



CHEMISTRY

NCERT - NCERT CHEMISTRY(TELUGU)

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

Example

1. Give names of the reagents to bring about the following transformations:

- (i) Hexan-1-ol to hexanal
- (ii) Cyclohexanol to cyclohexanone
- (iii) p-Fluorotoluene to
- (iv) Ethanenitrile to ethanal p-fluorobenzaldehyde
- (v) Allyl alcohol to propenal
- (vi) But-2-ene to ethanal



2. Arrange the following compounds in the increasing order of their boiling points:

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3. Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reactions than propanal? Explain your answer.

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4. An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent, nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives

a carboxylic acid (B) having molecular formula $C_7H_6O_2$. Identify the compounds (A) and (B) and explain the reactions involved.



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5. Write chemical reactions to affect the following transformations:

- (i) Butan-1-ol to butanoic acid
- (ii) Benzyl alcohol to phenylethanoic acid
- (iii) 3-Nitrobromobenzene to 3-nitrobenzoic acid
- (iv) 4-Methylacetophenone to benzene-1,4-dicarboxylic acid
- (v) Cyclohexene to hexane-1,6-dioic acid
- (vi) Butanal to butanoic acid.



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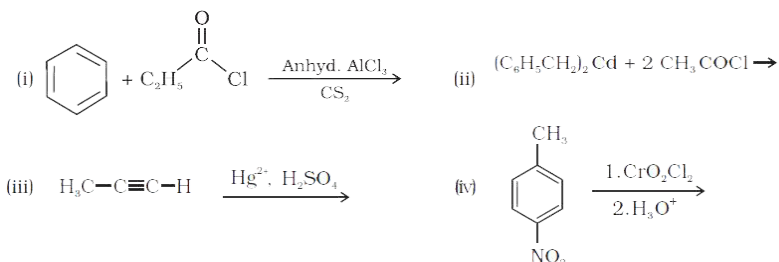
Intext Questions

1. Write the structures of the following compounds.

- (i) α - Methoxypropionaldehyde (ii) 3-Hydroxybutanal
(iii) 2-Hydroxycyclopentane carbaldehyde (iv) 4-Oxopentanal
(v) Di-sec. butyl ketone (vi) 4-Fluoroacetophenone

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2. Write the structures of products of the following reactions,



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3. Arrange the following compounds in increasing order of their boiling points.



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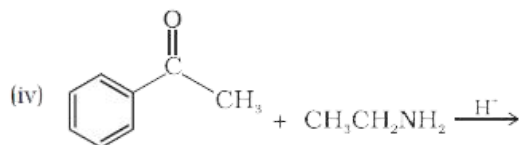
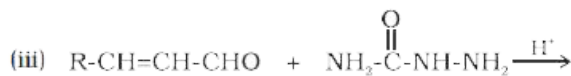
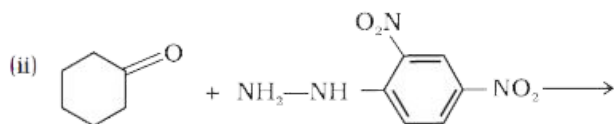
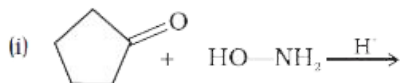
4. Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions.

(i) Ethanal, Propanal, Propanone, Butanone.

(ii) Benzaldehyde, p-Tolualdehyde, p-Nitrobenzaldehyde, Acetophenone.

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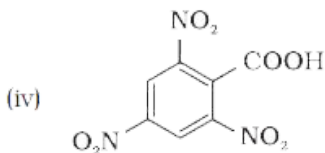
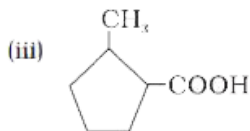
5. Predict the products of the following reactions:



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6. Give the IUPAC names of the following compounds:

(i) $PhCH_2CH_2COOH$ (ii) $(CH_3)_2C = CHCOOH$



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7. Show how each of the following compounds can be converted to benzoic acid.

(i) Ethylbenzene (ii) Acetophenone
(iii) Bromobenzene (iv) Phenylethene (Styrene)

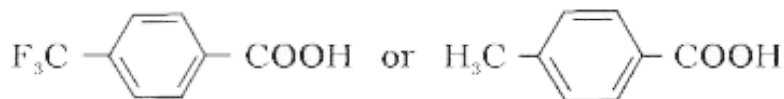
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8. Which acid of each pair shown here would you expect to be stronger?

(i) CH_3CO_2H or CH_2FCO_2H

(ii) CH_2FCO_2H or CH_2ClCO_2H

(iii) $CH_2FCH_2CH_2CO_2H$ or $CH_3CHFCH_2CO_2H$



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Exercises

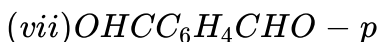
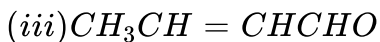
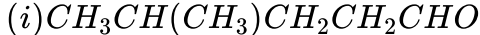
1. What is meant by the following terms ? Give an example of the reaction in each case.

