



CHEMISTRY

BOOKS - PRADEEP CHEMISTRY (HINGLISH)

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

CURIOSITY QUESTIONS

1. The terrorist attack which occurred in delhi high court on september 8,2011 used PETN as the deadly explosive. What does PETN stand for and how is it prepared?

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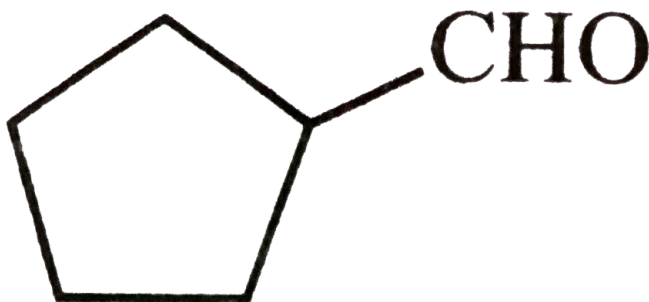
2. RDX has many military and civilian applications but these days, it is being misused for terrorist attacks. What does it stand for and how is it

prepared?

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TEST YOUR GRIP (I. MULTIPLE CHOICE QUESTIONS)

1. The IUPAC name of



is

- A. Pentanaldehydye
- B. Pentanal
- C. Cyclopentanecarbaldehyde
- D. hexanal

Answer: C



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TEST YOUR GRIP (MULTIPLE CHOICE QUESTIONS)

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

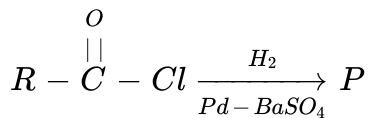
- A. acetophenone
- B. benzaldehyde
- C. benzophenone
- D. acetaldehyde

Answer: A



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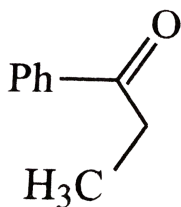
2. In the following reaction, product P is



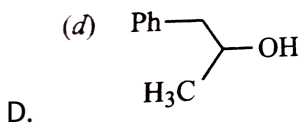
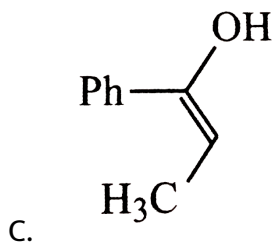
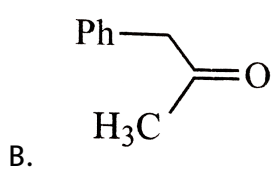
Answer: C

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3. $Ph - C \equiv C - CH_3 \xrightarrow{Hg^{2+} / H^+} A$, A is



A.



Answer: A

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4. The formation of cyanohydrin from acetone is which type of reaction?

A. Electrophilic

B. Electrophilic addition

C. Nucleophilic addition

D. Nucleophilic substitution.

Answer: C

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5. The increasing order of the rate of HCN addition compound $A - D$ is

A. $HCHO$

B. CH_3COCH_3

C. $PhCOCH_3$

D. $PhCOPh$

A. $A < B < C < D$

B. $D < B < C < A$

C. $D < C < B < A$

D. $C < D < B < A$

Answer: C

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6. With which of the following reagents, carbonyl compound shows addition cum elimination reaction

A. PCl_5

B. Brady's reagent

C. HCN

D. all of these

Answer: B



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7. In a reaction RCHO is reduced to RCH_3 using amalgamated zinc and concentrated HCl and warming the solution. The reaction is known as

A. Meerwein-Ponndorf Verley formate

B. Clemmensen reduction

C. Wolff-Kishner reduction

D. Schiff's reaction

Answer: B



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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 organic compounds answers to both iodoform test and Fehling's test?

- A. Ethanal
- B. Propanone
- C. Ethanol
- D. methanol

Answer: A



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10. 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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11. Which compounds do not undergo Cannizzaro Reaction ?

A. formaldehyde

B. acetaldehyde

C. benzaldehyde

D. trimethylacetaldehyde

Answer: B

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12. Methyl ketones are usually characterised through

A. Tollens' reagent

B. Iodoform test

C. Schiff's reagent

D. Fehling's solution

Answer: B

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13. In urotropine, the number of N-N bond

A. 6

B. 4

C. 2

D. 0

Answer: D

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14. 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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15. The general formula $C_nH_{2n}O_2$ could be for open chain

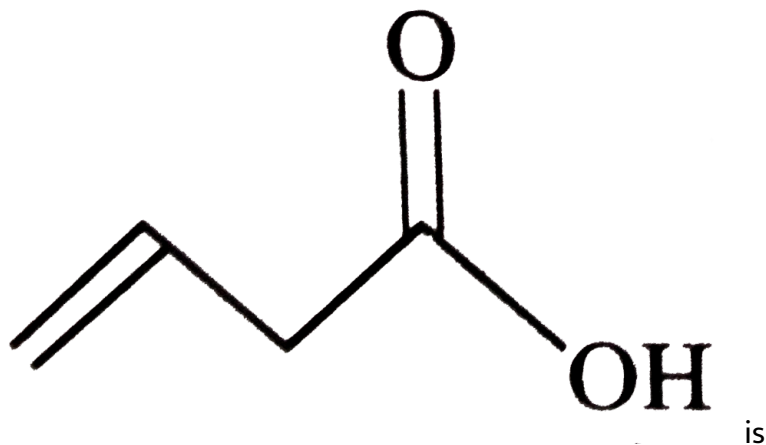
- A. dialdehydes
- B. diketones
- C. carboxylic acids

D. diols

Answer: C

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16. The IUPAC name of



A. but-3-enoic acid

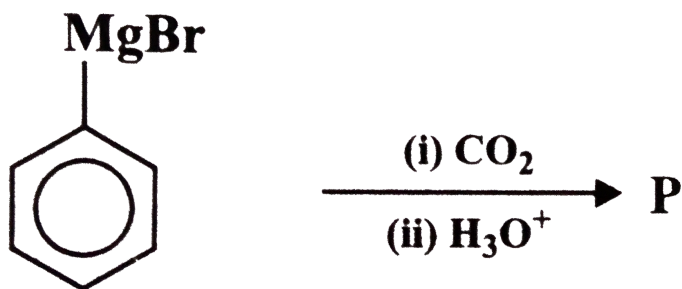
B. but-1-enoic acid

C. pent-4-enoic acid

D. prop-2-enoic acid

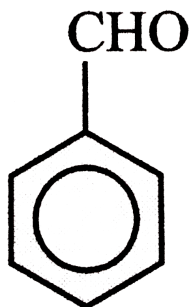
Answer: A

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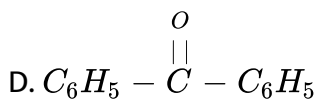
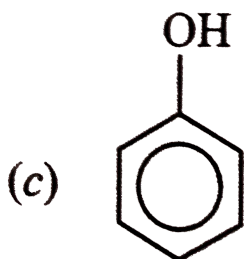
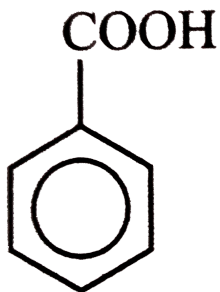


17.

In the above reaction, product 'P' is



A.



Answer: B

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18. Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH gives

A. o-Cresol

B. p-Cresol

C. 2,4-Dihydroxytoluene

D. Benzoic acid

Answer: D

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19. Identify the correct order of boiling points of the following compounds: $CH_3CH_2CH_2CH_2OH$, $CH_3CH_2CH_2CHO$

$CH_3CH_2CH_2COOH$

A. 1 > 2 > 3

B. 3 > 1 > 2

C. 1 > 3 > 2

D. 3 > 2 > 1

Answer: B



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20. When propionic acid is treated with aqueous sodium bicarbonate, CO_2 is liberated. The 'C' of CO_2 comes from

- A. methyl group
- B. carboxylic acid group
- C. methylene group
- D. bicarbonate.

