LeAP: Carbonyl Oxidation & Reduction

- Due Oct 31, 2024 at 11:59pm
- Points 5
- Questions 13
- Available Oct 6, 2024 at 12am - Nov 4, 2024 at 11:59pm
- Time Limit None
- Allowed Attempts 2

Instructions

Lecture Application Practices (LeAPs) serve as initial opportunities for students to apply the information they've gathered from the pre-lecture videos and in-person lectures/lecture videos.

Students are strongly encouraged to complete LeAPs on the same day that the corresponding topic is completed in class. However, to provide consistent due dates, sets of LeAPs will be due on Thursdays at 11:59 PM - Chicago time. See the Weekly Schedules or Course Calendar for specific due dates for each activity.

Each LeAP is worth 5 points. Credit will be awarded based on accuracy. There is no time limit. Students will receive two attempts for each assignment and the highest score will be recorded in the gradebook. LeAPs may consist of multiple-choice, calculation, ranking, choose all that apply, and fill in the blank type questions.

This quiz was locked Nov 4, 2024 at 11:59pm.

Attempt History

	Attempt	Time	Score
KEPT	Attempt 2	17 minutes	5 out of 5
LATEST	Attempt 2	17 minutes	5 out of 5
	Attempt 1	2,893 minutes	4.05 out of 5

ⓘ Correct answers are hidden.

Score for this attempt: 5 out of 5
Submitted Oct 30, 2024 at 11:52am
This attempt took 17 minutes.

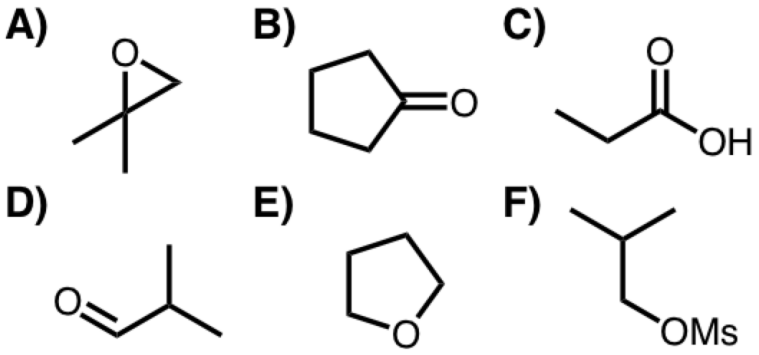
Question 1
0.25 / 0.25 pts

Sodium borohydride ($NaBH_4$) is a very **selective** reagent. Which functional groups can sodium borohydride reduce? **Choose all that apply.**

- [x] Aldehyde
- [x] Ketone
- [ ] Carboxylic Acid
- [ ] Ester

Question 2
0.5 / 0.5 pts

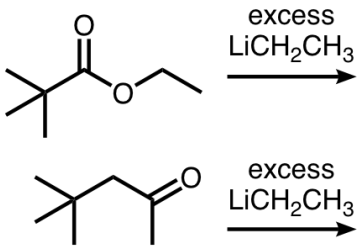
$LiAlH_4$ is applied to all of the molecules shown below. Which molecules will be converted to a **primary alcohol** during the reaction with $LiAlH_4$? Choose all that apply.



- All molecules will be converted to primary alcohols.
- A, D, E, F
- A, B, E
- C, D

Question 3
0.5 / 0.5 pts

Compare the two reactions shown below.



Both electrophiles, an ester and a ketone, are reacted with an excess amount of $LiCH_2CH_3$. Which reaction will result in the formation of a product with the molecular formula $C_9H_{20}O$ and why?

Only the reaction with the ester. $LiCH_2CH_3$ results in an addition mechanism with both starting materials. However, the product from the ketone reaction contains fewer than 9 carbons.

Only the reaction with the ketone. $LiCH_2CH_3$ results in an addition mechanism with both starting materials. However, the product from the ester reaction contains two oxygen atoms.

Both reactions. $LiCH_2CH_3$ results in an addition mechanism with the ketone. However, the ester goes through a SNAc mechanism because it contains a leaving group, which allows two equivalents of $LiCH_2CH_3$ to attack.

Neither reaction. $LiCH_2CH_3$ results in a SNAc mechanism with both starting materials. Both products contain more than 9 carbons.

Due to the oxygen leaving group, an ester will go through a SNAc mechanism followed by an addition. This allows two new C-C bonds to form at the carbonyl carbon.

Question 4
0.25 / 0.25 pts

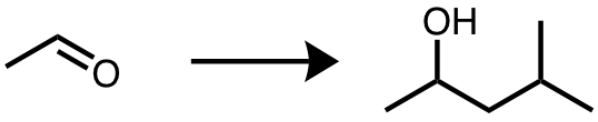
A Grignard reagent can be produced by combining an alkyl bromide or alkyl chloride with...

- Li
- LiCl
- Mg
- $MgBr_2$

Question 5
0.5 / 0.5 pts

Provide the organometallic reagent that is needed to perform the transformation shown below.

First, identify the new carbons that have been incorporated into the product. Then format the organometallic reagent used as LiR or BrMgR, where R a Condensed Formula that describes the structure of the new carbons added. (ex. Two new carbons have been added as an ethyl chain. The answer would be LiCH2CH3 or BrMgCH2H3.) Do not use subscripts. The last page of the **Reagent Cabinet List** (https://docs.google.com/document/d/1RGMrlYLL_vMpFFJwR9g6cNQAaUpIRSXUXcZQaINLY3Y/edit?usp=sharing) provides Condensed Formula examples for different alkyl chains.

