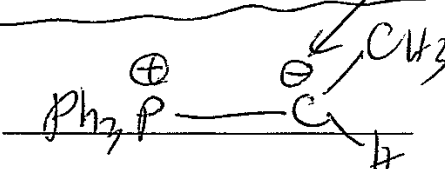
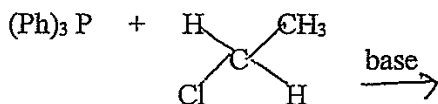
5)



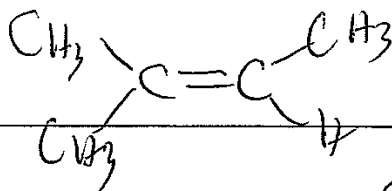
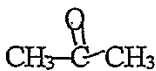
6)



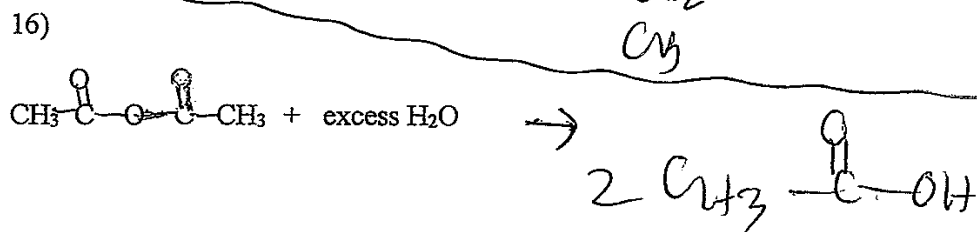
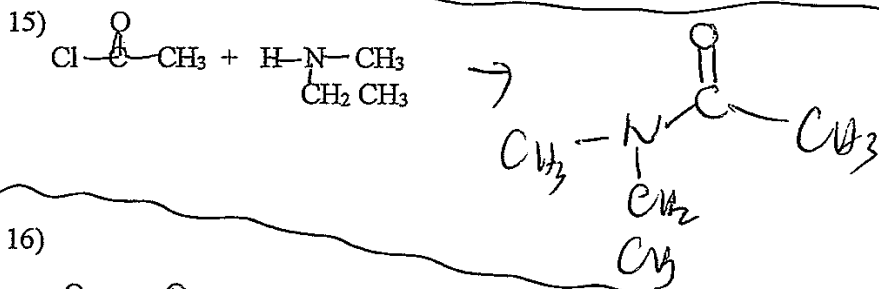
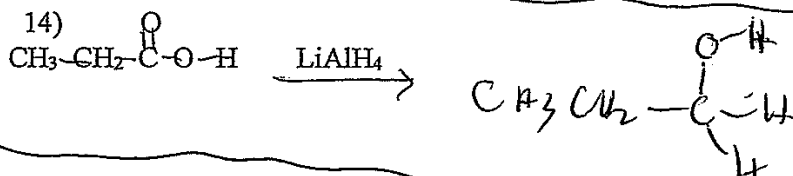
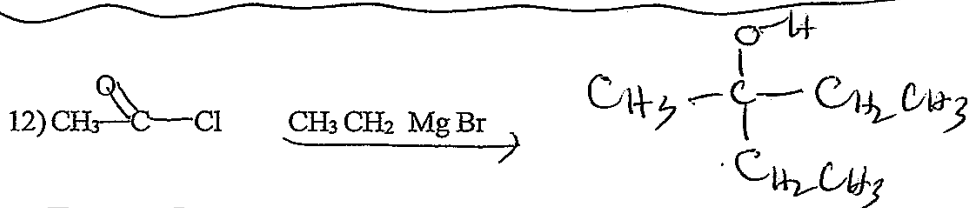
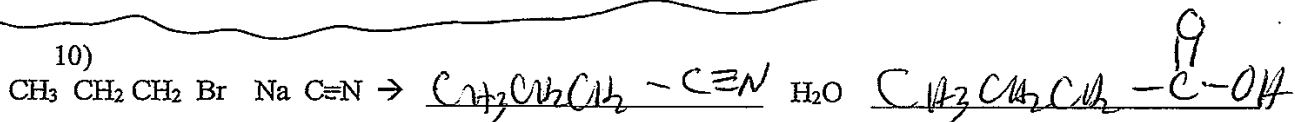
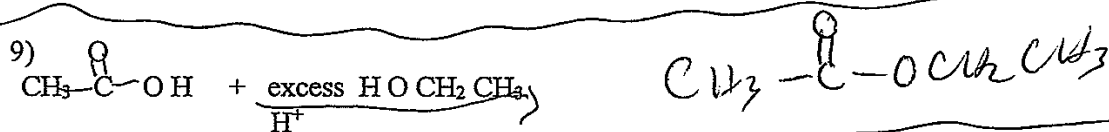
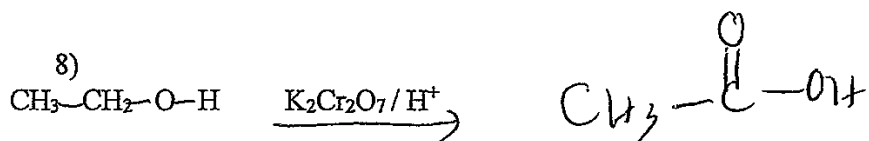
7)



regio, stereo, NFE, TP

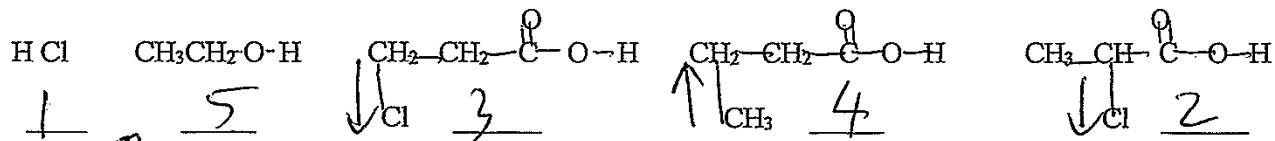


TF = too far
NFE = not far enough



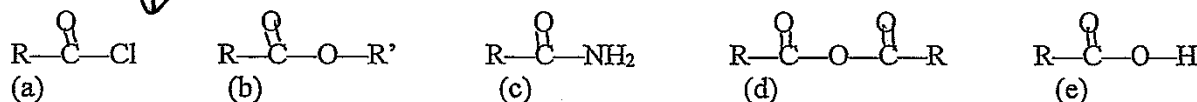
C. Short Answers part of Short Answers: (21 pts)

1. Given the following acids, put in order from (most acidic - # 1) to (least acidic- # 5) (5 pts)



Graded blank by match #

2. (1) Put the following carboxylic acid derivatives in order from most reactive to least reactive by filling the blank between (most reactive) and (least reactive) with the letter for the functional group.

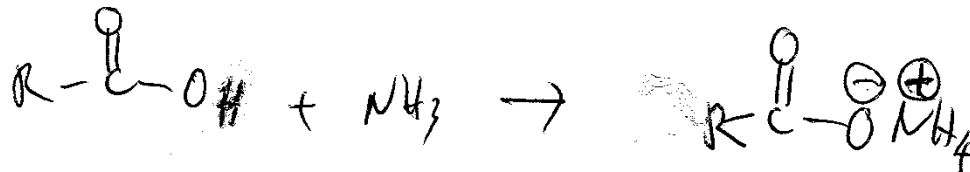
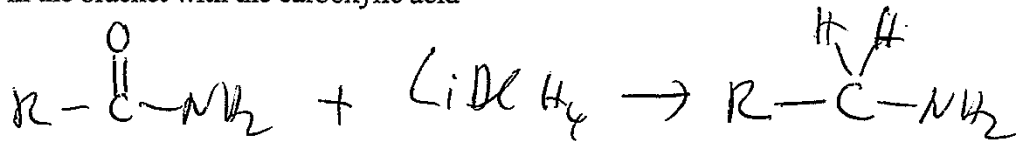


(most reactive) a d e b c (least reactive) (5 pts)

(2) Put the above carboxylic acid derivative in order from worst leaving group to best leaving group