Answer: D



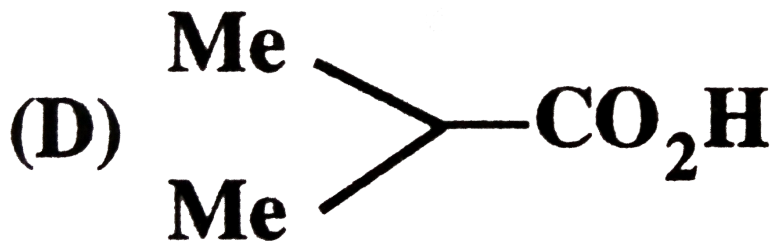
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21. The correct order of increasing acid strength of the compounds

(A) CH_3CO_2H

(B) $MeOCH_2CO_2H$

(C) CF_3CO_2H



(D).

A. $B < D < A < C$

B. $D < A < C < B$

C. $D < A < B < C$

D. $A < D < C < B$

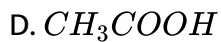
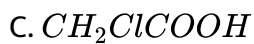
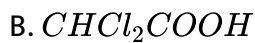
Answer: C



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22. Which is most acidic ?

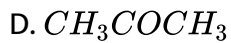
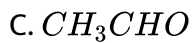
A. CF_3COOH



Answer: A

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23. Which of the following does not reduce Tollens reagent .



Answer: D

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24. Formic acid can be distinguished from acetic acid by its reaction with:

- A. NaHCO_3
- B. dil. Acidified KMnO_4 solution
- C. 2,4-dinitrophenylhydrazine
- D. Na metal

Answer: B

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TEST YOUR GRIP (II. FILL IN THE BLANKS)

1. Characteristic group of aldehyde is_____.

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2. The boiling points of alcohols are higher than those of hydrocarbons of comparable masses due to:

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3. Aliphatic aldehydes do not position isomers why ?

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4. When calcium acetate is distilled alone, __ is formed.

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5. In rosenmund reduction, benzoyl chloride in boiling xylene is reduced to benzaldehyde in presence of ____.

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6. The reaction of acetyl chloride with diethylcadmium followed by hydrolysis gives

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7. When 2-butyne is hydrated with dil. H_2SO_4 in presence of $HgSO_4$, it gives ____.

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8. Addition of water to acetylene compounds is catalysed by _____ and _____.

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9. The structure of the intermediate product formed by the oxidation of toluene with CrO_3 and acetic anhydride, whose

hydrolysis gives benzaldehyde is.....

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10. the characteristic reactions of aldehydes and ketones are ___ reactions.

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11. Propanal is ___ than propanone towards nucleophiles.

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12. The reaction of acetaldehyde and HCN, followed by complete acid hydrolysis gives

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13. Aldehydes react with alcohols in presence of dry hydrogen chloride to form_____.

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14. Acetone on reduction with magnesium amalgam and water gives

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15. Acetophenone hydrazone when heated with KOH in ethylene glycol at 453 K gives _____. This is known as _____.

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16. Fehling solution A consists of an aqueous solution of copper sulphate while Fehling solution B consists of an alkaline solution of _____.



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17. Fehling's solution reduces ____ aldehydes but not _____ aldehydes.

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18. 2-pentanone can be differentiated from 3-pentanone by

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19. Between acetophenone and anisole, iodoform test is given by ____.

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20. The reaction of acetophenone with Br_2 in presence of anhydrous $AlCl_3$ gives ____ but with Br_2 in presence of ether at 273K gives _____.

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21. Ethanol vapour is passed over heated copper and the product is treated with aqueous NaOH. The final product is

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22. In presence of $Ba(OH)_2$, two molecules of acetone condense together to form

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23. Acetone on heating with conc. H_2SO_4 gives :

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24. Cannizzaro reaction is given by aldehydes which do not have _____.

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25. In Canizzaro reaction, HCHO reacts in presence of_____.

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26. Formaldehyde on treatment with____gives an____and salt of a carboxylic and this reaction is called_____.

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27. Acetone reacts with butan-2-ol in presence of aluminium tertiary butoxide to form :

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28. Ammonia reacts with to give urotropine.

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29. Benzoin is formed when benzaldehyde is treated with_____.

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30. The structure of the enol form of

$CH_3 - CO - CH_2 - CO - CH_3$ with intermolecular hydrogen bonding is.....

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31. The structure of aspirin is_____.

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32. Lime water is an aqueous solution of

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33. The characteristic group of carboxylic acids is_____.

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34. O- Xylene on oxidation with alkaline $KMnO_4$ followed by acidification with HCl gives

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35. Ethanenitrile on hydrolysis gives_____.

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36. Grignard reagents give alkane, on reaction with :

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37. pK_a and K_a of an acid are connected by the relation

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38. Higher the ___ or lower the ___ of an acid, stronger is the acid.

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39. Ethanoic acid is a weaker acid than methanoic acid due to ___ of the methyl group.

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40. Chloroacetic acid is a stronger acid than acetic acid due to ___ of the chlorine atom.

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41. m-Methoxybenzoic acid is a _____ acid than p-methoxybenzoic acid due to ___ of the OCH_3 group at m-position.

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42. Acyl halides are prepared by the action of ___ on carboxylic acids.

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43. Amides are least reactive of the acid derivatives towards ___ reactions.

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44. ___ is involved when an amide is heated with a dilute solution of sodium hydroxide.

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45. Esters on treatment with excess of grignard reagents followed by acid hydrolysis gives_____.

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46. When ammonium acetate is heated_____ is formed.

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47. When ethyl acetate is treated with_____ acetoacetic ester is formed.

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48. Kolbe's electrolysis of potassium succinate gives CO_2 and
.....

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49. Hell-Volhard-Zelinsky reaction involves the replacement of an Atom from the alkyl group of a monocarboxylic acid by a Atom.

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50. Nitration of benzoic acid gives m-nitrobenzoic acid.

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51. Benzoic acid does not undergo Friedel-Crafts reaction due to..... Of the benzene ring by the Effect of $-COOH$ group.

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52. Formic acid reduces ____ but acetic acid does not.

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53. Vinegar is a dilute solution of ____.

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CONCEPTUAL QUESTIONS

1. Although aldehydes are easily oxidisable, propanal can conveniently be prepared by oxidation of propanol by acidified potassium dichromate.

Why?

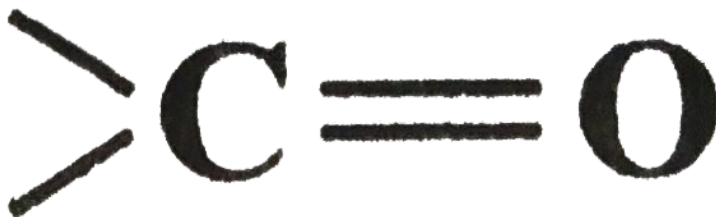
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2. Explain why dialkylcadmium is considered superior to Grignard reagent for the preparation of a ketone from an acid chloride?

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3. Although



and have a
double bond, they exhibit different type of addition reactions. Explain.

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4. Explain why aldehydes are more reactive than ketones.

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5. Benzaldehyde reduces Tollens' reagent but not the Fehling's or the Benedict's solution. Explain.

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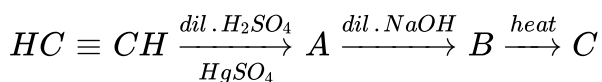
6. Dipole moments of aldehydes and ketones are higher than those of alcohols, explain.

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7. Explain, why *o*-hydroxybenzaldehyde is a liquid at room temperature while *p*-hydroxybenzaldehyde is a high melting solid?

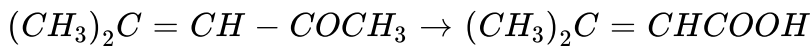
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8. Identity A,B and C in the following reaction



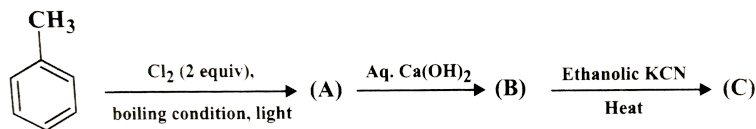
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9. Suggest a suitable oxidising agent for the given conversion.



