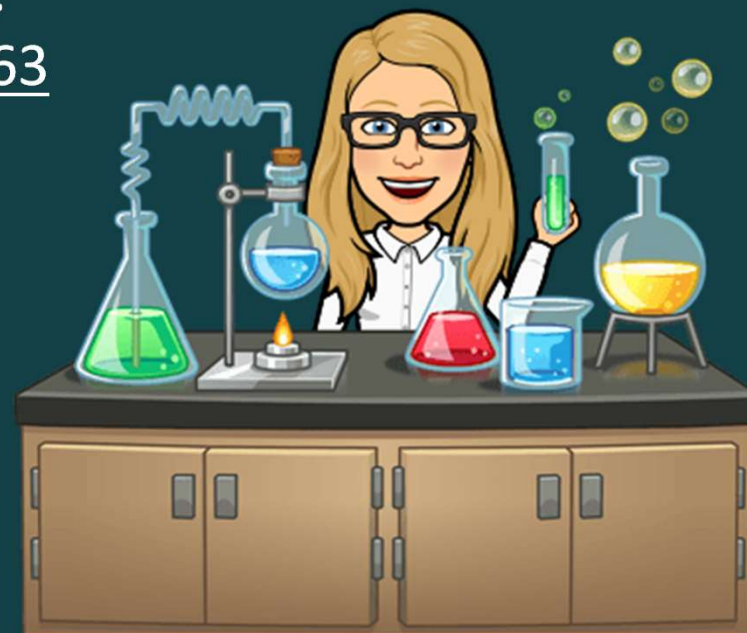




For clicker question voting, go to:
<https://pollev.com/lauriestarke263>



Dr. Laurie S. Starkey

Cal Poly Pomona

CHM 3150 Organic Chemistry II

10/9/25

Today's Topic: Reactivity & Preparation of Carboxylic Acid Derivatives

Ch. 20 Part 3

- ✓ Watch
- ✓ Read
- ✓ Practice

Daily To-Do

Flipped Lectures

Step 3

- Read Klein-Starkey 20.9 **Reactivity of Carboxylic Acid Derivatives**

Work on in-chapter problem 20.19a-c

- Read Klein-Starkey
- Sec. 20.10 **Preparation of Carboxylic Acid Derivatives**
- *Skim Sec. 20.11 Preparation and Reactions of Nitriles*

Work on in-chapter problems 20.20a-d, 20.21, 20.22, 20.23, 20.24a-d, 20.25, 20.26a, 20.27b, 20.28*

*indicates mechanism practice

- Klein-Starkey 20.7 **Reaction with Hydride and Grignard Nucleophiles**

Work on in-chapter problems 20.15a-f, 20.16ab*

*indicates mechanism practice

- Part 3a - Reactivity of CA Derivatives

25 minutes

skeleton notes 20-7 through 20-8

- Part 3b - Preparation and Reactions of CA Derivatives

37 minutes

skeleton notes 20-9 through 20-12

- Part 3c - Reaction with Hydride and Grignard

15 minutes

skeleton notes 20-12 through 20-14

- **Bonus material** Klein-Starkey 20.12 Selective Reagents (DIBAL & Cuprates - 5 minutes)

Flipped Lectures

Carboxylic Acid Derivatives

Intro	0:00
Carboxylic Acid Derivatives	0:05
Carboxylic Acid Derivatives	0:06
General Structure	1:00
Preparation of Carboxylic Acid Derivatives	1:19
Which Carbonyl is the Better E+?	
Inductive Effects	
Resonance	
Preparation of Carboxylic Acid Derivatives	
Which is Better E+, Ester or Acid Chloride?	
Inductive Effects	
Resonance	
Preparation of Carboxylic Acid Derivatives	
Which is Better E+, Carboxylic Acid or Anhydride?	
Inductive Effects & Resonance	
Overall: Order of Electrophilicity and Leaving Group	
Order of Electrophilicity and Leaving Group	
Example: Acid Chloride	
Example: Carboxylate	
Carboxylic Acid Derivative Interconversion	
Carboxylic Acid Derivative Interconversion	