(worst leaving group) c b e d a (best leaving group) (5 pts)

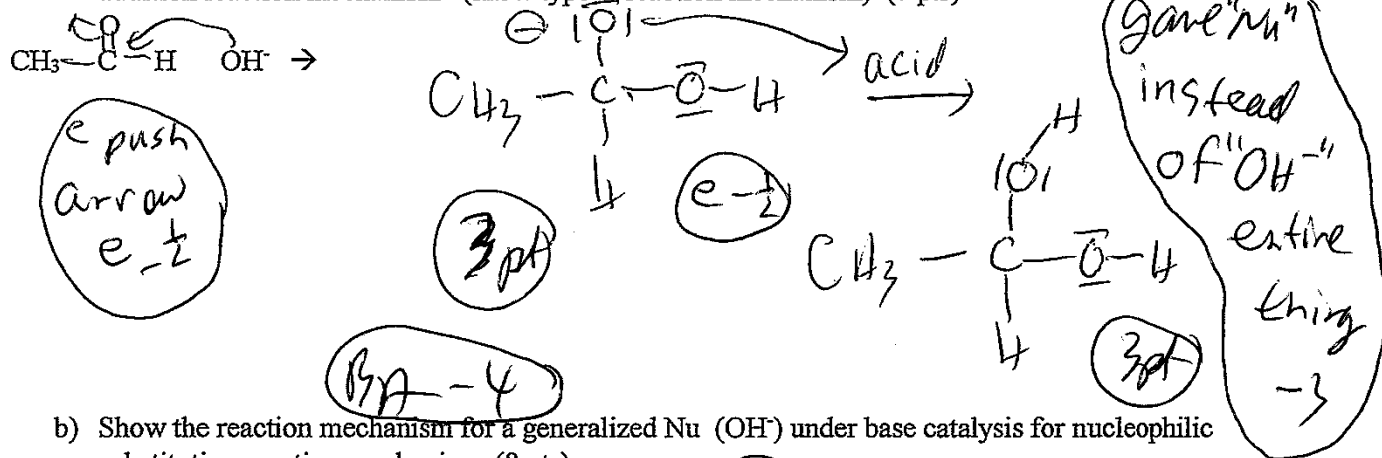
3. Give ONE example of a carboxylic acid derivative which does NOT do the normal carboxylic acid derivative reactions by showing the starting carboxylic acid derivatives using R groups, the reactant and the product that you normally do not get for the other carboxylic acid derivatives. (6 pts)
 (fill in the bracket with the carboxylic acid)



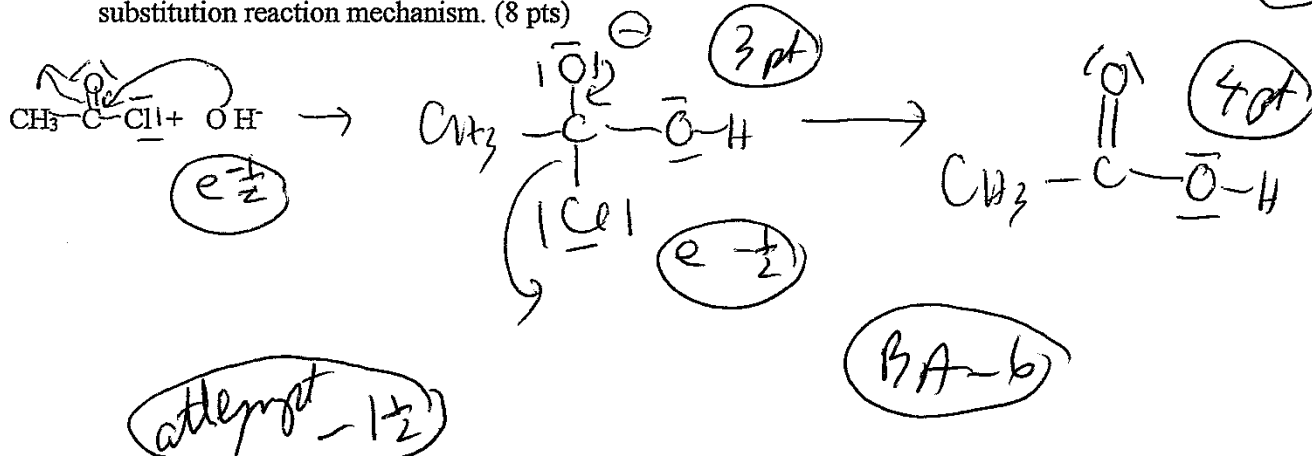
Part III. Long Answers (30 pts) Show work where applicable for full and partial credit.

1. Show the following reaction mechanism. This is a nucleophilic addition and substitution reaction mechanism under base catalysis. (I may not have gone over this specific mechanism but if you think "generalized nucleophilic addition" or "generalized nucleophilic substitution" then you will get it) (18 pts)

a) Show the reaction mechanism for a generalized Nu (OH⁻) under base catalysis for nucleophilic addition reaction mechanism (show type A reaction mechanism) (7 pts)



b) Show the reaction mechanism for a generalized Nu (OH⁻) under base catalysis for nucleophilic substitution reaction mechanism. (8 pts)



c) Explain why almost all reactions of aldehydes and ketones do nucleophilic addition and almost all reactions of carboxylic acids and carboxylic acid derivatives do nucleophilic substitution. You should mention something about "good leaving group". (3 pts)

ketone/aldehyde have bad leaving groups
 carboxylic acid + derivatives have good leaving groups so ketone + aldehyde do "Nu" addition while carboxylic acid + derivatives do "Nu" substitution.

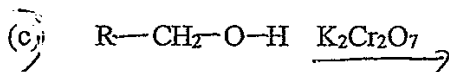
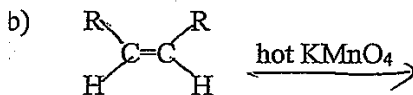
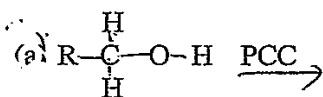
Sign Name Key Print Name _____
 (3 pts name above print & sign, 3 pt scantron name) (100 pts, 10 pages + periodic table + scantron sheet)

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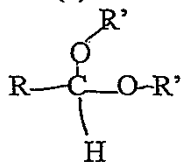
(e) Only (b) and (c) give carboxylic acid products

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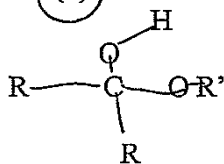
2. Choose the best statement.

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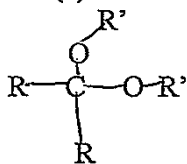


acetal

(b) The following is a hemiketal.



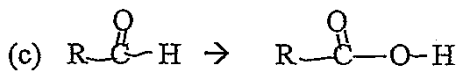
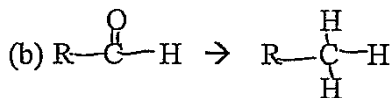
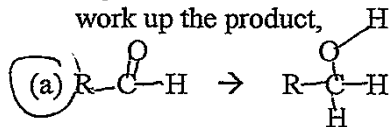
(c) The following is a acetal



ketal

(d) All statements above are true.