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10. Write the structures (A) to (C) for the following reactions:



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11. An organic compound (A) having molecular formula C_2H_6O on oxidation with $Na_2Cr_2O_7/H_2SO_4$ produces a compound (B) which reduces Tollens' reagent. Both (A) and (B) produce a yellow solid on treatment with I_2/OH^- . Identify (A) and (B).

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12. Show the arrowhead steps for the preparation

of acetic acid by using the following substances in the correct order:

dry $C_2H_5OC_2H_5$, I_2 , Mg , red P, CH_3OH , CO_2 , dilute HCl.



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13. Fluorine is more electronegative than chlorine but p-fluorobenzoic acid is a weaker acid than p-chlorobenzoic acid. Explain.



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14. p-Nitrobenzoic acid has higher K_a value than benzoic acid. Give reasons.

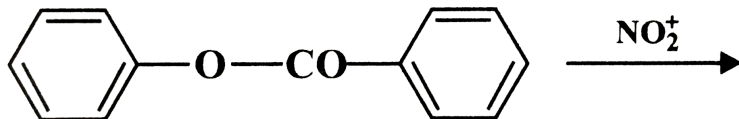


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15. Carboxylic acids do not give the characteristic reactions of carbonyl group. Explain.

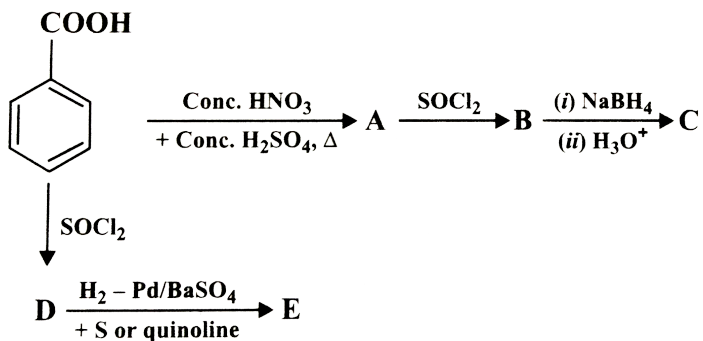
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16. Predict the product of the following reaction



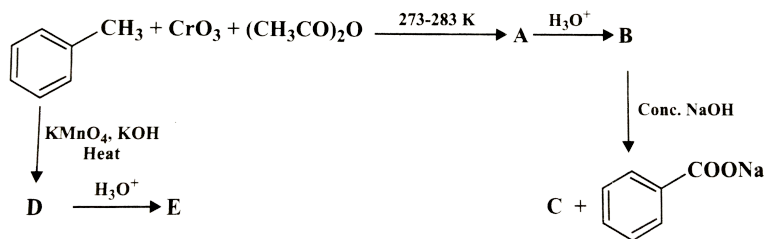
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17. Identify A to E in the following reaction



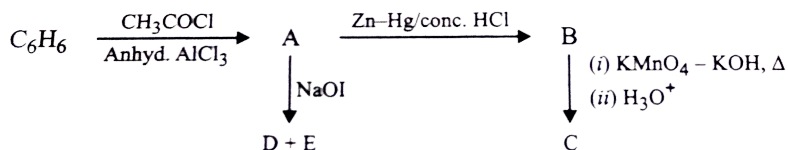
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18. Identify A to E in the following series of reactions:



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19. Write the structure of A,B,C,D and E in the following reactions:



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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



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

$CH_3CH_2CH_2CHO$, $CH_3CH_2CH_2CH_2OH$, $H_5C_2 - O - C_2H_5$, CH_3CH_2



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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 Tollen's reagent or Fehling's solution , nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formulae $C_7H_6O_2$. Identify the compound (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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NCERT QUESTIONS AND EXERCISES WITH ANSWERS (NCERT INTEXT UNSOLVED QUESTIONS)

1. Write the structures of the following compounds.

(i) α -Methoxypropionaldehyde

(ii) 3-Hydroxybutanal

(iii) 2-Hydroxycyclopentane carbaldehyde

(iv) 4-Oxopentanal

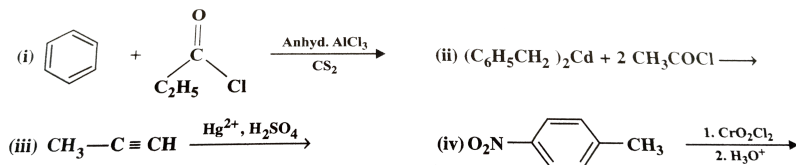
(v) Di-sec. butyl ketone

(vi) 4-Fluoroacetophenone



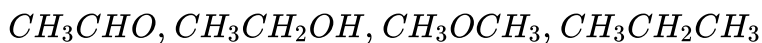
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2. Write the structures of product of the following reactions:



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



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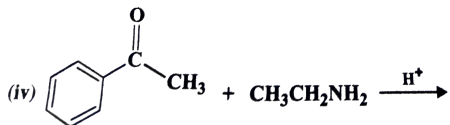
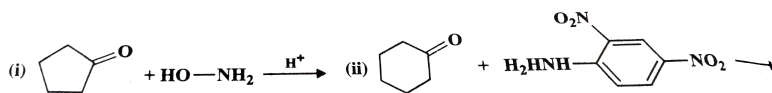
4. Arrange the following carbonyl compounds in the increasing order of their reactivity in nucleophilic addition reactions :

(i) Ethanal, propanal, propanone, butane

(ii) Benzaldehyde, p-tolualdehyde, p-nitrobenzaldehyde, acetophenone

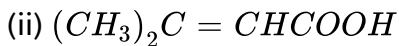
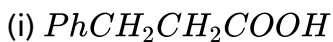
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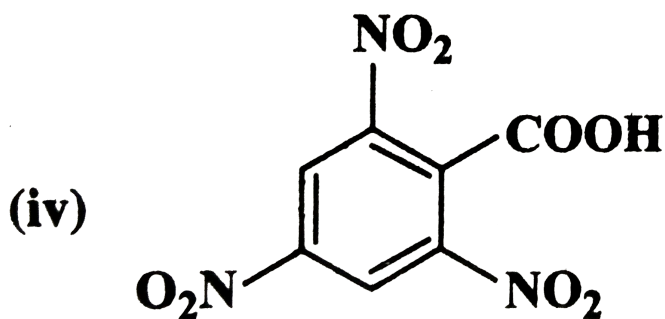
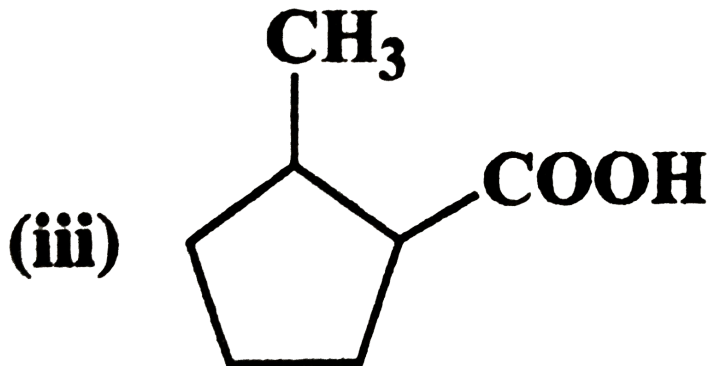
5. Predict the products of the following reactions:



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6. Give the IUPAC names of the following compounds:





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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 FCH_2CO_2H

(ii) FCH_2CO_2H or $ClCH_2CO_2H$

(iii) $FCH_2CH_2CH_2CO_2H$ or $CH_3 - CHF - CH_2CO_2H$

(iv) $F_3C - \text{C}_6\text{H}_4 - COOH$ or $H_3C - \text{C}_6\text{H}_4 - COOH$

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NCERT 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

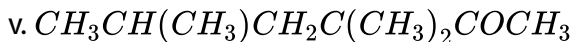
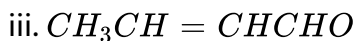
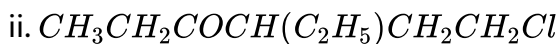
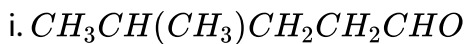
(ix) 2,4-DNP-derivative