Reactivity of CA Derivatives

Preparation of Acid Halides	24:31
Preparation of Acid Halides	24:32
Preparation of Anhydrides	25:45
A) Dehydration of Acids (For Symmetrical Anhydride)	25:46
Preparation of Anhydrides	27:29
Example: Dehydration of Acids	27:30
Preparation of Anhydrides	29:16
B) From an Acid Chloride (To Make Mixed Anhydride)	29:17
Mechanism	30:03
Preparation of Esters	31:53
A) From Acid Chloride or Anhydride	31:54
Preparation of Esters	33:48
B) From Carboxylic Acids (Fischer Esterification)	33:49
Mechanism	36:55
Preparations of Esters	41:38
Example: Predict the Product	41:39
Preparation of Esters	43:17
C) Transesterification	43:18
Mechanism	45:17
Preparation of Esters	47:58
D) SN2 with Carboxylate	47:59
Mechanism: Diazomethane	49:28
Preparation of Esters	51:01
Example: Transform	51:02
Reactions of Carboxylic Acid Derivatives with Nucleophiles	61:41
A) Hydride Nu: Review	61:42
A) Hydride Nu: Sodium Borohydride + Ester	62:43
Reactions of Carboxylic Acid Derivatives with Nucleophiles	63:57
Lithium Aluminum Hydride (LAH)	63:58
Mechanism	64:29
Summary of Hydride Reductions	67:09
Summary of Hydride Reductions 1	67:10
Summary of Hydride Reductions 2	67:36
Hydride Reduction of Amides	68:12
Hydride Reduction of Amides Mechanism	68:13
Reaction of Carboxylic Acid Derivatives with Organometallics	72:04
Review 1	72:05
Review 2	72:50
Reaction of Carboxylic Acid Derivatives with Organometallics	74:22
Example: Lactone	74:23

Preparation of Acid Chlorides & Anhydrides

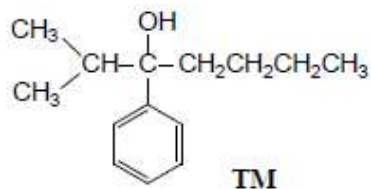
Preparation of Esters & Amides

Reactions with Hydride & Grignard

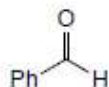
Alcohol Synthesis Homework

Name: _____ Section: _____

A) Suggest two possible syntheses for the following target molecule (TM) (start each synthesis with a different aldehyde). It may help to first cons



Hint! Possible aldehyde

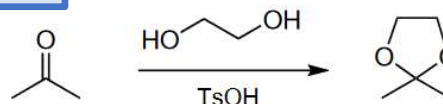


Ch. 19 & 20 “Free Red Ink” Homework x4

Chemistry II, Dr. Laurie S. Starkey, Cal Poly Pomona
Acetal Mechanism Homework

Section: _____ (day/time)

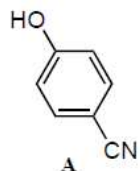
Homework, review Mechanism 19.5 and work on SkillBuilder 19.2. For both the formation of the cyclic acetal and then the hydrolysis of the acetal, including lone pairs, formal charges and the use of curved arrows.



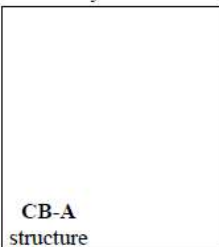
Acetal formation mechanism:

Consider the following guiding questions as you prepare your explanation:

- 1) What do the conjugate bases of these phenols look like? (please refer to the textbook for the structures of the phenols.)
- 2) Are the cyano groups involved in the resonance of CB-A?
- 3) Which conjugate base is more stable? Why?
- 4) How does CB stability correlate to the given pK_a data of the phenols?



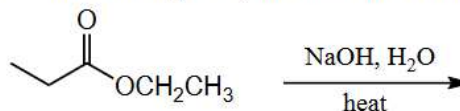
para-cyanophenol
pK_a 8.0



California State Polytechnic University
Dr. Laurie S. Starkey, Organic Chemistry

Name: _____ Section (Day): _____

Predict the products of the following reactions and draw the mechanism to account for their formation. Pay attention to stereochemistry and show lone pairs and formal charges.



Due ASAP to receive valuable **feedback** (practice free-throws **BEFORE** the game!)

Last chance: 10/16/25

Ch. 20 Supplemental Materials

- Carboxylic Acids/Derivatives [Nomenclature practice problems](#) and [answer key](#)
 - Infographics: [Common names of carboxylic acids](#) and [Odors of esters](#)
 - [Hydrolysis Mechanism homework](#) (submit to Gradescope)
 - [Phenol Acidity homework](#) (submit to Gradescope)
- Need a review of resonance? Check out a one-minute video on [allylic lone pair resonance](#) (or see the [entire playlist](#))

Short videos for resonance review!