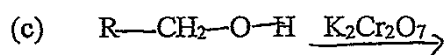
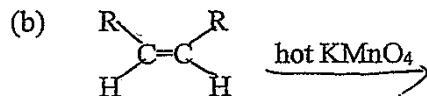
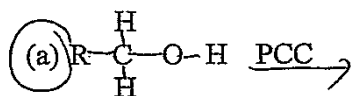
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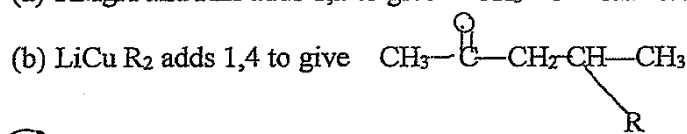
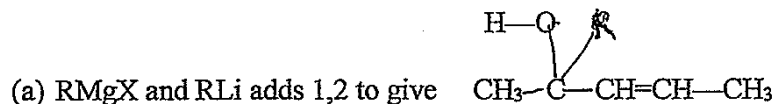
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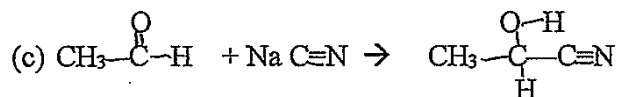
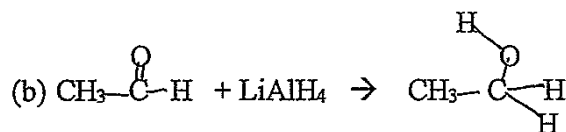
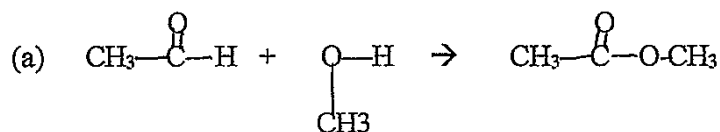
5. To an α, β unsaturated aldehyde or ketone $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}=\text{CH}-\text{CH}_3$



(c) All statements above are true.

(d) All statements above are false.

6. By "Nucleophilic Addition" choose the best reaction.



(d) (b) and (c) are correct.

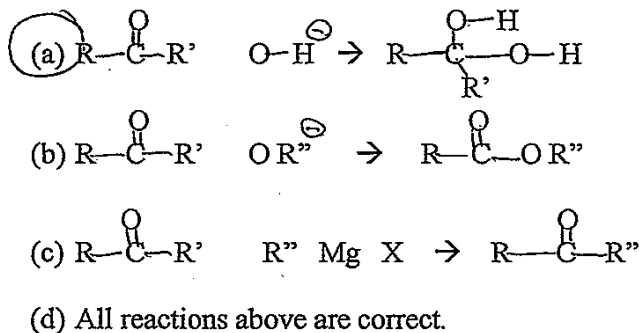
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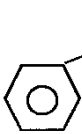
Choose the best statement.

- (a) Aldehyde as a suffix is -al, as a prefix is formyl.
 (b) Alcohol as a suffix is -ol, as a prefix is hydroxy.
 (c) Ketone as a suffix is -one, as a prefix is oxo.
 (d) All of the above are correct.
 (e) All of the above are incorrect.

8. The reaction of $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}'$ with the following results in which of the products shown. Circle the letter of the correct reactions.



9. Choose the best statement.

- (a) $\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{H}$ is formic acid
- (b) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ is acetic anhydride
- (c)  is benzoic acid
- (d) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2\text{CH}_3$ is ethyl acetate
- (e) All of the above are correct.

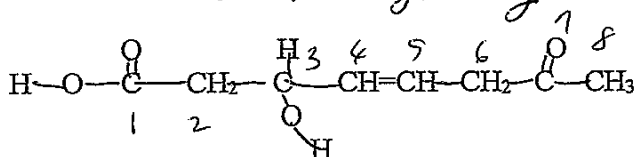
II. Short Answers (43 pts)

A. Nomenclature: (2 pts each, 6 pts)

BA - 1/2
- 1/2 each
Wrong thing

1. Given the structural formula shown below, give the IUPAC name of the molecule.

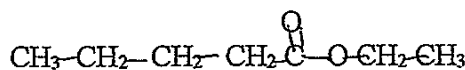
a. name 3-hydroxy-7-oxo-oct-4-enoic acid



4 → en-oic acid
~~oct-4-enoic acid~~

hydroxy 3 oxo 7

b. name ethyl pentanoate



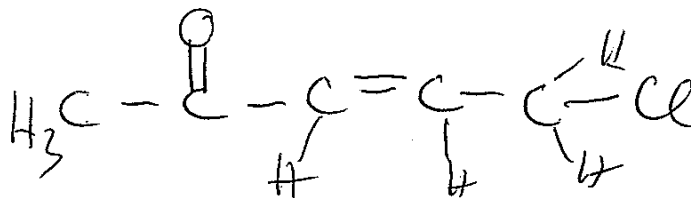
pentanoate

ethyl

2. Given the following IUPAC name, draw a structural formula of the molecule (skeletal formula acceptable, condensed structure, Lewis Dot structure acceptable, molecular formula not acceptable - don't forget to show the hydrogens in your formula unless you are using the skeletal structure.)

5-chloroPent-3-en-2-one

does not give E/Z so either ok

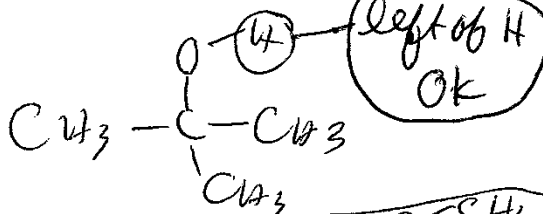
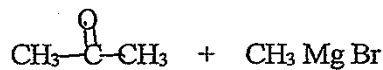


left off important H - 1/2

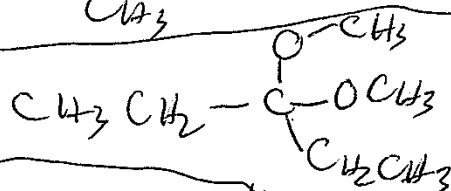
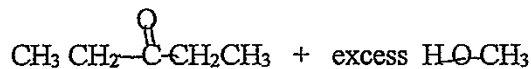
B. Reactions Part of Short Answers: ~~(2 pts per reaction, 16 pts total)~~

Given the following, what is the the expected organic product? Choose to do 8 of the following reactions you want graded by circling the letter of the reaction. If you do not choose, I will just grade the first **SEVEN** (3 pts each, 21 pts)

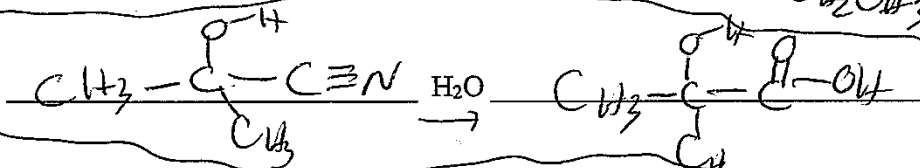
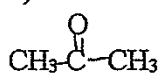
1)



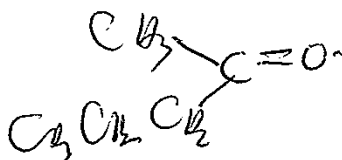
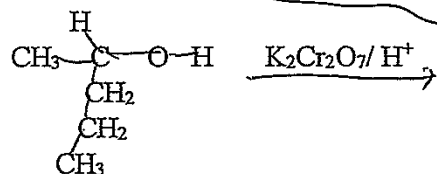
2)



3)

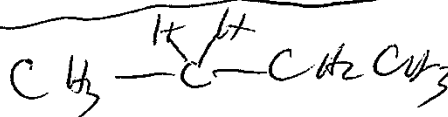
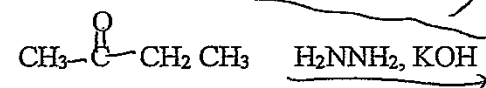


4)

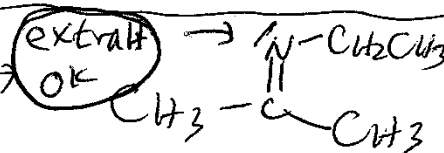
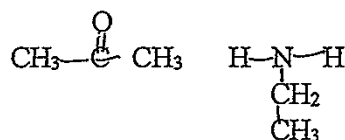


NFE = not far enough
TF = too far

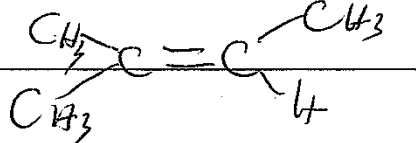
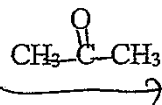
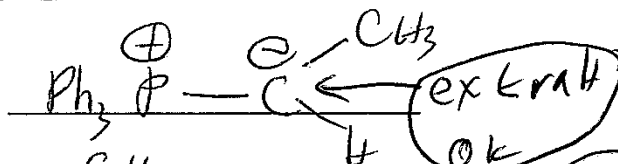
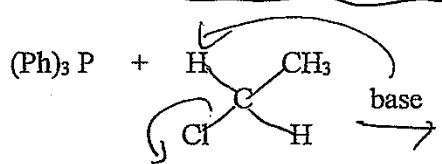
5)