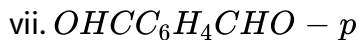
(x) Schiff's base



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





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3. Draw the structures of following compound:

i. 3-Methylbutanal

ii. p-Nitropropiopehnone

iii. P-Methylbenzaldehyde

iv. 4-Methylpent-3-en-2-one

v. 4-Chloropentan-2-one

vi. 3-Bromo-4-phenylpentanoic acid

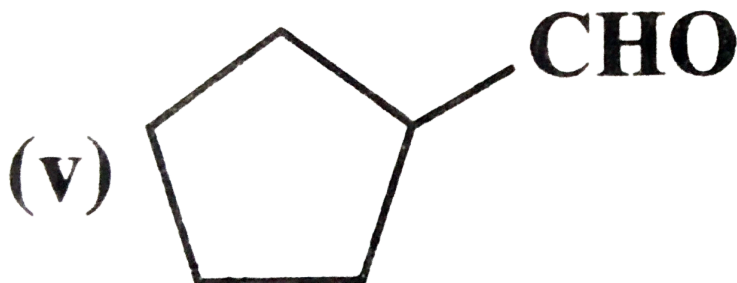
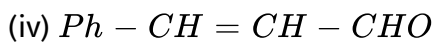
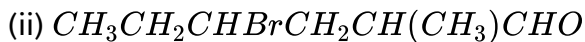
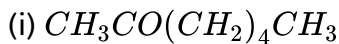
vii. p-p'-Dihydroxybenzophenone

viii. Hex-2-en-4-ynoic acid

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

Wherever possible, give also common names.



(v)

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5. Draw the structure of following derivatives:

i. 2,4-Dinitrophenylhydrazone of benzaldehyde.

ii. Cyclopropanone oxime

iii. Actaldehyde dimethyl acetal

iv. Semicarbazone of cyclobutanone

v. Ethylene ketal of hexan-3-one

vi. Methyl hemiacetal of formaldehyde

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

- i. PhMgBr and then H_3O^+
- ii. Tollens reagent
- iii. Semicarbazine 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 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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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 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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10. 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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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 the increasing order of their property as indicated:

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

ii.

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

(acidic strength).

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



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13. 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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14. 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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15. 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-Nitroacetopenone

v. Benzaldehyde to Benzophenone

vi. Bromobenzene to 1-Phenylethanal

vii. benzaldehyde to 3-Phenylpropan-1-ol

viii. Benzaldehyde to α -Hydroxyacetic acid

ix. Benzoic acid to m-Nitrobenzyl alcohol

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16. Describe the following

i. Acetylation

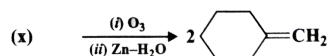
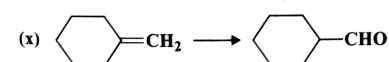
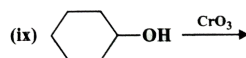
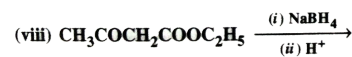
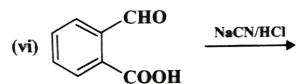
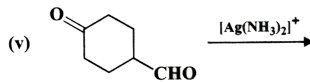
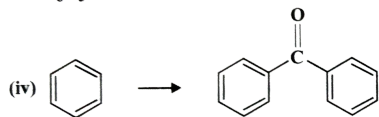
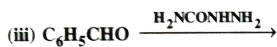
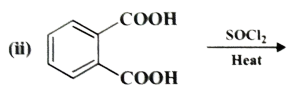
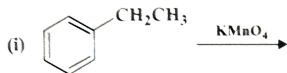
ii. Cannizzaro reaction

iii. Cross aldol condensation

iv. Decarboxylation

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



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18. 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 ester should be removed as soon as it is formed.

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19. 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 additional 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.

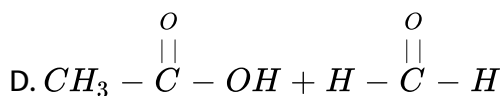
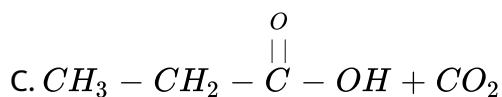
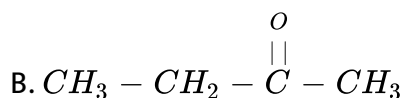
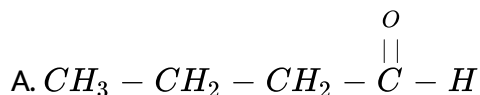
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20. Although phenoxide ion has more number of resonating structures than carboxylate ion, carboxylic acid is a stronger than phenol. Why?

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**NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS
(MULTIPLE CHOICE QUESTION-I)**

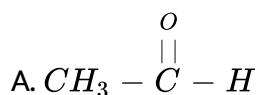
1. Addition of water to alkynes occurs in acidic medium and in the presence of Hg^{2+} ions as a catalyst. Which of the following products will be formed on addition of water to but-1-yne under these conditions ?

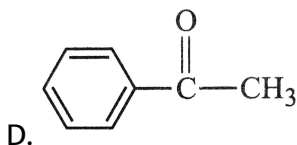
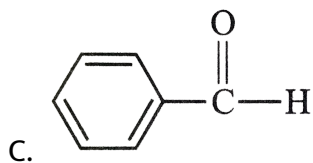
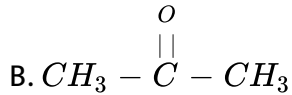


Answer: B

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2. Which of the following compounds is most reactive towards nucleophilic addition reactions?





Answer: A

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3. The correct order of increasing acidic strength is _____.

A. Phenol < Ethanol < Chloroacetic acid < Acetic acid

B. Ethanol < Phenol < Chloroacetic acid < Acetic acid

C. Ethanol < Phenol < Acetic acid < Chloroacetic acid

D. Chloroacetic acid < Acetic acid < Phenol < Ethanol

Answer: C



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4. Compound $Ph - O - \overset{O}{\parallel} C - Ph$ can be prepared by the reaction of _____.

- A. Phenol and benzoic acid in the presence of NaOH
- B. Phenol and benzoyl chloride in the presence of pyridine
- C. Phenol and benzoyl chloride in the presence of $ZnCl_2$
- D. Phenol and benzaldehyde in the presence of palladium

Answer: B



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

- A. Sodium hydrogensulphite

B. Phenyl hydrazine

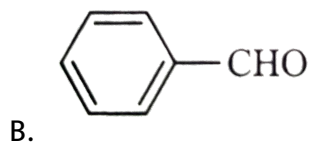
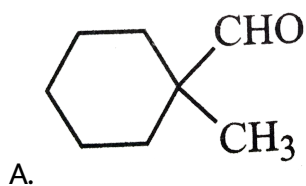
C. Fehling's solution

D. Grignard reagent

Answer: C

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6. Cannizzaro's reaction is not given by



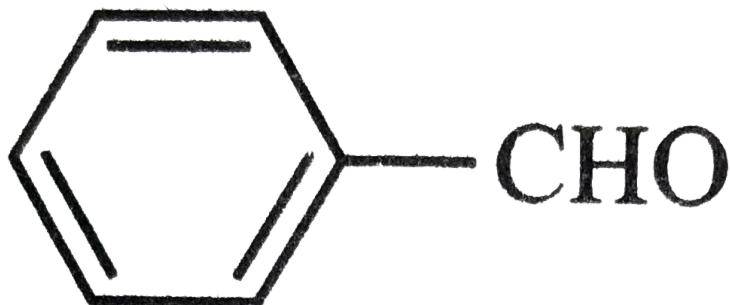
C. HCHO

D. CH_3CHO

Answer: D

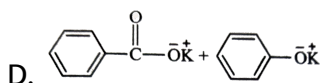
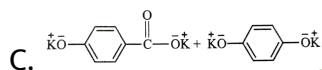
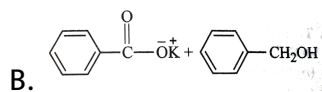
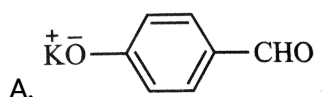
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7. Which product is formed when the compound



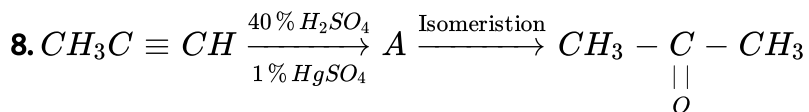
is treated

with concentrated aqueous KOH solution?