Exam II Thursday, 10/17 (Chapters 19 & 20)

CHM 3150 Organic Chemistry II, Dr. Laurie S. Starkey, Fall 2025					
<i>Tentative Schedule (Chapter and Worksheet #)</i>					
Week	Mon	Tues	Wed	Thurs	Fri
	9/22	9/23	9/24	9/25	9/26
5		Ch. 19 #1		Ch. 19 #2	
	9/29	9/30	10/1	10/2	10/3
6		Ch. 19 #3		Ch. 19/20 #1	
	10/6	10/7	10/8	10/9	10/10
7		Ch. 20 #2		Ch. 20 #3	
	10/13	10/14	10/5	10/16	10/17
8		Ch.20 #4, Review		Exam II	

Extra office hour/review session
(Zoom, recorded)
Tue. 10/15, 9-10 pm

Exam 1
 Wrapper &
 Corrections
 Last Chance
 due Monday
 10/13
 8 course pts!

CHM 3150 Exam Wrapper - Post-Test Survey Name: _____

Metacognition By taking a step back and **thinking** about the way you **learn**, you can **improve** your learning! The following survey will guide you through an exercise in **self-reflection**, with the goal of improving your performance on the next exam. *You will earn 4 points credit if you complete this survey, and 4 points for corrections (*include written reflection, if score <50).* It analyzes the following three areas:

1. How did you prepare for this exam?
2. What kinds of mistakes did you make?
3. How will you prepare differently next time?

What was your score on the exam? (out of 100 points)

What was your grade in CHM 1220? CHM 3140? Are you repeating CHM 3150? Y / N

1. Leading up to the exam, approximately how many hours per week outside of class (on average) did you spend studying Organic Chemistry?

2. Given the number of textbook problems in each chapter (#), about how many did you work on? Mark here if no VitalSource book:

Ch.11 (Synthesis)	~100	Ch. 12 (Alcohols)	~200	Ch. 13 (Ethers)	~200		
In-chapter	<input type="text"/>	In-chapter	<input type="text"/>	In-chapter	<input type="text"/>	# of Flashcards?	<input type="text"/>
End-of-ch.	<input type="text"/>	End-of-ch.	<input type="text"/>	End-of-chapter	<input type="text"/>	# hours per week?	<input type="text"/>

3. Approximately how much of your preparation was your
 5 major contributor 4 moderate contributor

1/3 of students haven't submitted

Exam Wrapper 1

SEP 22, 2025 8:00 AM OCT 6, 2025 11:59 PM
 Late Due Date: OCT 13, 2025 11:59 PM

81

Exam Corrections 1

SEP 22, 2025 8:00 AM OCT 6, 2025 11:59 PM
 Late Due Date: OCT 13, 2025 11:59 PM

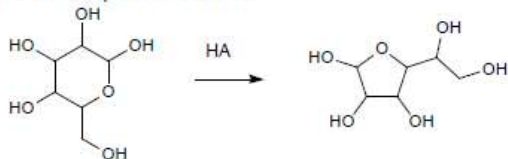
75

Ch. 19 & 20 Practice Worksheets (& Solutions!)

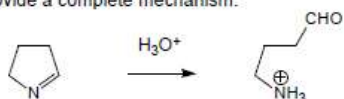
Acetal Mechanism Practice Problems

See also Klein (3rd ed.) problems 8, 12, 14, 19, 55, 63

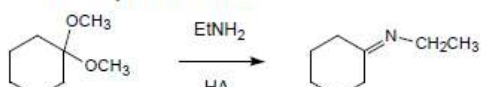
1. Provide a complete mechanism.



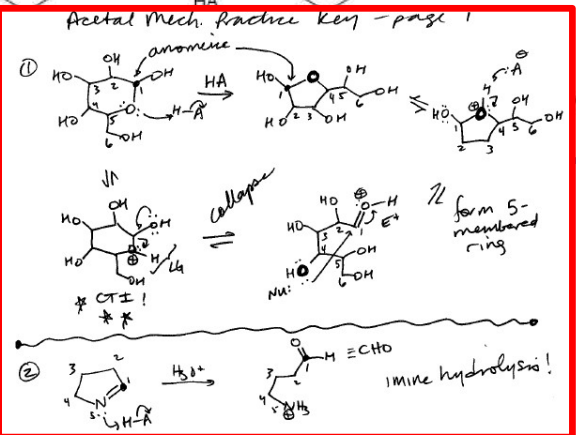
2. Provide a complete mechanism.



