



CHEMISTRY

BOOKS - V PUBLICATION

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

Question Bank

1. Write the structures of the following compounds (i) α -Methoxypropionaldehyde

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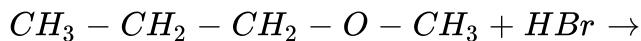
2. Arrange the following compounds in increasing order of their boiling points. CH_3CHO , CH_3CH_2OH , CH_3OCH_3 , $CH_3CH_2CH_3$

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3. Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reaction. i. Ethanal, Propanal, Propanone, Butanone ii. Benzaldehyde, *p* - Tolualdehyde, *p*-Nitrobenzaldehyde, Acetophenone (Hint: Consider' steric effect and electronic effect).

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4. Predict the products of the following reactions



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5. Give the IUPAC names of the following. (i) $PhCH_2CH_2COOH$

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6. Show how each of the following compounds can be converted to benzoic acid i. Ethyl benzene ii. Acetophenone iii. Bromobenzene iv. Phenylethene (Styrene)

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7. 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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8. 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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9. Name the following compounds according to IUPAC system of nomenclature: i. $CH_3CH(CH_3)CH_2CH_2CHO$ ii.

$CH_3CH_2COCH(C_2H_5)CH_2CH_2Cl$ iii. $CH_3CH = CHCHO$ iv.

$CH_3COCH_2COCH_3$ v. $CH_3CH(CH_3)CH_2C(CH_3)_2COCH_3$ vi.

$(CH_3)_3CCH_2COOH$ vii: $OHCC_6H_4CHO - p$

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10. Draw the structures of the following compounds. i: 3-Methylbutanal ii. p-Nitropropiophenone 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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11. Write the-IUPAC names. of the-following. Wherever.possible, give also common names. i. $CH_3CO(CH_2)_2CH_3$

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12. Draw structures of the following derivatives. i. The 2,4 - dinitrophenylhydrazone of benzaldehyde ii. Cyclopropanone oxime iii. Acetaldehyde dimethyl acetal iv. The semicarbazone of cyclobutanone v. The ethylene ketal of hexan-3-one vi. The methyl hemiacetal of formaldehyde

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13. 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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14. Which of the following compounds would undergo aldol condensation, in 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 vii. 1-Phenylpropanone vii, Phenylacetaldehyde viii. Butan-1-ol ix. 2,2-Dimethylbutanal

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15. 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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16. 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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17. 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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18. 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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19. 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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20. Write simple chemical tests and observations used to distinguish between the following compounds. (i) Propanal and propanone

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21. 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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22. 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 α -Hydroxyphenylacetic acid ix. Benzoic acid to *m*-Nitrobenzyl alcohol

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23. Describe the following: i. Acetylation ii. Cannizzaro reaction iii. Crossaldol condensation iv. Decarboxylation

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24. Give possible 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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25. 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 sodiumhydrogensulphite 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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26. 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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27. Dipole moment of aldehydes ($2.3 - 2.8, D$). is much higher than that of alcohols ($1.6 - 1.8D$). Explain.

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28. Name the reaction and the reagent used for the conversion, of acid chlorides to the corresponding aldehydes

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29. Arrange the following in order of their increasing reactivity towards HCN . CH_3CHO , CH_3COCH_3 , $HCHO$, $C_2H_5COCH_3$

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30. Give the product obtained when acetophenone is treated with hydrazine hydrate and KOH at $453 - 473\text{K}$?

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31. How will you convert acetone into ethanoic acid?

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32. How is acetone obtained from ethanol?

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33. How is acetone obtained from 2 - bromopropane?

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34. Which alkene on reductive ozonolysis given acetone as the only product?

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35. Give an example of a compound in which hydrogen bonding results in the formation of a dimer

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36. Why formic acid(HCOOH) does not give HVZ reaction but CH_3COOH does

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37. How will you distinguish experimentally between an alcohol and a carboxylic acid?

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38. How will you convert an acid into an ester without using an alcohol?

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39. Though butanol and butanal have the same solubility in water, there is large difference in their boiling points. Why?

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40. Give the formula and IUPAC name of an aliphatic aldehyde having 5 carbon atoms which undergoes -Cannizzaro reaction?

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41. Suggest a method to convert a primary alcohol into an acid with one more carbon atom.

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42.

"Arrange the following in increasing order of acid strength :

ClCH_2COOH , $\text{CH}_3\text{CH}_2\text{COOH}$, $\text{ClCH}_2\text{CH}_2\text{COOH}$, $(\text{CH}_3)_2\text{CHCOOH}$, CH_3COOH .

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43. How will you test aldehydes and ketones with: (i) Tollen's reagent (ii) Fehling solution Give equations.