- | | | |
|-------------------|----------------|-------------------------|
| (i) Cyanohydrin | (ii) Acetal | (iii) Semicarbazone |
| (iv) Aldol | (v) Hemiacetal | (vi) Oxime |
| (vii) Ketal | (viii) Imine | (ix) 2,4-DNP-derivative |
| (x) Schiff's base | | |



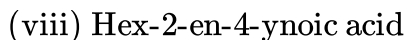
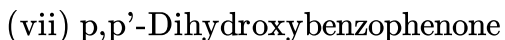
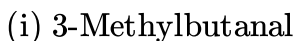
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2. Name the following compounds according to IUPAC system of nomenclature:



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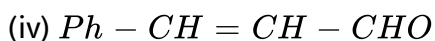
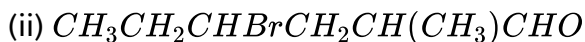
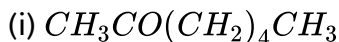
3. Draw the structures of the following compounds.



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4. Write the IUPAC names of the following ketones and aldehydes.

Wherever possible, give also common names.





(v)

(vi) $PhCOPh$



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5. Draw structures of the following derivatives.

(i) The 2,4-dinitrophenylhydrazone of benzaldehyde

(ii) Cyclopropanone oxime

(iii) Acetaldehydedimethylacetal

(iv) The semicarbazone of cyclobutanone

(v) The ethylene ketal of hexan-3-one

(vi) The methyl hemiacetal of formaldehyde



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6. Predict the products formed when cyclohexanecarbaldehyde reacts with following reagents.

- (i) $PhMgBr$ and then H_3O^+
- (ii) Tollens' reagent
- (iii) Semicarbazide and weak acid
- (iv) Excess ethanol and acid
- (v) Zinc amalgam and dilute hydrochloric acid



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7. Which of the following compounds would undergo aldol condensation, which the Cannizzaro reaction and which neither? Write the structures of the expected products of aldol condensation and Cannizzaro reaction.

- | | | |
|--------------------------|-----------------------|---------------------------|
| (i) Methanal | (ii) 2-Methylpentanal | (iii) Benzaldehyde |
| (iv) Benzophenone | (v) Cyclohexanone | (vi) 1-Phenylpropan-2-one |
| (vii) Phenylacetaldehyde | (viii) Butan-1-ol | (ix) 2,2-Dimethylbutanal |



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8. How will you convert ethanal into the following compounds?

(i) Butane-1,3-diol (ii) But-2-enal (iii) But-2-enoic acid



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9. Write structural formulas and names of four possible aldol condensation products from propanal and butanal. In each case, indicate which aldehyde acts as nucleophile and which as electrophile.



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10. An organic compound with the molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.



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11. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.



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12. Arrange the following compounds in increasing order of their property as indicated:

(i) Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone (reactivity towards HCN)

(ii)

$CH_3CH_2CH(Br)COOH$, $CH_3CH(Br)CH_2COOH$, $(CH_3)_2CHCOOH$, $CH_3CH_2CH_2COOH$

(acid strength)

(iii) Benzoic acid, 4-Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid (acid strength)



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13. Give simple chemical tests to distinguish between the following pairs of compounds.

- | | |
|-----------------------------------|--------------------------------------|
| (i) Propanal and Propanone | (ii) Acetophenone and Benzophenone |
| (iii) Phenol and Benzoic acid | (iv) Benzoic acid and Ethyl benzoate |
| (v) Pentan-2-one and Pentan-3-one | (vi) Benzaldehyde and Acetophenone |
| (vii) Ethanal and Propanal | |



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14. How will you prepare the following compounds from benzene? You may use any inorganic reagent and any organic reagent having not more than one carbon atom

- | | |
|---------------------------|--------------------------|
| (i) Methyl benzoate | (ii) m-Nitrobenzoic acid |
| (iii) p-Nitrobenzoic acid | (iv) Phenylacetic acid |
| (v) p-Nitrobenzaldehyde. | |



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15. Describe the following:

- (i) Acetylation
- (ii) Cannizzaro reaction

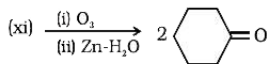
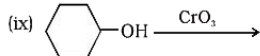
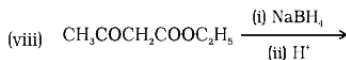
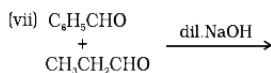
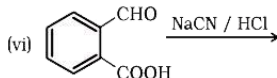
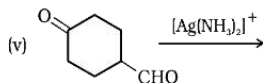
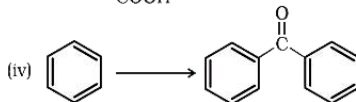
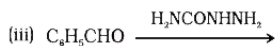
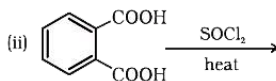
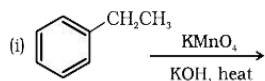
(iii) Cross aldol condensation

(iv) Decarboxylation



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16. Complete each synthesis by giving missing starting material, reagent or products



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17. Give plausible explanation for each of the following:

(i) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.

(ii) There are two $-NH_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazones.

(iii) During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester should be removed as soon as it is formed.



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18. An organic compound contains 69.77 % carbon, 11.63 % hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollens' reagent but forms an addition compound with sodium hydrogensulphite and give positive iodoform test. On vigorous oxidation it gives ethanoic and propanoic acid. Write the possible structure of the compound.



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19. Although phenoxide ion has more number of resonating structures than carboxylate ion, carboxylic acid is a stronger acid than phenol. Why?



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