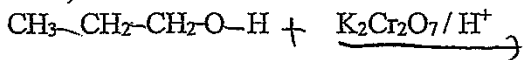
6)



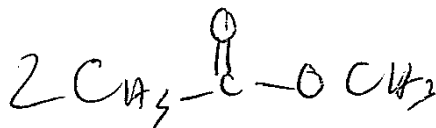
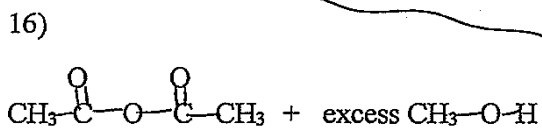
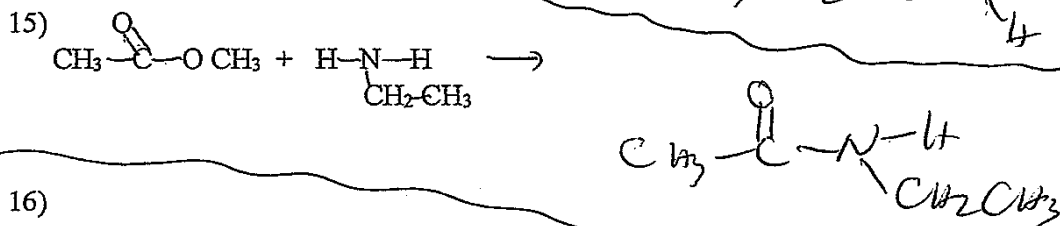
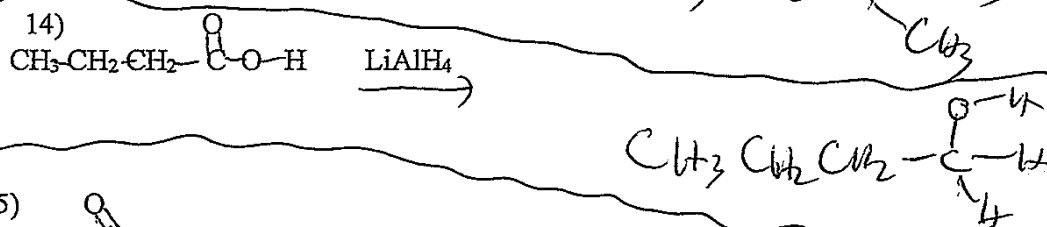
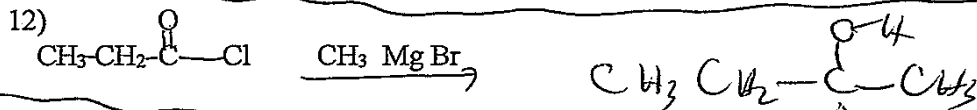
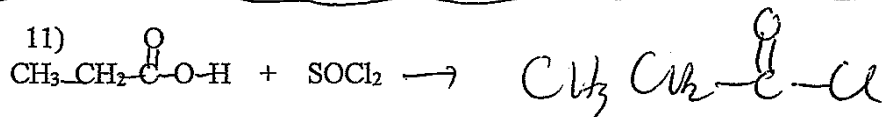
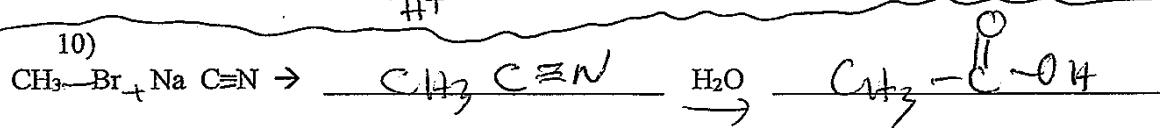
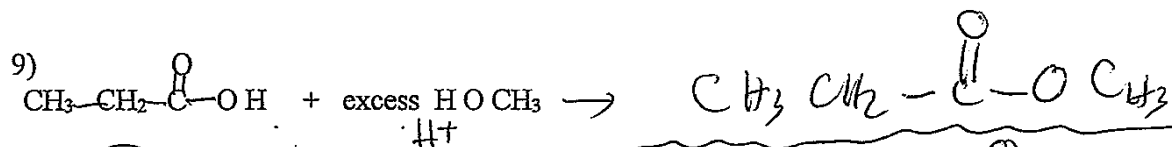
7)



8)

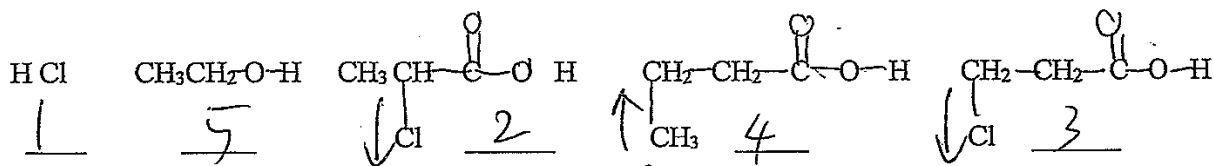


regio
stereo
NFE, TF
-1 1/2

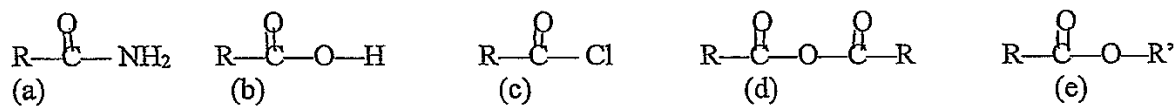


C. Short Answers part of Short Answers: (21 pts)

1. Given the following acids, put in order from (most acidic - # 1) to (least acidic - # 5) (5 pts)



2. (1) Put the following carboxylic acid derivatives in order from most reactive to least reactive by filling the blank between (most reactive) and (least reactive) with the letter for the functional group.

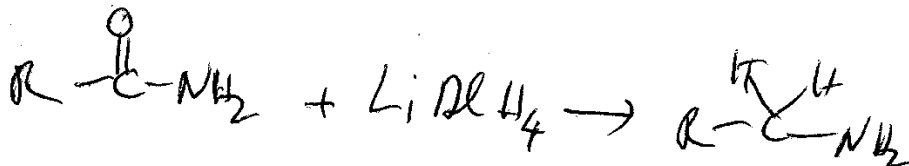
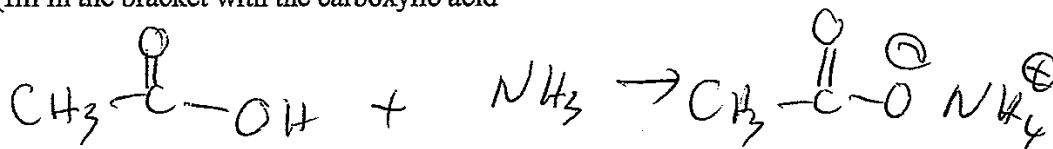


(most reactive) c d b e a (least reactive) (5 pts)

- (2) Put the above carboxylic acid derivative in order from worst leaving group to best leaving group

(worst leaving group) a e b d c (best leaving group) (5 pts)

