

## CHEMISTRY

### BOOKS - MS CHOUHAN CHEMISTRY (HINGLISH)

## ALDEHYDES AND KETONES I. NUCLEOPHILIC ADDITION TO THE CARBONYL GROUP

### Solved Problems

1. Write bond - line formulas for three isomeric compounds that contain a carbonyl group and have the molecular formula  $C_4H_8O$ . Then give their IUPAC names .



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2. Provide the reagents for transformations (1),(2), and (3) . 

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3. What is the product of the following reaction ?



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4. Starting with benzyl alcohol , outline a synthesis of phenylethanal.



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5. With 1- butanol as your only organic starting compound, devise a synthesis of 5-nonanone. Begin by writing a retrosynthetic analysis.

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6. Provide the missing reagents and intermediate in the following synthesis.



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7. Synthesize 2-methyl-1-phenylprop-1-ene using a Wittig reaction. Begin by writing a tetrosynthetic analysis.

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8. Suggest a sequence of reaction to carry out the following transformation, but one intermediate must be an alkene.



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9. Provide the organic product(s) for the following reactions . If more than one product is formed, indicate which product (if any ) is the major one. If no reaction occurs , write " NR". (Hint: Almost any time you are asked to provide a reaction product , you should also be able to write the mechanism for the reaction as well. If you do not know the product , then trying to figure out the mechanism will guide you in the right direction. )



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10. 

Write a mechanism for part (a).



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11. Consider the two Wittig reactions shown below. Select the most efficient route and provide three reasons for your choice .



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### Additional Objective Questions Single Correct Choice Type

1. Hydrogenation of benzoyl chloride in the presence of Pd and  $BaSO_4$  gives

- A. benzyl alcohol
- B. benzaldehyde
- C. benzoic acid
- D. phenol

**Answer: B**

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2. m-chlorobenzaldehyde on reaction with conc. KOH at room temperature gives

- A. potassium m-chlorobenzoate and m-hydroxybenzaldehyde.
- B. m-hydroxybenzaldehyde and m-chlorobenzyl alcohol.
- C. m-chlorobenzyl and m-hydroxybenzyl alcohol.
- D. potassium m-chlorobenzoate and m-chlorobenzyl alcohol.

**Answer: D**

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3.  $LiAlH_4$  (LAH) cannot be used to convert carboxylic acids to the corresponding aldehydes because

- A. LAH is not sufficiently reactive.
- B. RCOOH is converted into RCOOLi.
- C. RCOOH is reduced to  $RCH_2OH$ .
- D. RCOOH is reduced to  $RCH_3$ .

**Answer: C**

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4. In the Cannizzaro reaction given below

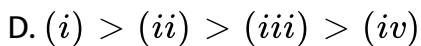
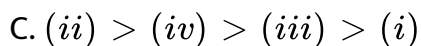
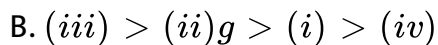
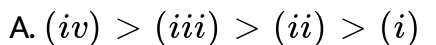
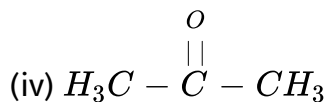
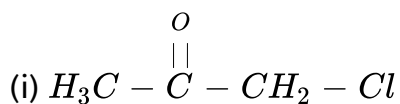


- A. the attack of OH at the carbonyl group.
- B. the transfer of hydride to the carbonyl group.
- C. the abstraction of proton from the carboxylic acid.
- D. the deprotonation of  $Ph - CH_2OH$

Answer: B

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5. Arrange the given compounds in order of decreasing reactivity for nucleophilic addition reaction.

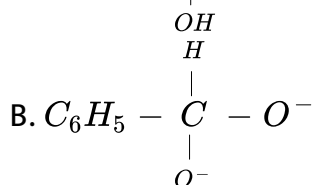
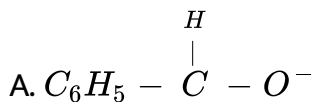




Answer: B

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6. In a Cannizzaro reaction, the intermediate which is the best hydride donor is



Answer: D

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7. What carbonyl compound reacts with HCN to give the highest yield of cyanohydrin?