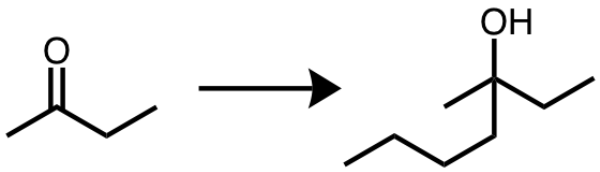


LiCH2CH(CH3)2

Question 6
0.5 / 0.5 pts

Provide the organometallic reagent that is needed to perform the transformation shown below.

First, identify the new carbons that have been incorporated into the product. Then format the organometallic reagent used as LiR or BrMgR, where R a Condensed Formula that describes the structure of the new carbons added. (ex. Two new carbons have been added as an ethyl chain. The answer would be LiCH2CH3 or BrMgCH2H3.) Do not use subscripts. The last page of the **Reagent Cabinet List (https://docs.google.com/document/d/1RGMrlYLL_vMpFFJwR9g6cNQAaUplRSXUXcZQaINLY3Y/edit?usp=sharing)** provides Condensed Formula examples for different alkyl chains.



LiCH2CH2CH2CH3

Question 7
0.25 / 0.25 pts

Which reagent(s) are needed to generate pyridinium chlorochromate? **Choose all that apply.**

- [ ] NH4OH
- [ ] H2SO4
- [x] pyridine
- [x] CrO3
- [ ] H2O
- [ ] Cl2
- [ ] Ag2O
- [x] HCl

Question 8
0.25 / 0.25 pts

Which fundamental mechanisms appear in the reaction between pyridinium chlorochromate and a secondary alcohol? **Choose all that apply.**

- [x] Acid-Base
- [ ] S_N1
- [ ] S_N2
- [x] S_NAc
- [ ] E1
- [x] E2

Question 9
0.25 / 0.25 pts

Which reagent(s) are needed to generate Jones Reagent? **Choose all that apply.**

- [ ] NH4OH
- [x] H2SO4
- [ ] pyridine
- [x] CrO3
- [x] H2O
- [ ] Cl2
- [ ] Ag2O
- [ ] HCl

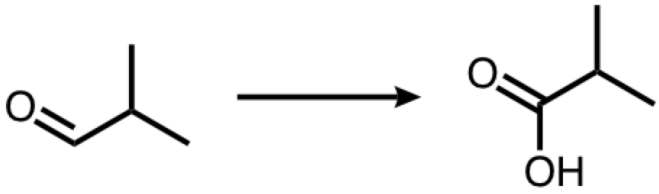
Question 10
0.25 / 0.25 pts

Water may be used as the solvent in Tollen's reaction. What additional reagent(s) are needed to generate Tollen's Reagent? **Choose all that apply.**

- [x] NH4OH
- [ ] H2SO4
- [ ] pyridine
- [ ] CrO3
- [ ] Cl2
- [x] Ag2O
- [ ] HCl

Question 11
0.5 / 0.5 pts

Which reagent(s) can be used to convert an aldehyde to a carboxylic acid? Choose all that apply.

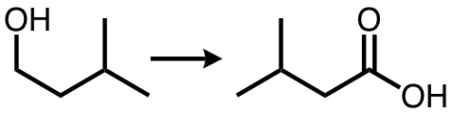


- ○ Grignard reagents and Lithium Aluminum Hydride
- ○ Sodium Borohydride
- ◉ Jone's reagent and Tollen's reagent
- ○ Tollen's reagent
- ○ PCC and Jone's reagent

Question 12

0.5 / 0.5 pts

Consider the transformation shown below.



i. Calculate the oxidation number for the **carbon atom** that experiences changes in its bonds.

N_{ox}(starting material) = -1 N_{ox}(product) = 3

ii. Determine whether an oxidation, reduction, or neither took place.

Answer **oxidation** or **reduction** or **neither**: oxidation

iii. Determine the number of electrons transferred.

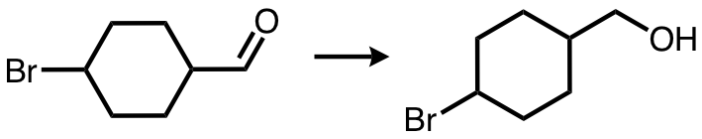
Answer should be a positive integer: 4

iv. Provide the reagent(s) that are needed to produce the transformation shown. Reagents should be listed in alphabetical order (numbers come before letters) and separated by commas. Do not use subscripts. (Use the **Reagent Cabinet List** (https://docs.google.com/document/d/1RGMrlYLL_vMpFFJwR9g6cNQAaUplRSXUXcZQaINLY3Y/edit?usp=sharing) as a reference for correct formatting of your answer.)

Reagents: CrO3,H2O,H2SO4

Answer 1:
-1
Answer 2:
3
Answer 3:
oxidation
Answer 4:
4
Answer 5:
CrO3,H2O,H2SO4

Question 13
0.5 / 0.5 pts
Consider the transformation shown below.



i. Calculate the oxidation number for the **carbon atom** that experiences changes in its bonds.

N_{ox}(starting material) = 1 N_{ox}(product) = -1

ii. Determine whether an oxidation, reduction, or neither took place.

Answer **oxidation** or **reduction** or **neither**: reduction

iii. Determine the number of electrons transferred.

Answer should be a positive integer: 2

iv. Provide the reagent(s) that are needed to produce the transformation shown. Reagents should be listed in alphabetical order (numbers come before letters) and separated by commas. Do not use subscripts. (Use the **Reagent Cabinet List** (https://docs.google.com/document/d/1RGMrlYLL_vMpFFJwR9g6cNQAaUplRSXUXcZQaINLY3Y/edit?usp=sharing) as a reference for correct formatting of your answer.)

Reagents: NaBH4

Answer 1:
1
Answer 2:
-1
Answer 3:
reduction

Answer 4:
2
Answer 5:
NaBH4

Quiz Score: 5 out of 5