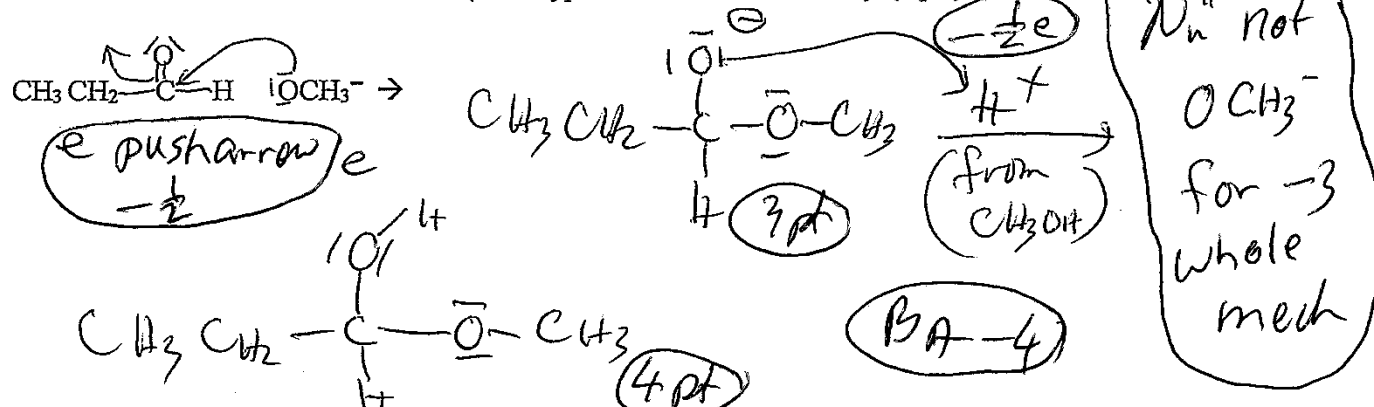
3. Give ONE example of a carboxylic acid derivative which does NOT do the normal carboxylic acid derivative reactions by showing the starting carboxylic acid derivatives using R groups, the reactant and the product that you normally do not get for the other carboxylic acid derivatives. (6 pts)
 (fill in the bracket with the carboxylic acid)



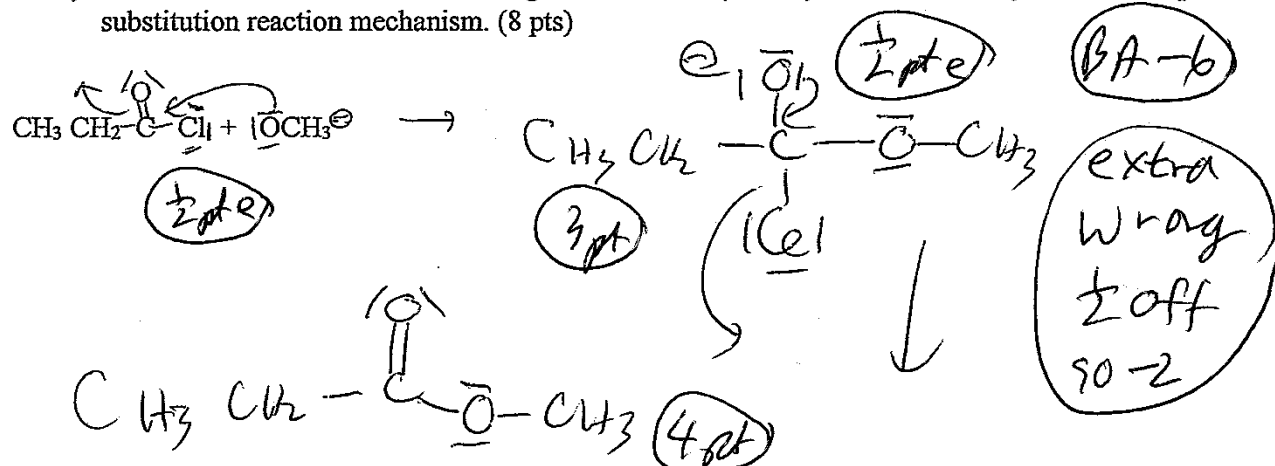
Part III. Long Answers (30 pts) Show work where applicable for full and partial credit.

1. Show the following reaction mechanism. This is a nucleophilic addition and substitution reaction mechanism under base catalysis. (I may not have gone over this specific mechanism but if you think "generalized nucleophilic addition" or "generalized nucleophilic substitution" then you will get it) (18 pts)

- a) Show the reaction mechanism for a generalized Nu (OCH_3^-) under base catalysis for nucleophilic addition reaction mechanism (show type A reaction mechanism) (7 pts)



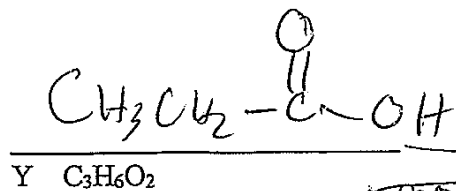
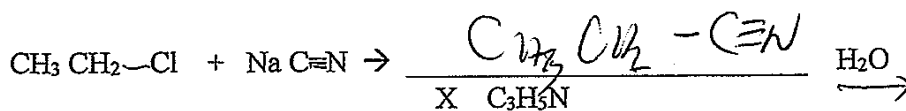
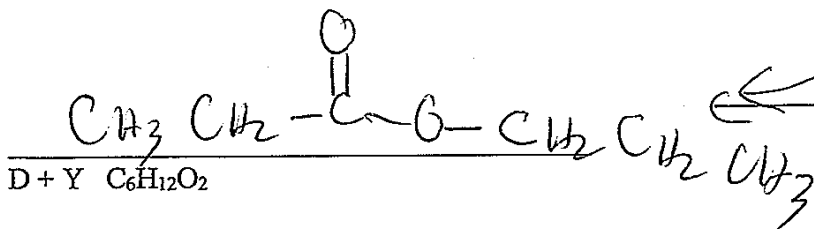
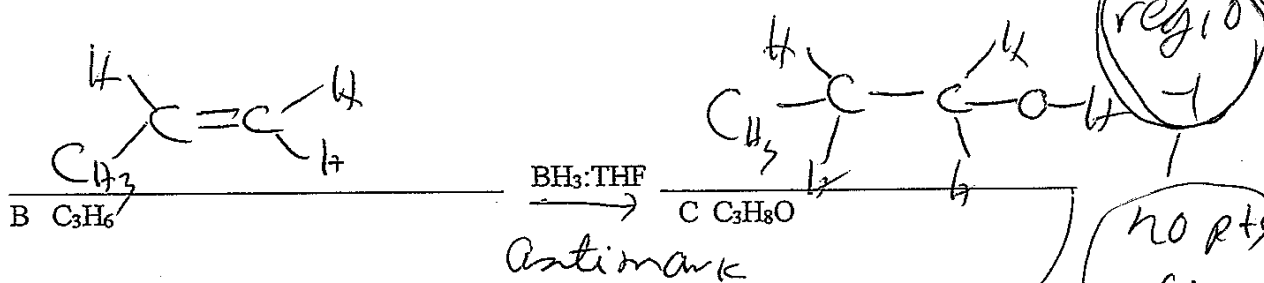
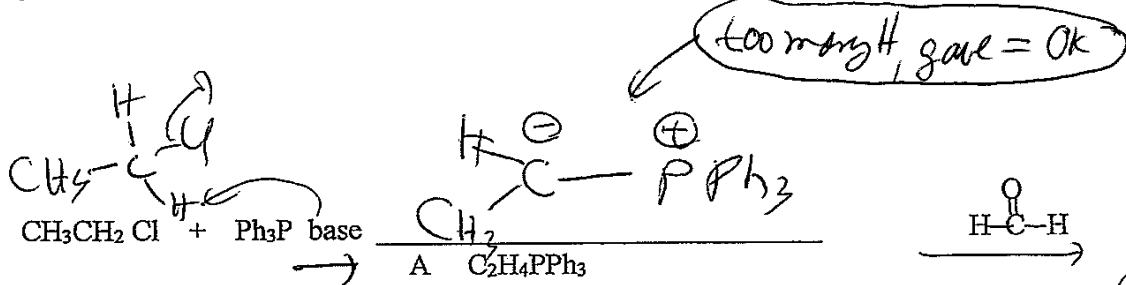
- b) Show the reaction mechanism for a generalized Nu (OCH_3^-) under base catalysis for nucleophilic substitution reaction mechanism. (8 pts)



- c) Explain why almost all reactions of aldehydes and ketones do nucleophilic addition and almost all reactions of carboxylic acids and carboxylic acid derivatives do nucleophilic substitution. You should mention something about "good leaving group". (3 pts)

ketone/aldehyde have really bad leaving group alkyl or H. All carboxylic acid derivatives have good leaving groups. So ketone/aldehyde do "Nu" addn.