Answer: B

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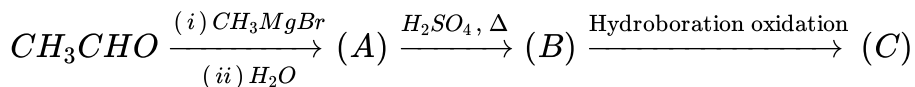
Structure of A and type of isomerism in the above reaction respectively are

- A. Prop-1-en-2-ol, metamerism
- B. Prop-1-en-1-ol, tautomerism
- C. Prop-2-en-2-ol, geometrical isomerism
- D. Prop-1-en-2-ol, tautomerism

Answer: D

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9. Compounds (A) and (C) in the following reactions are



- A. Identical
- B. Positional isomers
- C. Functional isomers
- D. Optical isomers

Answer: B



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10. Which is the most suitable reagent for the following conversion ?



- A. Tollens' reagent

B. Benzoyl peroxide

C. I_2 and $NaOH$ solution

D. Sn and NaOH solution.

Answer: C

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11. Which of the following compound will give butanone on oxidation with alkaline $KMnO_4$ solution ?

A. Butan-1-ol

B. Butan-2-ol

C. Both of these

D. None of these

Answer: B

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12. In Clemmensen reduction carbonyl compound is treated with _____.

- A. Zinc amalgam+HCl
- B. Sodium amalgam+HCl
- C. Zinc amalgam+Nitric acid
- D. Sodium amalgam+ HNO_3 .

Answer: A

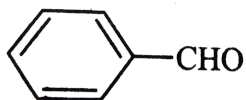


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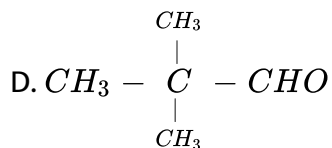
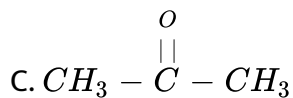
**NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS
(MULTIPLE CHOICE QUESTION-II)**

1. Which of the following compounds do not undergo aldol condensation?

- A. $CH_3 - CHO$



B.



Answer: B::D

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2. Treatment of compound $\text{Ph} - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{Ph}$

with NaOH solution yields

- A. Phenol
- B. Sodium phenoxide
- C. Sodium benzoate
- D. Benzophenone

Answer: B::C

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3. Which of the following conversion can be carried out by Clemmensen reduction ?

- A. Benzaldehyde into benzyl alcohol
- B. Cyclohexanone into cyclohexane
- C. Benzoyl chloride into benzaldehyde
- D. Benzophenone into diphenylmethane

Answer: B::D

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4. Through which of the following reactions number of carbon atoms can be increased in the chain ?

- A. Grignard reaction
- B. Cannizzaro's reaction
- C. Aldol condensation
- D. HVZ reaction

Answer: A:C

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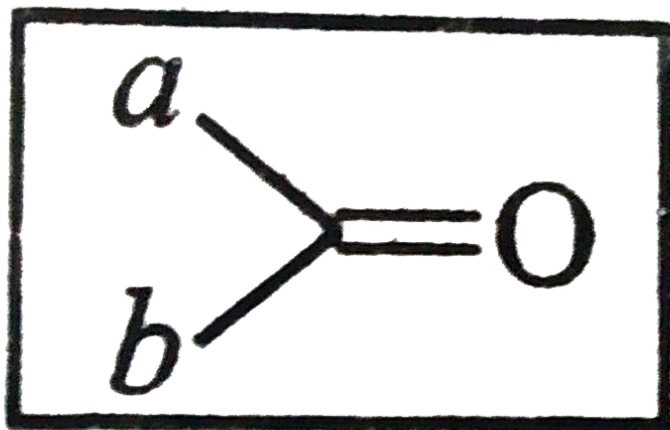
5. Benzophenone can be obtained by

- A. Benzoyl chloride+Benzene+ $AlCl_3$
- B. Benzoyl chloride+Diphenylcadmium
- C. Benzoyl chloride+Phenylmagnesium chloride
- D. Benzene+Carbon monoxide+ $ZnCl_2$

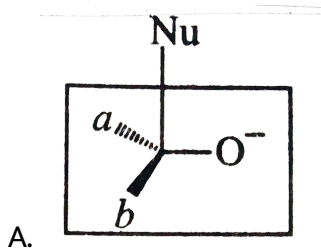
Answer: A:B

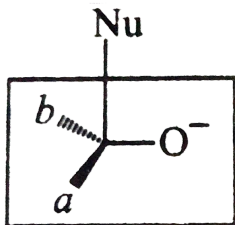
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6. Which of the following is the correct representation for intermediate of nucleophilic addition reaction to the given carbonyl compound (A):

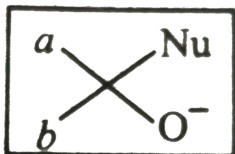


(A)

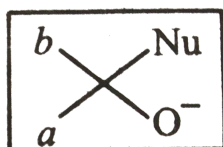




B.



C.



D.

Answer: A::B

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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (SHORT ANSWER QUESTIONS)

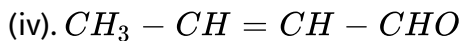
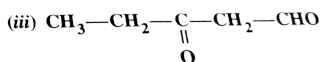
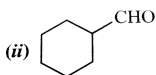
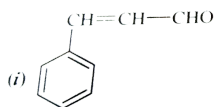
1. Why is there a large difference in the boiling points of butanal and butan-1-ol ?

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2. Write a test to differentiate between pentan-2-one and pentan-3-one.

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3. Give the IUPAC names of the following compounds



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4. Give the structure of the following compounds :

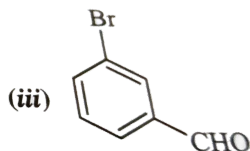
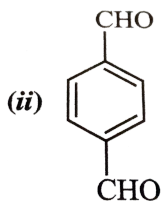
(i) 4-Nitropropiophenone

(ii) 2-Hydroxycyclopentanecarbaldehyde

(iii) Phenyl acetaldehyde.

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5. Write IUPAC names of the following structures.



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6. Benzaldehyde can be obtained from benzalchloride. Write reactions for obtaining benzalchloride and then benzaldehyde from it.

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7. Name the electrophile produced in the reaction of benzene with benzoyl chloride in the presence of anhydrous $AlCl_3$. Name the reaction also.

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8. Oxidation of ketones involves carbon-carbon bond cleavage. Name the products formed on oxidation of 2, 5-dimethylhexan-3-one.

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9. Arrange the following in decreasing order of their acidic strength and give reason for your answer.

CH_3CH_2OH , CH_3COOH , $ClCH_2COOH$, FCH_2COOH , $C_6H_5CH_2COOH$

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10. What product will be formed on reaction of propanal with 2-methylpropanal in the presence of NaOH? Write the name of the reaction also.

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11. Compound 'A' is prepared by oxidation of compound 'B' with alkaline $KMnO_4$. Compound 'A' on reduction with lithium aluminium hydride gets converted back to compound 'B'. When compound 'A' is heated with compound 'B' in the presence of H_2SO_4 , it produces fruity smell of compound 'C'. To which family, the compounds 'A', 'B' and 'C' belong to ?

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12. Arrange the following in decreasing order of their acidic strength. Give explanation for the arrangement.

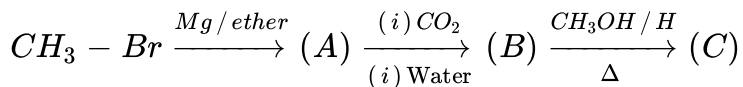


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13. Carboxylic acids contain carbonyl group but do not show the nucleophilic addition reactions like aldehydes or ketones. Why?