A. Formaldehyde

B. Propanal

C. 2-butanone

D. di-t-butyl ketone

**Answer: A**



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8. A mixture of benzaldehyde and formaldehyde on heating with aqueous NaOH solution gives

A. benzyl alcohol and sodium formate.

B. sodium benzoate and methyl alcohol.

C. sodium benzoate and sodium formate.

D. benzyl alcohol and methyl alcohol.

**Answer: A**



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9. Which of the following carbonyl compounds reacts with HCN to give the lowest yield of cyanohydrin?

A. Formaldehyde

B. Propanal

C. 2-Butanone

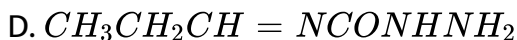
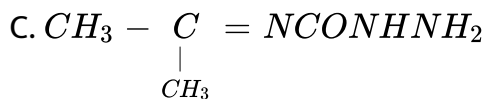
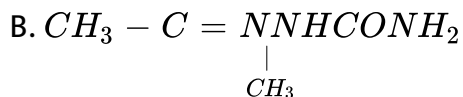
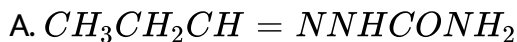
D. di-t-butyl ketone

**Answer: D**



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10. Compound A (molecular formula  $C_3H_8O$ ) is treated with acidified potassium dichromate to form a product B (molecular formula  $C_3H_6O$ ). B forms a shining silver mirror on warming with ammonical silver nitrate. B when treated with an aqueous solution of  $H_2NCONHNH_2 \cdot HCl$  and sodium acetate gives a product C. Identify the structure of C.



Answer: A



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11. The reagent which does not react with both acetone and benzaldehyde is

- A.  $NaHSO_3$
- B. phenyl hydrazine .
- C. Fehling solution.
- D. Grignard reagent.

**Answer: C**



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12. The formation of cyanohydrin from a ketone is an example of

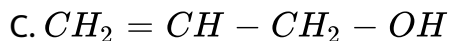
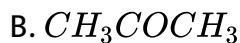
- A. electrophilic addition
- B. nucleophilic addition
- C. nucleophilic substitution

D. electrophilic substitution

Answer: B

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13. An organic compound  $C_3H_6O$  does not give a precipitate with 2,4-dinitrophenyl hydrazine reagent and does not react with metallic sodium. It could be



Answer: D

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14. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is

A. MeCOCl

B. MeCHO

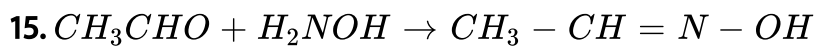
C. MeCOOMe

D. MeCOOCOMe

**Answer: A**



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The above reaction occurs at

A. pH=1

B. pH = 4.5

C. any value of pH

D. pH=2

**Answer: B**



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**16.** Which of the following is not a common reaction of aldehydes?

A. Nucleophilic acyl addition

B. Nucleophilic acyl substitution

C. Alpha substitution

D. Reduction to a ketone

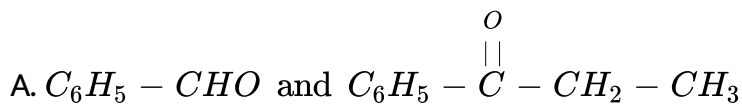
**Answer: D**



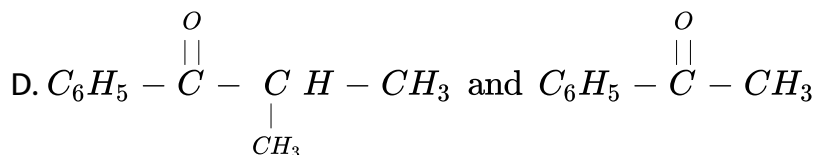
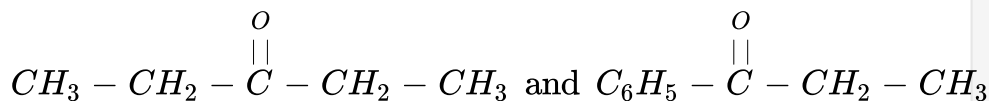
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17. Which pair of the following carbonyl compounds can be differentiated by  $I_2/NaOH$ ?



C.



Answer: D



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