2 Complete the following synthesis by filling in the blank. I have provided some hints to help you come up with the answers. NOTE: The way I grade this is for you to fill in reasonable molecules based on the immediate prior molecule. i.e. If you fill in part A with the wrong molecule and then do the next reaction to molecule B correctly you will get half credit for answering B correctly. If you fill in B with what you would have gotten if you got A correctly but which cannot possibly be generated from your wrong A, you will lose all credit even if it matches what you should have gotten for B. (2 pts each, 12 pts total)



Y C₃H₆O₂

wrong prior step 1
but correct current step - does it match
blank

Sign Name _____ Print Name _____
 (3 pts name above print & sign, 3 pt scantron name) (100 pts, 11 pages + periodic table + scantron sheet)

Please show work on all questions for partial credit even on questions which do not specify. Please write legibly. If I cannot read your answer, I cannot grade your answer. (use back of exam for scratch paper – If you want me to grade something not in the space for the answer, clearly specify in writing. Telling me during the exam where to find the answer does not qualify because I will just vaguely remember someone telling me something during the exam not which one of 200 students told me what to grade on what page.) **Circle answer on this form for backup to the scantron. There is no partial credit for showing work in the multiple choice.** In all questions on all parts of this exam, R is not equal to hydrogen but is an alkyl. Assume standard workup in all reactions even if workup is not explicitly shown. *color*

Please READ and FOLLOW directions. This is a **TIMED EXAM**. (ex: don't give me 5 structures if I only ask for one or you will lose points on this exam by **RUNNING OUT OF TIME**)

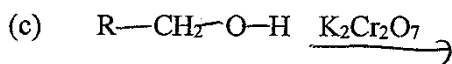
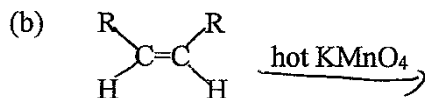
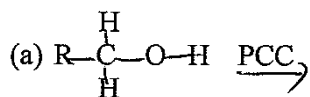
I. Multiple Choice (3 pts each, 27 pts) Choose the **one** best statement in each question.

1. In IUPAC nomenclature the higher priority functional group name shows up most of the time as a suffix. If something higher priority is in the name, then the functional group name would be written as a prefix.

Choose the best statement.

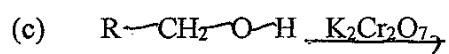
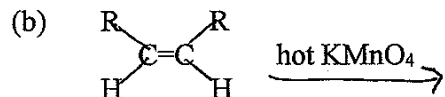
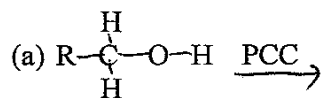
- (a) Aldehyde as a suffix is –al, as a prefix is formyl.
- (b) Alcohol as a suffix is –ol, as a prefix is hydroxy
- (c) Ketone as a suffix is –one, as a prefix is oxo.
- (d) All of the above are correct.
- (e) All of the above are incorrect.

2. Choose the following reactions which will give aldehyde or ketone products.



(d) All of the above give aldehyde, or ketone products.

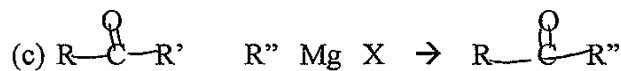
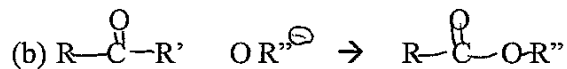
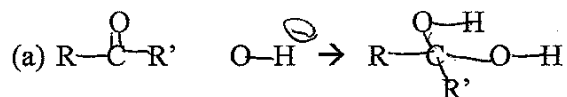
6. Choose the following reactions which will give carboxylic acid products.



(d) All of the above give carboxylic acid products.

(e) Only (b) and (c) give carboxylic acid products

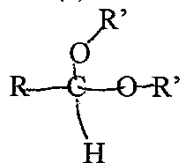
7. The reaction of $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}'$ with the following results in which of the products shown. Circle the letter of the correct reactions.



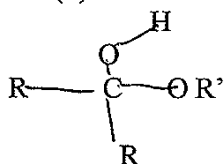
(d) All reactions above are correct.

8. Choose the best statement.

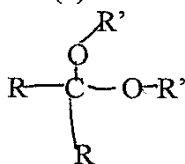
(a) The following is a hemiacetal:



(b) The following is a hemiketal.



(c) The following is an acetal

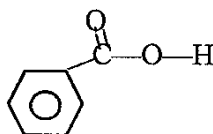


(d) All statements above are true.

9. Choose the best statement.

(a) $\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{H}$ is formic acid

(b) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ is acetic anhydride

(c)  is benzoic acid

(d) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2\text{CH}_3$ is ethyl acetate

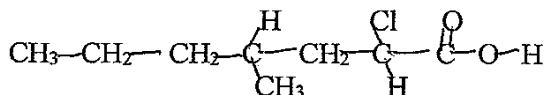
(e) All of the above are correct.

II. Short Answers (43 pts)

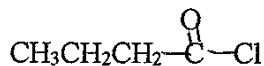
A. Nomenclature: (2 pts each, 6 pts)

1. Given the structural formula shown below, give the IUPAC name of the molecule.

a. name _____



b. name _____



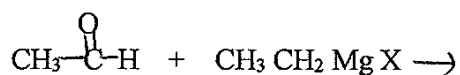
2. Given the following IUPAC name, draw a structural formula of the molecule (skeletal formula acceptable, condensed structure, Lewis Dot structure acceptable, molecular formula not acceptable - don't forget to show the hydrogens in your formula unless you are using the skeletal structure.)

4-hydroxy-heptanal

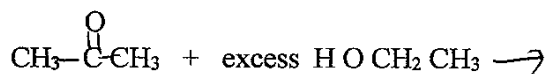
B. Reactions Part of Short Answers: (2 pts per reaction, 16 pts total)

Given the following, what is the the expected organic product ? **Choose to do 8** of the following reactions you want graded by circling the letter of the reaction. If you do not choose, I will just grade the first **SEVEN** (3 pts each, 21 pts)

1)



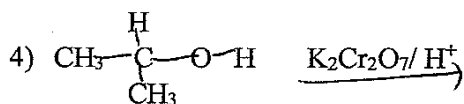
2)



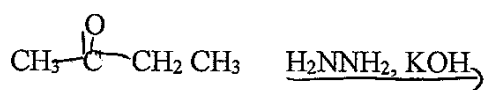
3)



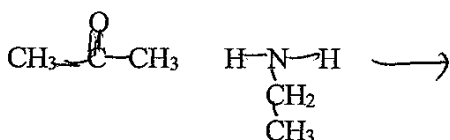
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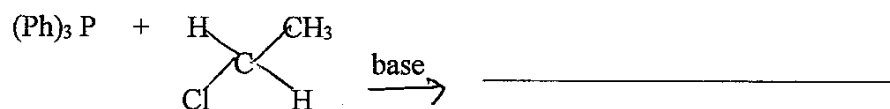
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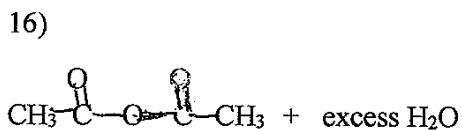
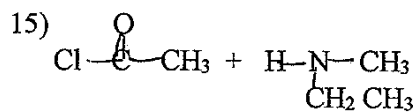
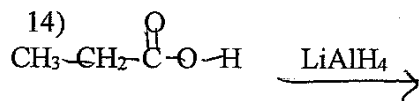
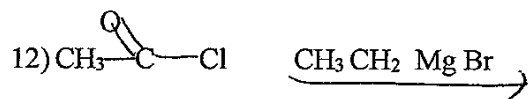
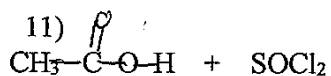
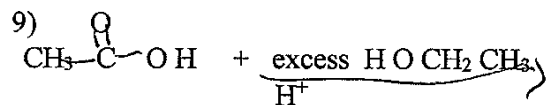
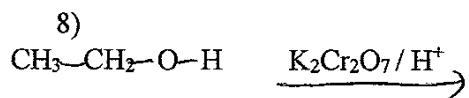


6)



7)

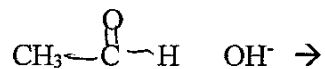




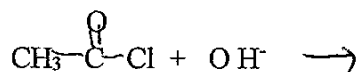
Part III. Long Answers (30 pts) Show work where applicable for full and partial credit.