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14. Identify the compounds A, B and C in the following reaction :

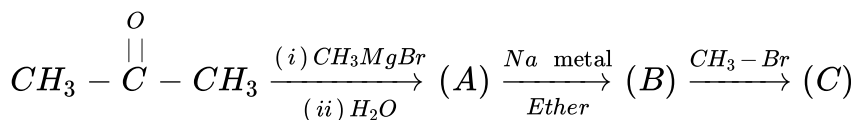


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15. Why are carboxylic acids more acidic than alcohols or phenols although all of them have hydrogen atom attached to a oxygen atom (-OH)?

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16. Complete the following reactions sequence:



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17. Ethylbenzene is generally prepared by acetylation of benzene followed by reduction and not by the direct alkylation of benzene. Think of a possible reason.

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18. Can Gattermann-Koch reaction be considered similar to Friedel Craft's acylation ? Discuss.

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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (MATCHING TYPE QUESTIONS)

1. Match the acids given in column I with their correct IUPAC names given in column II.

Column I (Acids)

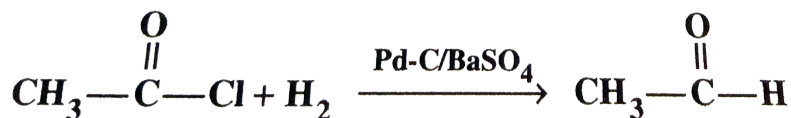
- (a) Phthalic acid
- (b) Oxalic acid
- (c) Succinic acid
- (d) Adipic acid
- (e) Glutaric acid

Column II (IUPAC names)

- (i) Hexane-1, 6-dioic acid
- (ii) Benzene-1, 2-dicarboxylic acid
- (iii) Pentane-1, 5-dioic acid
- (iv) Butane-1, 4-dioic acid
- (v) Ethane-1, 2-dioic acid

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2. Match the reactions given in column I with the suitable reagents given in column II.



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**NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS
(ASSERTION AND REASON TYPE QUESTIONS)**

1. Assertion: Formaldehyde is a planar molecule.

Reason: It contains sp^2 hybridised carbon atom.

- A. Assertion and reason both are correct and reason is correct explanation of assertion.
- B. Assertion and reason both are wrong statement.
- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

Answer: A

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2. Assertion (A) compound containing -CHO group are easily oxidised to corresponding carboxylic acids

Reason (R) : Carboxylic acids can be reduced to alcohols by treatment with $LiAlH_4$

- A. Assertion and reason both are correct and reason is correct explanation of assertion.
- B. Assertion and reason both are wrong statement.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion and reason both are correct statement but reason is not correct explanation of assertion.

Answer: D

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3. Assertion: The α -hydrogen atom in carbonyl compounds is less acidic.

Reason: The anion formed after the loss of α -hydrogen atom is resonance stabilised.

A. Assertion and reason both are correct and reason is correct explanation of assertion.

B. Assertion and reason both are wrong statement.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: D

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4. Assertion : Aromatic aldehydes and formaldehyde undergo Cannizzaro reaction

Reason : Aromatic aldehydes are almost as reactive as formaldehyde.

- A. Assertion and reason both are correct and reason is correct explanation of assertion.
- B. Assertion and reason both are wrong statement.
- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

Answer: C

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5. Assertion: Aldehydes and ketones, both react with tollens' reagent to form silver mirror.

Reason: Both, aldehydes and ketones contain a carbonyl group.

- A. Assertion and reason both are correct and reason is correct explanation of assertion.
- B. Assertion and reason both are wrong statement.
- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

Answer: D



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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (LONG ANSWER QUESTIONS)

1. An alkene 'A' (molecular formula C_5H_{10}) on ozonolysis gives a mixture of two compounds 'B' and 'C'. Compound 'B' gives positive Fehling's test and also forms iodoform on treatment with I_2 and $NaOH$. Compound 'C' does not give Fehling's test but forms iodoform. Identify the compounds A, B and C. Write the reaction for ozonolysis and formation of iodoform from B and C.

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2. An aromatic compound 'A' (Molecular formula C_8H_8O) gives positive 2, 4-DNP test. It gives a yellow precipitate of compound 'B' on treatment with iodine and sodium hydroxide solution. Compound 'A' does not give Tollen's or Fehling's test. On drastic oxidation with potassium permanganate, it forms a carboxylic acid 'C' (Molecular formula $C_7H_6O_2$), which is also formed along with the yellow compound in the above reaction. Identify A, B and C and write all the reactions involved.

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3. Write down functional isomers of a carbonyl compound with molecular formula C_3H_6O . Which isomer will react faster with HCN and why? Explain the mechanism of the reaction also. Will the reaction lead to the completion with the conversion of whole reactant into product at reaction conditions? if a strong acid is added to the reaction mixture what will be the effect on concentration of the product and why?

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4. When liquid 'A' is treated with a freshly prepared ammoniacal silver nitrate solution, it gives bright silver mirror. The liquid forms a white crystalline solid on treatment with sodium hydrogen sulphite. Liquid 'B' also forms a white crystalline solid with sodium hydrogen sulphite but it does not give test with ammoniacal silver nitrate. which of the two liquids is aldehyde? Write the chemical equations of these reactions also.

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ADDITIONAL QUESTIONS (VERY SHORT ANSWER QUESTIONS)

1. Give the IUPAC names of: (i) Diacetone alcohol (ii) Crotonaldehyde.

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2. Draw the structure of the following :

(i) 3-Methylbutanal , (ii) p-Methoxybenzaldehyde , (iii) 4-Chloropentan-2-one

(iv) p,p-Dihydroxybenzophenone, (v) p-Nitropropiophenone , (vi) 4-Methylpent-3-en-2-one,

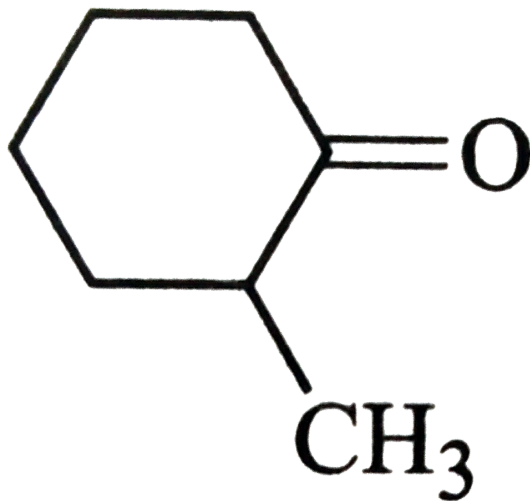
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3. Write the structural formula of

(i) 3-oxopentanal,

(ii) 1-Phenylpentan-1-one

(iii) p-Methylbenzaldehyde,



(iv).

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4. Name the reaction and the reagent used for the conversion of acid chloride to the corresponding aldehydes.

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5. What happens when calcium ethanoate is dry distilled?

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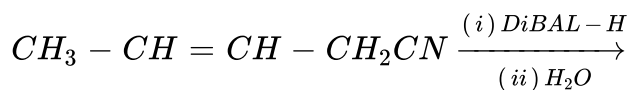
6. What is the product of the reaction of ethanoyl chloride with diethylcadmium followed by acid hydrolysis?

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7. How is acetone obtained from 2-bromopropane?

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8. Write the product of the following reaction:



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9. Write one chemical reaction to illustrate Wacker's process for converting ethylene into ethanal.



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10. How is acetone obtained from ethanol?

Or How is acetic acid converted into acetone?



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11. Name one reagent used to convert toluene into benzaldehyde.



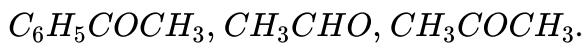
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12. Chromyl chloride in CS_2 (CrO_2Cl_2/CS_2) or chromium trioxide in acetic anhydride [$CrO_3/(CH_3CO)_2O$] followed by acid hydrolysis.