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44. An organic compound *Awithmo* \leq *carf* or $\mu\text{laC}_k\text{H}_8\text{O}$

. f or $msan'$ or $an \geq red \prec i\pi tatewith2, 4. DNP$ $rea \geq nt$ and gives ye
 $\leq n's$ or $Fehl \in g'srea \geq nt, n$ or $doesitdecolonisebro$ min $ewater$ or
 $\in gmo \leq carf$ or μla

$C_7H_6O_{-2}^{\prime}$ Ident if $ythe$ compounds A and B` and explain the reactions involved..

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45. Compound X with molecular formula $C_9H_{10}O$ forms a semicarbazone and gives negative Tollen's and iodoform tests. Upon reduction it gives n -propyl benzene, Deduce the structure of X .

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46. The compound $C_4H_8Cl_2$ (A) on hydrolysis gives a compound $C_4H_8O_1$ (B). The compound (B) reacts with hydroxylamine and gives a negative test with Tollen's reagent. What are (A) and (B), Support your answer with proper reasoning and give the equations of reactions.

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47. A ketone (A) which undergoes haloform reaction gives compound (B) on reduction. (B) on heating with H_2SO_4 gives (C) which forms monoozonide (D). (D) on hydrolysis in presence of zinc -dust gives only acetaldehyde. Identify (A) (B) and (C). Write the reactions involved.

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48. Compound A, $C_4H_8O_2$ has the following properties. (i) It reacts with sodium bicarbonate to liberate CO_2 (ii) On fusion with alkali gives propane. (iii) with $Ca(OH)_2$, it gives $C_8H_{14}O_4Ca$ which on heating decomposes to di - isopropyl ketone. Identify A

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49. A liquid (X) having molecular formula ' $C_6H_{12}O_2$ ' is hydrolysed with water in presence of g m acta to give

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50. Compound (A) 'C₆H₁₂O₂' an reduction with LiAlH₄ yielded two compounds (B) and (C) . The compound (B) on oxidation gave (D) which on treatment with alkali aqueous and subsequent heating furnished (E). The latter on catalytic hydrogenation gave (C). The compound (D) was oxidised further to give (F) which was found to be monobasic acid (m. wt. 60). Deduce structures of A to (E).

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51. Complete the following reactions by identifying (A), (B) and (C):

'(##VPS_HSS_CHE_XII_C12_E03_030_Q01##)'

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52. In the Cannizzaro reaction

$2Ph + CHO \xrightarrow{OH^-} Ph - CH_2OH + PhCOO^-$ the slowest step is : the attack of $-OH$ at the carbonyl group, the transfer of hydride ion to the

carboxylic acid, the abstraction of proton from the carboxylic acid, the deprotonation of the $PhCH_2OH$

- A. the attack of -OH at the carbonyl group
- B. the transfer of hydride ion to the carboxylic acid
- C. the abstraction of proton from the carboxylic acid
- D. the deprotonation of the $Ph - CH_2 OH$

Answer: B



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53. Which of the following will react with H_2O

- A. $CHCl_3$
- B. CCl_3CHO
- C. CCl_4
- D. $CH_2Cl_2CH_2Cl$

Answer: B

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54.

The product obtained in a oxymercuration

($HgSO_4 + H_2SO_4$) of 1 -butyne would be : $CH_3CH_2COCH_3$,

$CH_3CH_2CH_2CHO$,

$CH_3CH_2CHO + HCHO$,

$CH_3CH_2COOH + HCOOH$

A. $CH_3CH_2COCH_3$ '

B. $CH_3CH_2CH_2CHO$ '

C. $CH_3CH_2CHO + HCHO$ '

D. $CH_3CH_2COOH + HCOOH$ '

Answer: A

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55. 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 sodium formate

Answer: A



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

Electrophilic addition

Nucleophilic addition

Nucleophilic substitution

Electrophilic substitution

- A. Electrophilic addition

- B. Nucleophilic addition
- C. Nucleophilic substitution
- D. Electrophilic substitution

Answer: B

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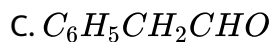
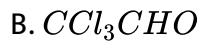
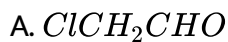
57. Acetaldehyde cannot show

- A. iodoform test
- B. Lucas test
- C. Benedict's test
- D. Tollen's test

Answer: B

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58. Which of the following does not undergo aldol condensation



D. none

Answer: B

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59. The reagent with which both acetaldehyde and acetophenone react easily are

A. Fehling's solution

B. Schiff's reagent

C. Tollen's reagent

D. 2, 4 - Dinitrophenyl hydrazine

Answer: D

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60. Self condensation of 2 moles of ethyl acetate in presence of sodium ethoxide yields

A. ethyl propanoate

B. ethyl butyrate

C. acetoacetic ester

D. methyl acetoacetate

Answer: C

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61. Iodoform test is not given by

A. 2 - pentanone

B. 3 - pentanone

C. ethanal

D. ethanol

Answer: B

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62. Which of the following organic compounds answers both iodoform test and Fehlings test

A. Ethanal

B. Propanone

C. Ethanol

D. Methanol

Answer: A

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63. Which one of the following can be oxidised to the corresponding carbonyl compound

- A. 2 - Hydropropane
- B. o - nitro phenol
- C. Phenol
- D. 2- methyl - 2 - hydropropane

Answer: A

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64. With which of the following reagent, carbonyl compound shows addition cum elimination reaction?: PCl_5 , Brady's reagent, HCN, All of these

A. PCl_5

B. Brady's reagent

C. HCN

D. All of these

Answer: B

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65.