3. Provide a complete mechanism.

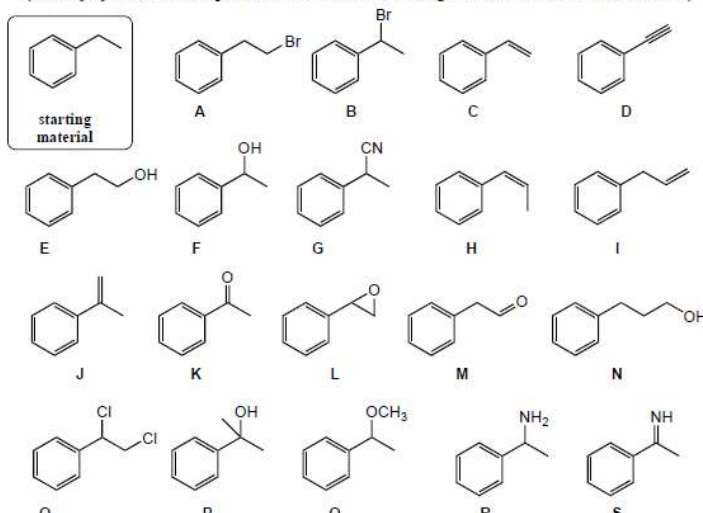


4. F

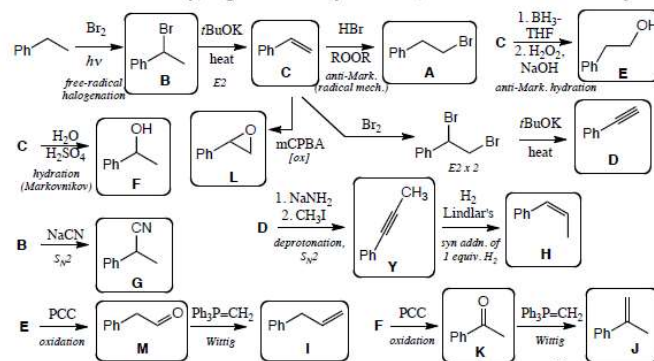


California State Polytechnic University, Pomona Organic Chem. II CHM 3150, Dr. L. S. Starkey, Ch. 1-19 Target Molecules (TMs)

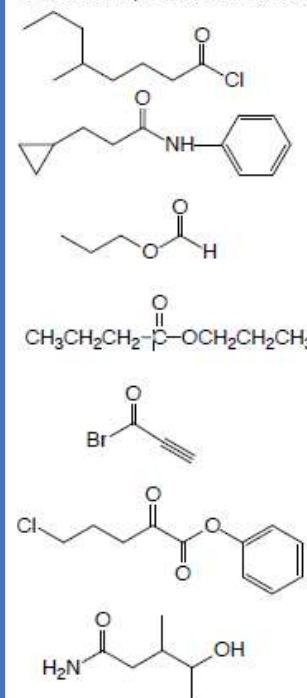
Synthesize the following TMs using phenylethane as a starting material
(and any synthesized compound can be used as a starting material to make a different TM)



California State Polytechnic University, Pomona Dr. Laurie S. Starkey, Organic Chemistry CHM 315, Final Exam TM Answer Key

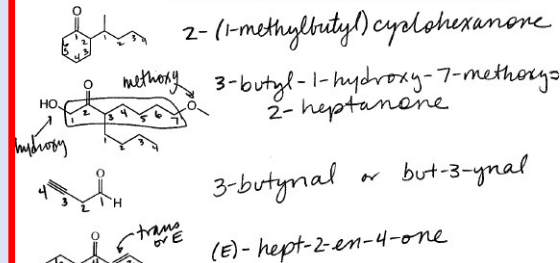


CHM 3150, Dr. Laurie S. Starkey, Carboxylic Acid/



ANSWER KEY

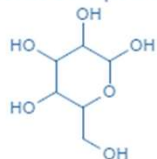
CHM 315, Dr. Laurie S. Starkey, Ketone/Aldehyde Nomenclature Practice Problems



Ch. 19 & 20 Practice Worksheets (& Solutions!)

Acetal Mechanism Practice Problems
See also Klein (3rd ed.) problems 8, 12, 14, 19, 55, 63

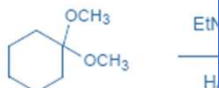
1. Provide a complete mechanism.



