



## CHEMISTRY

### NCERT - NCERT CHEMISTRY(HINGLISH)

#### ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

##### Solved Examples

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 containing (x) with molecular formula  $C_8H_8O$  forms an orange-red precipitate with 2, 4, 6-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollen's reagent, nor does it decolorise bromine water or Baeyer's reagent.

On drastic oxidation with chromic acid, it gives a carboxylic acid (Y) having molecular formula  $C_7H_6O_2$ . Identify the compounds X and Y.

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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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Exercise

1. Write the structures of the following compounds.

(i)  $\alpha$ -Methoxypropionaldehyde

(ii) 3-Hydroxybutanal

(iii) 2-Hydroxycyclopentane carbaldehyde

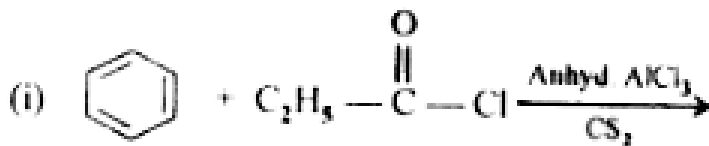
(iv) 4-Oxopentanal

(v) Di-sec. butyl ketone

(vi) 4-Fluoroacetophenone

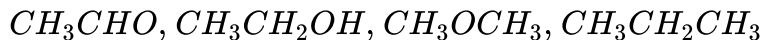
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2. Write the structures of products of the following reactions,



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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.

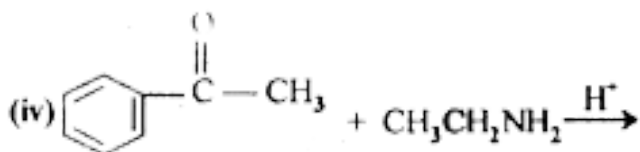
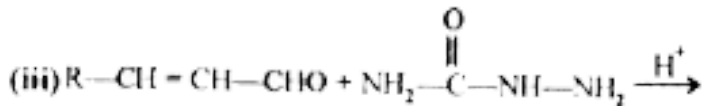
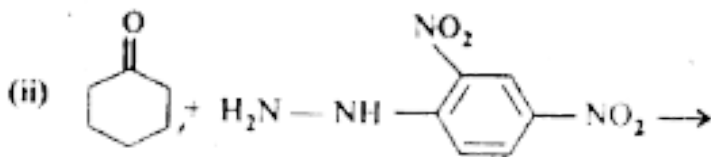
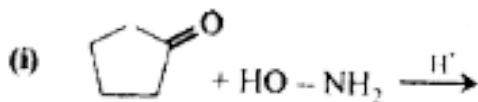
(i) Ethanal, Propanal, Propanone, Butanone.

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

Hint: Consider steric effect and electronic effect.

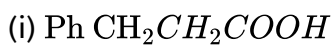
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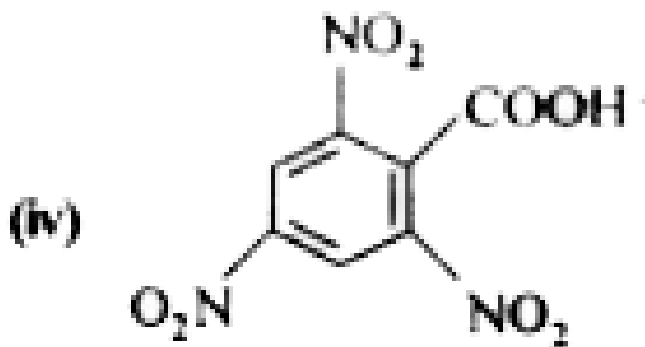
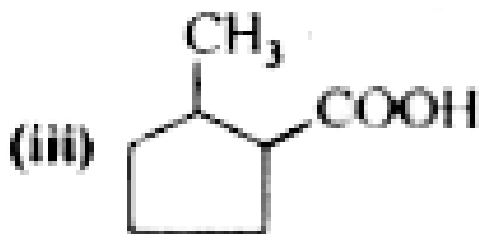
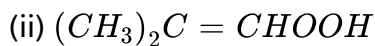
5. Predict the products of the following reactions:



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6. Give the IUPAC names of the following compounds:





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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)

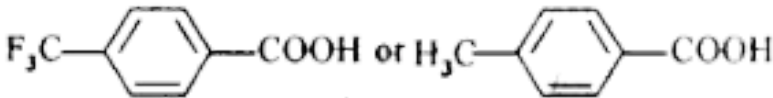
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8. Which acid of each pair shown here would you expect to be stronger?

(i)  $CH_3CO_2H$  or  $CH_2FCO_2H$

(ii)  $CH_2FCO_2H$  or  $CH_2ClCO_2H$

(iii)  $CH_2FCH_2CH_2CO_2H$  or  $CH_3CHFCH_2CO_2H$

(iv) 

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9. 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

(vii) Imine

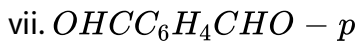
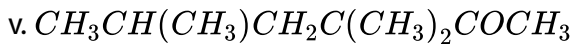
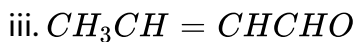
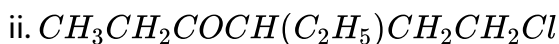
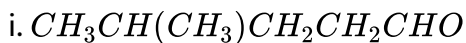
(ix) 2,4-DNP-derivative

(x) Schiff's base



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



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11. Draw the structures of following compound:

- i. 3-Methylbutanal
- ii. p-Nitropropionphenone
- iii. p-Methylbenzaldehyde
- iv. 4-Methylpent-3-en-2-one
- v. 4-Chloropentan-2-one
- vi. 3-Bromo-4-phenylpentanoic acid
- vii. p,p'-Dihydroxybenzophenone
- viii. Hex-2-en-4-ynoic acid

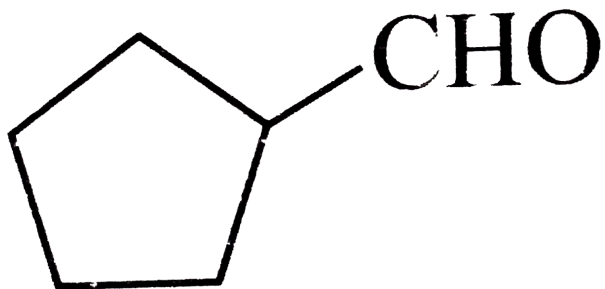


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12. Write the IUPAC names of following ketones and aldehydes. Wherever possible, give common names also.

- i.  $CH_3CO(CH_2)_4CH_3$
- ii.  $CH_3CH_2CHBrCH_2CH(CH_3)CHO$
- iii.  $CH_3(CH_2)_5CHO$
- iv.  $Ph - CH = CH - CHO$

V.



v.

vi. *PhCOPh*

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13. Draw the structure of following derivatives:

i. 2,4-Dinitrophenylhydrazone of benzaldehyde.

ii. Cyclopropanone oxime

iii. Acetaldehyde dimethyl acetal

iv. Semicarbazone of cyclobutanone

v. Ethylene ketal of hexan-3-one

vi. Methyl hemiacetal of formaldehyde

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14. Predict the products formed when cyclohexane carbaldehyde reacts with the following reagents:

- i.  $\text{PhMgBr}$  and then  $\text{H}_3\text{O}^+$
- ii. Tollens reagent
- iii. Semicarbazide and weak acid
- iv. Excess ethanol and acid
- v. Zinc amalgam and dilute hydrochloric acid



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

- i. Methanal
- ii. 2-Methylpentanal
- iii. Benzaldehyde
- iv. Benzophenone
- v. Cyclohexanone
- vi. 1-Phenylpropanone
- vii. Phenylacetaldehyde
- viii. Butan-1-ol
- ix. 2,2-Dimethylbutanal



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16. 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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17. Write structure formulae 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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18. An organic compound with the molecular formula  $C_9H_{10}O$  forms a 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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19. 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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20. Arrange the following compounds in the increasing order of their property as indicated:

i. Acetaldehyde, acetone, di-tert-butyl ketone, methyl tert-butyl ketone (reactivity towards HCN).

ii.

$CH_3CH_2CH(Br)COOH$ ,  $CH_3CH(Br)CH_2COOH$ ,  $(CH_3)_2CHCOOH$ ,  $(CH_3)_3CCOOH$

(acidic strength).

iii. Benzoic acid, 4-nitrobenzoic acid, 3,4-dinitro-benzoic acid, 4-methoxybenzoic acid (acidic strength).



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**21.** Give simple chemical test to distinguish between the following pairs of compounds.

- i. Propanal and Propanone
- ii. Acetophenone and Benzophenone
- iii. Phenol and Benzioc 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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**22.** How will you prepare the following compounds from benzene ? You may use any inorganic reagent and any organic one 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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**23.** How will you bring about the following conversions in not more than two steps ?

i. Propanone to propene

ii. Benzoic acid to Benzaldehyde

iii. Ethanol to 3-Hydroxybutanal

iv. Benzene to m-Nitroacetophenone

v. Benzaldehyde to Benzophenone

vi. Bromobenzene to 1-Phenylethanol

vii. Benzaldehyde to 3-Phenylpropan-1-ol

viii. Benzaldehyde to  $\alpha$ -Hydroxyphenylacetic acid

ix. Benzoic acid to m-Nitrobenzyl alcohol

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24. Describe the following

i. Acetylation

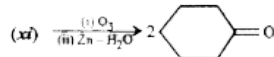
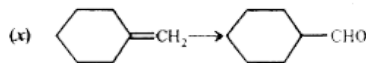
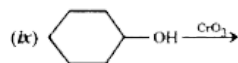
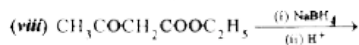
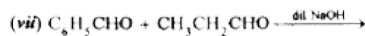
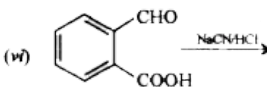
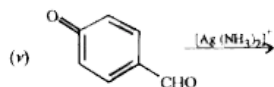
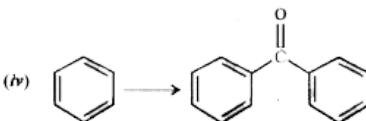
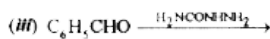
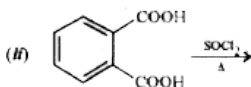
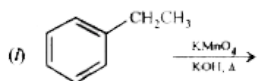
ii. Cannizzaro reaction

iii. Cross aldol condensation

iv. Decarboxylation

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



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26. Giving plausible explanation for each of the following:

- i. Cyclohexanone forms cyanohydrin 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 acid catalyst, the water or the ester should be removed as soon as it is formed.



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27. 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 gives positive iodoform test. On vigorous oxidation, it gives ethanoic and propanoic acid. Write the possible structure of the compound.



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



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