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13. Arrange the following in order of increasing reactivity towards nucleophilic addition reactions



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14. Ethanal is soluble in water. Why?

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15. Acetone is highly soluble in water but benzophenone is not. Give reasons.

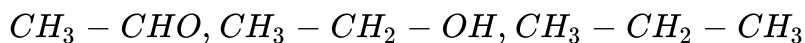
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16. Suggest a reason for the larger difference between boiling points of butanol and butanal, although they have almost the same solubility in

water.

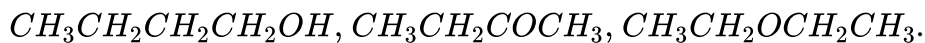
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17. Rearrange the following compounds in the increasing order of their boiling points :



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



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19. How will you convert acetone into 2-methyl-2-propanol?

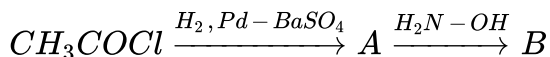
Or how is tert-butyl alcohol obtained from acetone?

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20. Draw the structure of semicarbozide of ethanal.

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21. Write the structures of A and B in the following reaction,



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22. Hydrazones of aldehydes and ketones are not prepared in highly acidic medium. Explain.

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23. Acetophenone on reaction with hydroxyl amine hydrochloride can produce two isomeric oximes. Write the structures of the oxime.

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24. How will you convert propanone to propan-2-ol?

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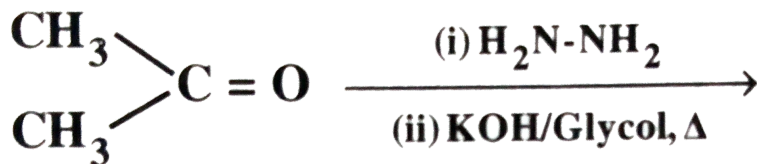
25. Name two methods which are commonly used to convert $>C=O$ group into a $>CH_2$ group.

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26. What product is obtained when acetophenone is treated with hydrazine hydrate and KOH at 453-473K?

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27. Predict the product of the following reaction:



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28. Give the chemical reaction when ethanal is heated with hydrogen iodide and red phosphorus under high pressure.

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29. Fehling's solution is

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30. What is Tollen's reagent? Write one usefulness of this reagent.

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31. Name two reagents which can be used to distinguish acetaldehyde from acetone?

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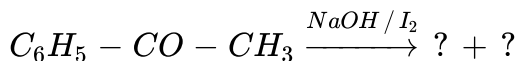
32. Give the IUPAC name of the only aldehyde which undergoes iodoform test.

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33. What type of ketones undergo test?

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34. Predict the product of the following reaction:



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35. To distinguish between 2-pentanone and 3-pentanone which reagent can be used ?

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36. Out of acetophenone and benzophenone, which gives iodoform test?

Write the reaction involved.

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37. A and B are two functional isomers of compound C_3H_6O . On heating with NaOH and I_2 , isomer B forms yellow precipitate of iodoform whereas

isomer A does not form any precipitate. Write the structures of A and B.

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38. What type of aldehydes and ketones undergo aldol condensation?

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39. Which type of aldehyde can go Cannizzaro reaction ?

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40. How will you prepare methanol from formaldehyde without using a reducing agent.

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41. Write chemical equation involved in Cannizzaro's reaction.



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42. Write method of preparation of urotropine and give its use.



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43. Write two important uses of formalin.



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44. Draw the structures of the following :

(i) 3-Bromo -4- phenylpentanoic acid (ii) Hex -2- en 4- ynoic acid



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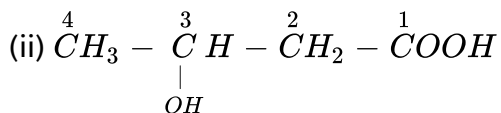
45. Give the structure and the IUPAC name of the lowest molecular mass aliphatic monocarboxylic acid containing a chiral carbon. Or write the

structure of active valeric acid.

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46. Give the IUPAC name of the following compounds.

(i) 

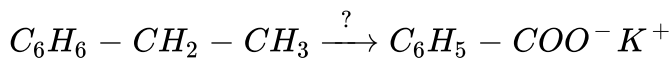


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47. Why are carboxylic acids called fatty acids?

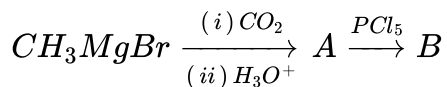
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48. Name the reagent used in the following reactions:



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49. Write the structures of A and B in the following reaction



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50. Suggest a scheme to convert alcohol into an acid with one more carbon atom.

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51. How is CH_3OH converted into CH_3COOH (in one step)?

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52. Why is benzoic acid less soluble in water than acetic acid?

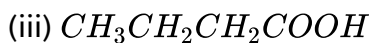
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53. Arrange the following in increasing order of their boiling points.



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54. Arrange the following in decreasing order of boiling point.



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55. What is meant by 'acidity constant', K_a ? How is it expressed?

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56. What makes ethanoic acid a stronger acid than ethanol?

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57. What makes acetic acid a stronger acid than phenol?

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58. pK_a of chloroacetic acid is lower than pK_a of acetic acid. Explain.

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59. Arrange the following as stated :

'Increasing order of acidic strength'.

$ClCH_2COOH$, CH_3CH_2COOH , $ClCH_2CH_2COOH$, $(CH_3)_2CHCOOH$,

.

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60. Why is pK_a of $F - CH_2COOH$ lower than that of $Cl - CH_2COOH$

?



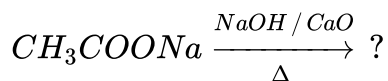
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61. How would you distinguish experimentally between an alcohol and a carboxylic acid?



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62. Predict the product of the following reaction



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63. Which one of the following is an example of Hell-Volhard Zelinsky reaction?



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64. Why HCOOH does not give HVZ reaction but CH_3COOH does ?

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65. Name the reagent used to convert carboxylic acids directly to the corresponding alcohols.

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66. Account for the following :

(i) Benzoic acid does not undergo Friedel crafts reaction

(ii) Pk_a value of chloroacetic is lower than Pk_a of acetic acid.

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67. What is vinegar ?

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68. Mention a chemical property in which formic acid (methanoic acid) differs from acetic acid (ethanoic acid).

Or Formic acid reduces Tollens' reagent but acetic acid does not.

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

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70. Why is ester hydrolysis slow in the beginning and becomes faster after some time?

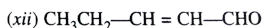
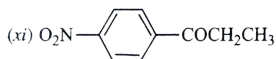
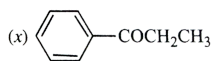
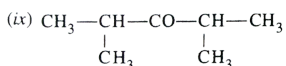
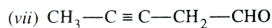
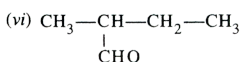
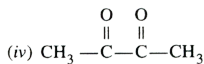
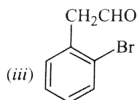
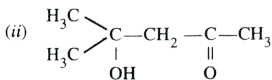
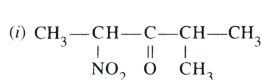
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ADDITIONAL QUESTIONS (SHORT ANSWER QUESTIONS)

1. Write structures of various possible carbonyl compounds having the molecular formula, C_4H_8O . Give their common as well as IUPAC names.

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2. Give the IUPAC names of the following compounds:



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3. Write the formula of the following (i) 4-Methylpent-3-en-2-one (ii) 2-Ethoxy-4-methoxypentan-3-one

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4. In what respects, the C=C and C=O bonds resemble and differ from each other?

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5. Why do aldehydes behave like polar compounds?

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6. Draw the structure of a carbonyl group and indicate clearly (i) hybridised state of carbon, bonds present and (iii) electrophilic and nucleophilic centres in it.

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7. How will you prepare

(i) ethyl bromide from propionic acid (ii) ethyl propanoate from propanoic acid

(iii) Acetone from acetic acid (iv) m- nitrobenzoic acid from benzoic

(v) Chloroacetic acid from methyl chloride



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8. How will you obtain

(i) Benzaldehyde from benzoyl chloride

(ii) Acetophenone from benzene.