' $(\text{CH}_3)_2\text{C}=\text{CHCOCH}$ can be oxidised to ' $(\text{CH}_3)_2\text{C}=\text{CHCOOH}$ by

A. Chromic acid

B. NaOH

C. Cu 300°C

D. KMnO_4

Answer: B

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66. Aldol condensation will not take place in

- A. HCHO
- B. CH_3CHO
- C. CH_3COCH_3
- D. $\text{CH}_3\text{CH}_2\text{CHO}$

Answer: A

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67. The chemical that undergoes self oxidation and self reduction in the same reaction is

- A. Benzyl alcohol
- B. acetone

C. formaldehyde

D. acetic acid

Answer: C

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68. The reagent used for separation of acetaldehyde and acetophenone is

: $NaHSO_3$, $C_6H_5NHNH_2$, NH_2OH , $NaOH - I_2$

A. $NaHSO_3$

B. $C_6H_5NHNH_2$

C. NH_2OH

D. $NaOH - I_2$

Answer: A

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69. When a mixture of calcium benzoate and calcium acetate is dry distilled, the resulting compound is

- A. acetophenone
- B. benzaldehyde
- C. benzophenone
- D. acetaldehyde

Answer: A



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70. Which one of the following is reduced with zinc and hydrochloric acid to give the corresponding hydrocarbon

- A. ethyl acetate
- B. acetic acid
- C. acetamide

D. butan 2 - one

Answer: C

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71. When 2-butyne is treated with dil H_2SO_4 $HgSO_4$ the product formed is

A. Butanol

B. 2 Butanone

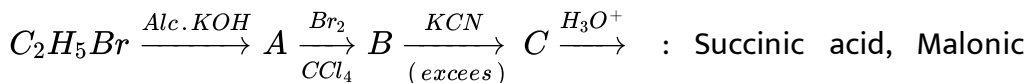
C. 2 - Butanol

D. acetone

Answer: B

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72. The acid D obtained through the following sequence of reactions is



acid, Maleic acid, Oxalic acid

A. Succinic acid

B. Malonic acid

C. Maleic acid

D. Oxalic acid

Answer: A



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73. In which of the following reactions, carbon-carbon bond formation takes place : Cannizzaro, Reimer - Tiemann, HVZ reaction, Schmidt reaction

A. Cannizzaro

B. Reimer - Tiemann

C. HVZ reaction

D. SCHEidt reaction

Answer: B



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74. A carbonyl compound react with HCN to form a cyanohydrin which on hydrolysis forms a racemic mixture of alpha- hydroxy acids. The carbonyl compound is

A. formaldehyde

B. acetaldehyde

C. acetone

D. diethyl ketone

Answer: B



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75. 1 - phenyl ethanol can be prepared by reaction of benzaldehyde with

- A. methyl bromide
- B. ethyl iodide and magnesium
- C. methyl bromide and aluminium bromide
- D. methyl iodide and magnesium

Answer: D



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76. The product formed in Aldol condensation is

- A. an alpha, beta, unsaturated ester
- B. a beta hydroxy acid
- C. a beta hydroxyaldehyde or ketone

D. an alpha hydroxy aldehyde or ketone

Answer: C

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77. A dihalogen derivative X of a hydrocarbon with three carbon atoms reacts with alcoholic KOH and produces another hydrocarbon which forms a red precipitate with ammoniacal Cu_2Cl_2 . X gives an aldehyde on reaction with aqueous KOH . The compound X is

- A. 1, 3- dichloropropane
- B. 1, 2 - Dichloropropane
- C. 2, 2 -Dichloropropane
- D. 1, 3 Dichloropropene

Answer: D

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78. Which compound is most reactive towards nucleophilic addition :

CH_3CHO , $PhCOCH_3$, $PhCOPH$, CH_3COCH_3

A. CH_3CHO

B. $PhCOCH_3$

C. $PhCOPH$

D. CH_3COCH_3

Answer: D



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79. In which of the following reactions, carbon- carbon bond formation takes place : Cannizzaro, Reimer - Tiemann, HVZ reaction, Schmidt reaction

A. Cannizzaro reaction

B. Friedel - Crafts reaction

C. Clemmensen reduction

D. Reimer Tiemann reaction

Answer: C



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