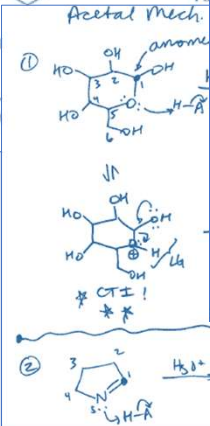
2. Provide a complete mechanism.



3. Provide a complete mechanism.

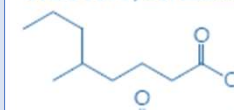


4. P



California State Polytechnic University, Pomona
Organic Chem. II CHM 3150, Dr. L. S. Starkey, Ch. 1-19 Target Molecules (TMs)
Synthesize the following TMs using phenylethane as a starting material
(and any synthesized compound can be used as a starting material to make a different TM)

CHM 3150, Dr. Laurie S. Starkey, Carboxylic Acid/



See CHM 3150 Course Homepage

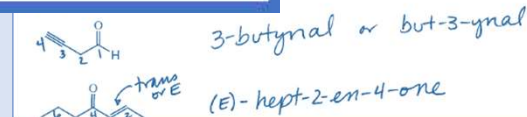
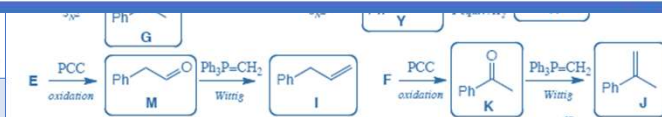
Ch. 20 Supplemental Materials

- Carboxylic Acids/Derivatives [Nomenclature practice problems](#) and [answer key](#)
- Infographics: [Common names of carboxylic acids](#) and [Odors of esters](#)
- **Hydrolysis Mechanism homework** (submit to [Gradescope](#))
- **Phenol Acidity homework**

Ch. 19 Supplemental Materials

- Aldehyde/Ketone [Nomenclature practice worksheet](#) and [answer key](#)
- [Fragrant carbonyl compounds](#)
- **Alcohol Synthesis homework** (submit to [Gradescope](#))
- **Acetal Mechanism homework** (submit to [Gradescope](#)) and [common mistakes to avoid](#)
- Acetal/carbohydrate mechanism [practice problems](#) and [answer key](#)
- **Chapters 1-19 synthesis practice** and [answer key](#)






























































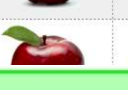










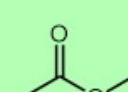

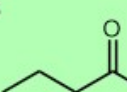
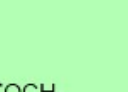
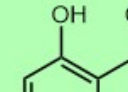
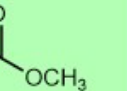





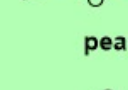


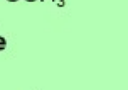
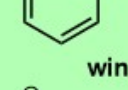






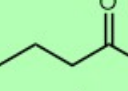
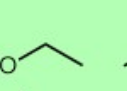
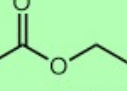
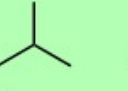
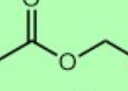
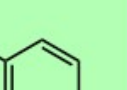
KEY
Aldehyde Nomenclature Practice Problems
ethyl(cyclohexyl)cyclohexanone
1-hydroxy-7-methoxy-
heptanone



Esters
Table of esters and their smells

from the carboxylic acid (second word)

from the alcohol (first word)

	methyl 1 carbon	ethyl 2 carbons	propyl 3 carbons	2-methyl propyl-	butyl 4 carbons	pentyl 5 carbons	hexyl 6 carbons	benzyl benzene ring	heptyl 7 carbons	octyl 8 carbons	nonyl 9 carbons
methanoate 1 carbon	ETHEREAL	 BACARDÍ		ETHEREAL							?
ethanoate 2 carbons											
propanoate 3 carbons											?
2-methyl propanoate 4 carbons, branched		ETHEREAL	 BACARDÍ								?
butanoate 4 carbons											?
pentanoate 5 carbons					ETHEREAL					?	?
hexanoate 6 carbons											
benzoate benzene ring											
heptanoate 7 carbons											
salicylate from salicylic acid											

Esters

CCC(=O)OCC
pear

CCCC(=O)OC
apple

Oc1ccc(cc1)C(=O)OC
wintergreen

CCCC(=O)OCC
pineapple

CC(C)CC(=O)OC
banana

CC(=O)OCCc1ccccc1
peach