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, Ácetophẹnone (Hint: Consider' steric effect and electronic effect).

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4. Predict the products of the following reactions

$CH_3 - CH_2 - CH_2 - O - CH_3 + HBr \rightarrow$

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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 benzonic 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. $CH_2FCO_2\dot{H}$ or CH_2ClCO_2H iii. $CH_2FCH_2CH_2CO_2'H$ 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.Heniacetal vi. Oxime vii. Ketal viii. Imine ix. 2,4-DNP-derivative x. Schiffs 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.Acetaldehydedimethylacetal iv. The semicarbazone of cyclobutanone v The ethylene ketaI of hexan-3-one vi.The methyl hemiácetal of formaldehyde

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13. Predict the products formed,when cyclohexanecarbaldehyde reacts with following reagents. i. PhMgBr and then H_3O^+ ii. Tollèns 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 thé 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 benzenedicarobxylic acid. Identify the compound.

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18. Án 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 producèd (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, 3,4Dinitrobenzoic 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-Nitrobenzaldehydè.

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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-l-ol, viii. Benazaldehyde 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 conden'sation iv. Decarboxylation

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24. Give possible explanation fòr 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 cọntains 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 propanoicacid. 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 thảt of alcohols $(1.6 - 1.8D)$. Explain.

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28. Name the reaction and the reagent used for the converstion, of acid chloridés to the corresponding aldehydes

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29. Arrange the following in order of their increasing reactivity fowards $HCN. CH_3CHO, CH_3COCH_3, HCHO, C_2H_3COCH_3$

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30. Give the product obtainéd when acetophenone is treated with hydrazine hydrate and KOH at $453 - 473 \sim K$?

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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 CH3COOH 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 thelr boiling points. Why?

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40. Give the fomula and IUPAC name of an aliphatic aldehyde having 5 carbon atoms which under goes -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 :

ClCH2COOH, CH3CH2COOH, ClCH2CH2COOH,(CH3)2CHCOOH, CH3COOH .

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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 $Awithmo \leq c\underline{a}rf$ or μlaC_k H_8 O

$. f$ or $msan'$ or $an \geq red \prec i\pi tatewith 2,4. DNPrea \geq nt$ and $givesye \leq n's$ or $Fehl \in g'srea \geq nt, n$ or $doesitdecolonisebro$ min $ewater$ or $\in gmo \leq c\underline{a}rf$ or μla

C_7 H_6 O_-2^prime$Ident$ if $ythecompounds$A and B` and explain the reactions involved..

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45. Compund 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) an 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 halaform reaction gives compound (B) an reduction. (B) on heating with H_2SO_4 gives (C) which forms monoozonide (D). (D) on hydrolysis in presence of zinc -dust gives only accetaldehyde. Identify (A) (B) and (C). Write the reactions invoived.

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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_6 H_12 O_2^*' is hydrolysed with water in presence of g m acta to give

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50. Compound (A) 'C_6 H_12 O_2' an reduction with LiAl H_4 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 $2Ph + CHO \xrightarrow{\overset{\ominus}{OH}} Ph - CH_2OH + PhCOO$ 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_3 CH_2 COCH_3'

B. CH_3 CH_2 CH_2 CHO'

C. CH_3 CH_2 CHO+HCHO'

D. CH_3 CH_2 COOH+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

A. $ClCH_2CHO$

B. CCl_3CHO

C. $C_6H_5CH_2CHO$

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 proponate

B. ethyl butyate

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 anwers 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?: PCl5, Brady's reagent, HCN, All of these

A. PCl5

B. Brady's reagent

C. HCN

D. All of these

Answer: B

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65.

'(CH3)2C=CHCOCH can be oxidised to '(CH3)2 C=CHCOOH by

A. Chromic acid

B. NaOl

C. Cu 300^circ C'

D. KMnO_4'

Answer: B

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66. Aldol condensation will not take place in

A. HCHO'

B. CH3CHO'

C. CH3COCH3'

D. CH3CH2CHO'

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_6 H_5 NHNH_2'

C. NH_2 OH'

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 sequece of reactions is $C_2H_5Br \xrightarrow{Alc.KOH} A \xrightarrow[CCl_4]{Br_2} B \xrightarrow[(excees)]{KCN} C \xrightarrow{H_3O^+}$: Succinic acid, Malonic 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. I - 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 bydroxy aldehyde or ketone

Answer: C

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77. A dihalogen derivative X of a hydrocarbon witn three carbon atom react with alocholic KOH and produces another hydrocarbon which forms a red precipitate with ammoniacal $Cu_2Cl_2 \cdot X$ gives 'an aldehyde on reaction with aqueous KOH. The compound X is

A. 1, 3- dichloropropane

B. 1, 2 - Dichloropropane

C. 2, 2 -Dichoropropane

D. 1, 3 Dichoropropene

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_3 CHO'

B. PhCOCH_3'

C. PhCOPH'

D. CH_3 COCH_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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