1. Show the following reaction mechanism. This is a nucleophilic addition and substitution reaction mechanism under base catalysis. (I may not have gone over this specific mechanism but if you think “generalized nucleophilic addition” or “generalized nucleophilic substitution” then you will get it) (18 pts)

a) Show the reaction mechanism for a generalized Nu (OH⁻) under base catalysis for nucleophilic addition reaction mechanism (show type A reaction mechanism) (7 pts)

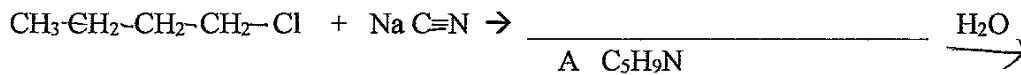


b) Show the reaction mechanism for a generalized Nu (OH⁻) under base catalysis for nucleophilic substitution reaction mechanism. (8 pts)

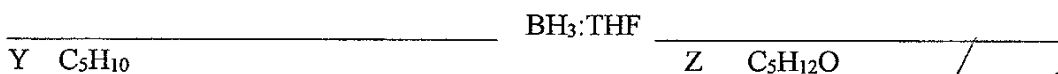
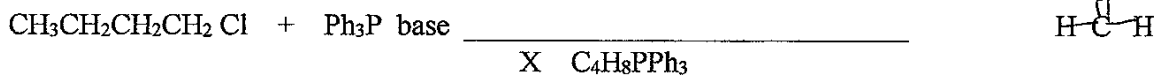


c) Explain why almost all reactions of aldehydes and ketones do nucleophilic addition and almost all reactions of carboxylic acids and carboxylic acid derivatives do nucleophilic substitution. You should mention something about “good leaving group”. (3 pts)

2 Complete the following synthesis by filling in the blank. I have provided some hints to help you come up with the answers. NOTE: The way I grade this is for you to fill in reasonable molecules based on the immediate prior molecule. i.e. If you fill in part A with the wrong molecule and then do the next reaction to molecule B correctly you will get half credit for answering B correctly. If you fill in B with what you would have gotten if you got A correctly but which cannot possibly be generated from your wrong A, you will lose all credit even if it matches what you should have gotten for B. (2 pts each, 12 pts total)



B $\text{C}_5\text{H}_{10}\text{O}_2$



B + Z $\text{C}_{10}\text{H}_{20}\text{O}_2$

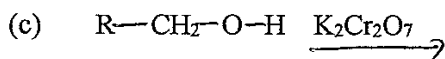
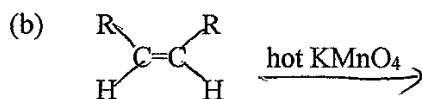
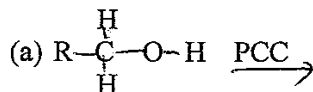
Sign Name _____ Print Name _____
 (3 pts name above print & sign, 3 pt scantron name) (100 pts, 10 pages + periodic table + scantron sheet)

Please show work on all questions for partial credit even on questions which do not specify. Please write legibly. If I cannot read your answer, I cannot grade your answer. (use back of exam for scratch paper – If you want me to grade something not in the space for the answer, clearly specify in writing. Telling me during the exam where to find the answer does not qualify because I will just vaguely remember someone telling me something during the exam not which one of 200 students told me what to grade on what page.) **Circle answer on this form for backup to the scantron. There is no partial credit for showing work in the multiple choice.** In all questions on all parts of this exam, R is not equal to hydrogen but is an alkyl. Assume standard workup in all reactions even if workup is not explicitly shown.

Please READ and FOLLOW directions. This is a **TIMED EXAM**. (ex: don't give me 5 structures if I only ask for one or you will lose points on this exam by **RUNNING OUT OF TIME**)

I. Multiple Choice (3 pts each, 27 pts) Choose the **one** best statement in each question.

1. Choose the following reactions which will give carboxylic acid products.

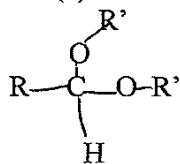


(d) All of the above give carboxylic acid products.

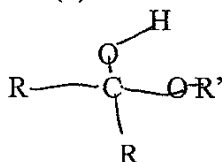
(e) Only (b) and (c) give carboxylic acid products

2. Choose the best statement.

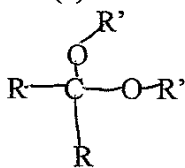
(a) The following is a hemiacetal:



(b) The following is a hemiketal.

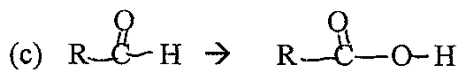
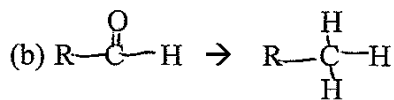
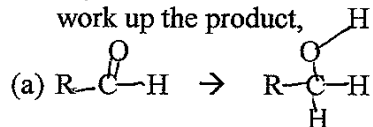


(c) The following is an acetal



(d) All statements above are true.

3. If you start with a ketone or aldehyde, and you reduce it using a reducing agent like LiAlH_4 and then work up the product,



(d) (a) and (b) are correct

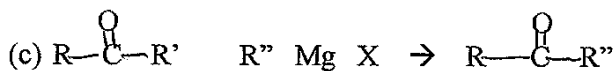
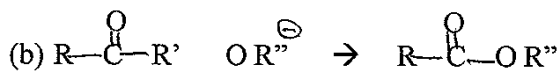
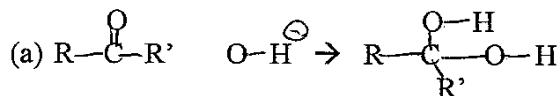
(e) (a), (b) and (c) are correct.

7. In IUPAC nomenclature the higher priority functional group name shows up most of the time as a suffix. If something higher priority is in the name, then the functional group name would be written as a prefix.

Choose the best statement.

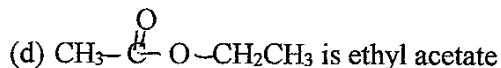
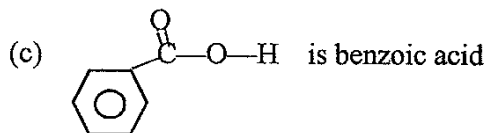
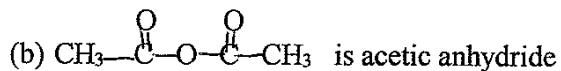
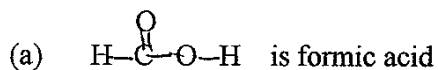
- (a) Aldehyde as a suffix is $-al$, as a prefix is formyl.
 (b) Alcohol as a suffix is $-ol$, as a prefix is hydroxy.
 (c) Ketone as a suffix is $-one$, as a prefix is oxo.
 (d) All of the above are correct.
 (e) All of the above are incorrect.

8. The reaction of $R-\overset{\text{O}}{\parallel}{C}-R'$ with the following results in which of the products shown. Circle the letter of the correct reactions.



- (d) All reactions above are correct.

9. Choose the best statement.



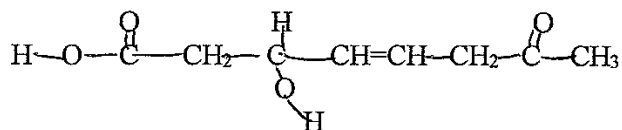
- (e) All of the above are correct.

II. Short Answers (43 pts)

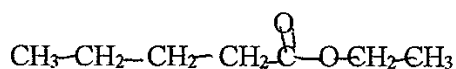
A. Nomenclature: (2 pts each, 6 pts)

1. Given the structural formula shown below, give the IUPAC name of the molecule.

a. name _____



b. name _____



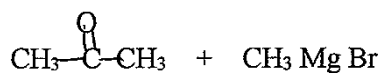
2. Given the following IUPAC name, draw a structural formula of the molecule (skeletal formula acceptable, condensed structure, Lewis Dot structure acceptable, molecular formula not acceptable - don't forget to show the hydrogens in your formula unless you are using the skeletal structure.)

5-chloroPent-3-en-2-one

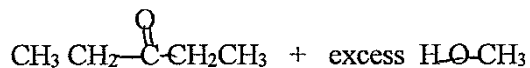
B. Reactions Part of Short Answers: (2 pts per reaction, 16 pts total)

Given the following, what is the the expected organic product ? **Choose to do 8** of the following reactions you want graded by circling the letter of the reaction. If you do not choose, I will just grade the first **SEVEN** (3 pts each, 21 pts)

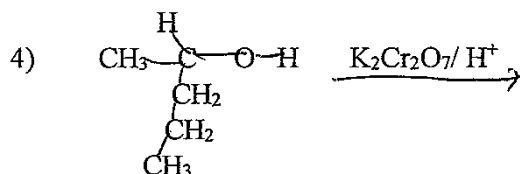
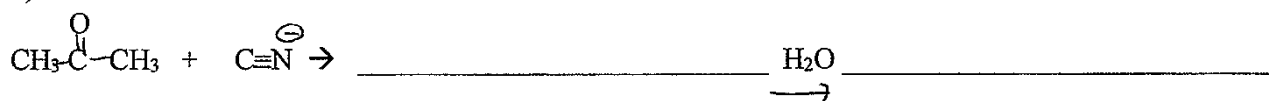
1)



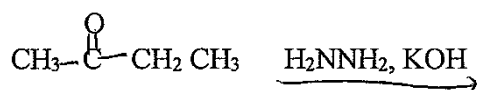
2)



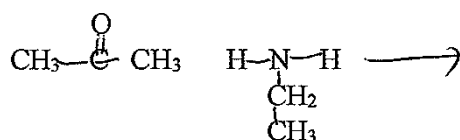
3)



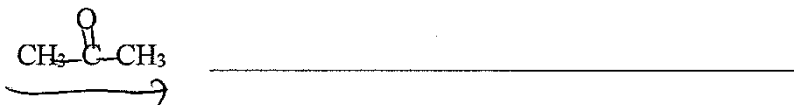
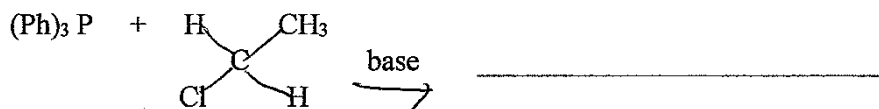
5)



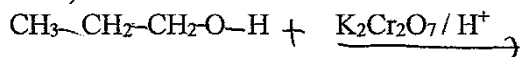
6)

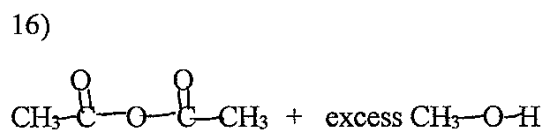
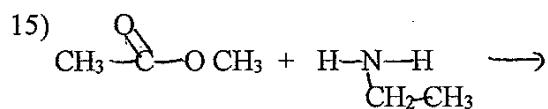
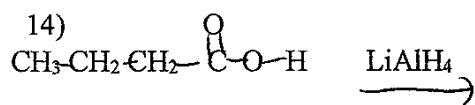
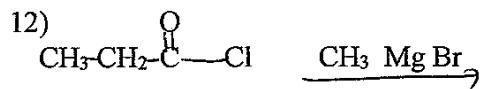
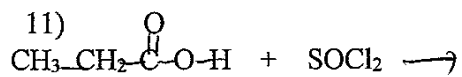
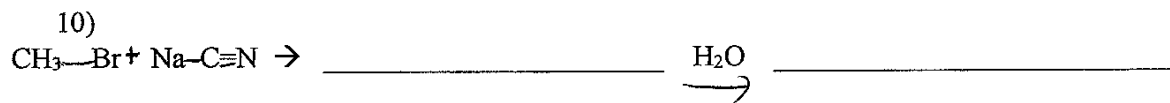
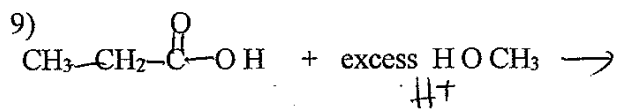


7)



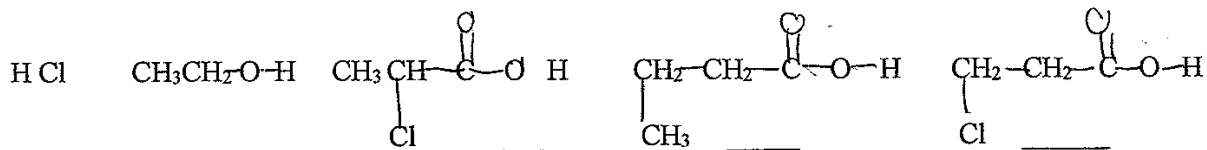
8)



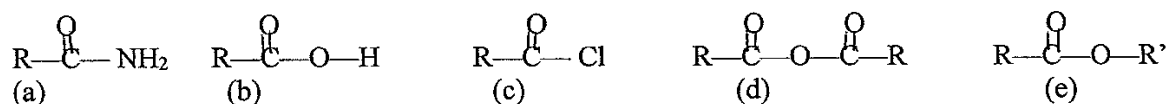


C. Short Answers part of Short Answers: (21 pts)

1. Given the following acids, put in order from (most acidic - # 1) to (least acidic- # 5) (5 pts)



2. (1) Put the following carboxylic acid derivatives in order from most reactive to least reactive by filling the blank between (most reactive) and (least reactive) with the letter for the functional group.



(most reactive) _____ (least reactive) (5 pts)

(2) Put the above carboxylic acid derivative in order from worst leaving group to best leaving group

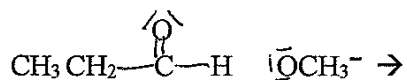
(worst leaving group) _____ (best leaving group) (5 pts)

3. Give ONE example of a carboxylic acid derivative which does NOT do the normal carboxylic acid derivative reactions by showing the starting carboxylic acid derivatives using R groups, the reactant and the product that you normally do not get for the other carboxylic acid derivatives. (6 pts)
 (fill in the bracket with the carboxylic acid)

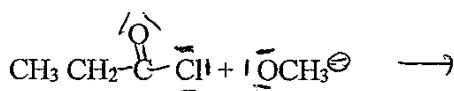
Part III. Long Answers (30 pts) Show work where applicable for full and partial credit.

1. Show the following reaction mechanism. This is a nucleophilic addition and substitution reaction mechanism under base catalysis. (I may not have gone over this specific mechanism but if you think "generalized nucleophilic addition" or "generalized nucleophilic substitution" then you will get it) (18 pts)

- a) Show the reaction mechanism for a generalized Nu (OCH_3^-) under base catalysis for nucleophilic addition reaction mechanism (show type A reaction mechanism) (7 pts)



- b) Show the reaction mechanism for a generalized Nu (OCH_3^-) under base catalysis for nucleophilic substitution reaction mechanism. (8 pts)



- c) Explain why almost all reactions of aldehydes and ketones do nucleophilic addition and almost all reactions of carboxylic acids and carboxylic acid derivatives do nucleophilic substitution. You should mention something about "good leaving group". (3 pts)

2 Complete the following synthesis by filling in the blank. I have provided some hints to help you come up with the answers. NOTE: The way I grade this is for you to fill in reasonable molecules based on the immediate prior molecule. i.e. If you fill in part A with the wrong molecule and then do the next reaction to molecule B correctly you will get half credit for answering B correctly. If you fill in B with what you would have gotten if you got A correctly but which cannot possibly be generated from your wrong A, you will lose all credit even if it matches what you should have gotten for B. (2 pts each, 12 pts total)