(iii) Butanone from 2-butanol

(iv) Ethanal from 2-butene.

(v) Benzaldehyde from toluene.

(vi) Acetaldehyde from acetylene?



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9. How will you perform the following conversions?

- (i) Acetaldehyde to acetone
- (ii) Propanone to propene
- (iii) Propene to propanone
- (iv) Benzaldehyde to benzophenone
- (v) Benzene to acetophenone

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10. Write reactions stating conditions for the following conversion:

- (i) Toluene to benzaldehyde.
- (ii) Benzene to acetophenone.
- (iii) Ethyl cyanide or propanenitrile to 1-phenylpropanone.
- (iv) Benzene to benzaldehyde.

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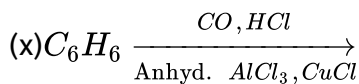
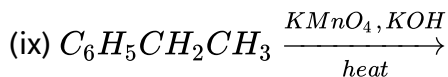
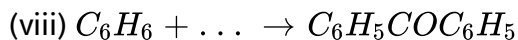
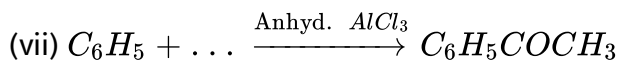
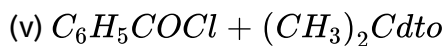
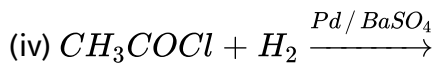
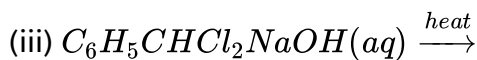
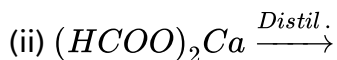
11. How is benzophenone prepared from benzene? Give only equation.

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12. How will you obtain 3-pentanone from propionic acid?

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13. Complete the following equation giving the names of the reactants and the products:





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14. Show with chemical equation, how will you convert (i) acetaldehyde into acetone and (ii) benzaldehyde into acetophenone?

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15. Why are boiling point of aldehydes and ketones lower than those of the corresponding acids ?

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16. What do you mean by a nucleophilic addition reaction? Give its mechanism.

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17. Explain the mechanism of a nucleophilic attack on the carbonyl group of an aldehyde or a ketone.

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18. Aldehydes and ketones undergo nucleophilic/electrophilic addition reactions.

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19. (a) Explain why aldehydes undergo nucleophilic addition reactions more readily than ketones?

(b) Arrange the following in increasing order of reactivity towards nucleophilic addition: HCHO , CH_3CHO , CH_3COCH_3 .

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20. Account for the following:

(i) Ethanal is more reactive towards nucleophilic addition reactions than propanone.

or CH_3CHO is more reactive than CH_3COCH_3 .

(ii) Di-tert-butyl ketone does not give a $NaHSO_3$ adduct but acetone does.

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21. Write chemical equation when:

(i) Acetone reacts with ethanol.

(ii) Ethanal reacts with HCN.

(iii) Acetone reacts with HCN.

(iv) Acetone reacts with $NaHSO_3$.

(v) Ethanal reacts with $NaHSO_3$

(vi) Acetaldehyde reacts with C_2H_5MgBr .

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22. (a) Sodium bisulphite is used for the purification of aldehydes and ketones. Explain.

(b) Benzophenone does not react with $NaHSO_3$.

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23. How is grignard reagent used to prepare tert-butyl alcohol.

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24. Convert ketones into tertiary alcohols.

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25. Write the names and structures of the products formed in the following reactions.

(i) Reaction of ethylmagnesium bromide with 2-butanone

(ii) Acetaldehyde is treated with methylmagnesium halide and then

hydrolysed.

(iii) Propanone is treated with methylmagnesium iodide and then hydrolysed.

(iv) Ethanal is treated with ethanol in the presence of dry HCl gas.

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26. Explain why during preparation of ammonia derivatives from aldehydes and ketones, pH of the reaction is carefully controlled.

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27. Write the structure of the product formed when semicarbazide reacts with formaldehyde.

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28. Write the products of oxidation of (i) 2-pentanone and (ii) 3-pentanone.

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29. How are aldehydes distinguished from ketones using Tollen's and Fehling's reagents? Chemical reaction.

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30. How will you distinguish benzaldehyde from (i) Acetaldehyde, (ii) Acetone? Give reactions.

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31. What is the haloform reaction? Discuss its utility in organic analysis.

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32. Formaldehyde and benzaldehyde give cannizzaro reaction but acetaldehyde does not. Explain

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33. Why acetaldehyde gives aldol condensation while formaldehyde does not. Explain.

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34. What compound is formed When ethanal is heated with dilute NaOH solution?

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35. Write giving chemical equations, a brief account of the following:

- (i) Aldol condensation
- (ii) Cannizzaro reaction
- (iii) Wolff-kishner reduction.
- (iv) Clemmensen reduction.
- (v) Friedel-Crafts reaction.
- (vi) Rosenmund reduction.
- (vii) Tollens' reagent.
- (viii) Gattermann-Koch reaction.
- (ix) Cross aldol condensation.
- (x) Decarboxylation.
- (xi) Haloform reaction.
- (xii) Perkin reaction.



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36. v34



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37. How will you bring about the following conversions in not more than two steps

(a) Propanone to propene

(b) propanal to butanone

(c) benzaldehyde to benzophenone

(d) Benzaldehyde to -3- phenylpropan -1- ol

(e) Benzaldehyde to α - hydroxyphenyl acetic acid

(f) ethanal to 3- hydroxybutanal



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38. Give a chemical test to distinguish between:

(i) Acetophenone and benzophenone

(ii) Ethanal and propanal

(iii) Propanal and diethyl ether

(iv) Propanone and propanol

(vi) Acetaldehyde and acetone..

(vii) Propanol and propanone

(viii) Benzaldehyde and acetophenone

(ix) Acetaldehyde and benzaldehyde

(x) Pentanone-2 and pentanone-3

(xi) $C_6H_5COCH_3$ and C_6H_5CHO

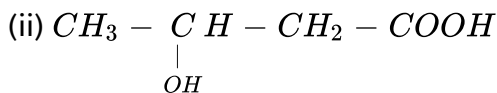
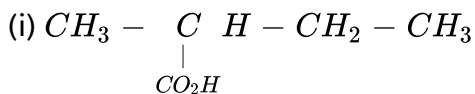
Write the balanced chemical equation in each case.

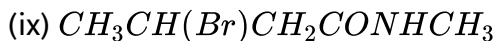
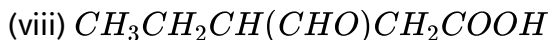
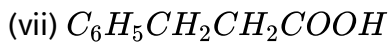
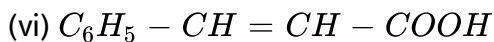
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39. Give two reactions in which aliphatic aldehydes differ from aromatic aldehydes?

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40. Give the IUPAC names of the following:





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41. Assertion : Carboxylic acids contain a carbonyl group but donot give the characteristic reactions of the group.

Reason : The electrophilicity of the carbon atom is more in carboxylic acids than in aldehydes and ketones.



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42. Carboxylic acids donot give the characteristic reactions of carbonyl group. Explain.



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43. Acetonitrile is prepared by reacting an alcoholic solution of methyl iodide with

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44. Product formed by the oxidation of acetylene in the presence of alkaline $KMnO_4$.

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45. How is benzoic acid prepared from:

- (i) Ethylbenzene
- (ii) Toluene
- (iii) Bromobenzene
- (iv) Benzonitrile
- (v) benzaldehyde?

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46. Describe how the following conversions are carried out :

- (i) Toluene to benzoic acid
- (ii) Bromobenzene to benzoic acid
- (iii) Ethylcyanide to ethanoic acid
- (iv) butan -1- ol to butanoic acid

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47. Starting from methylmagnesium bromide, how will you synthesize acetic acid?

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48. How is Grignard reagent employed to prepare and acid?

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49. Consider the following statements.

(I) The melting points and boiling points of aliphatic acids are usually higher than those of aromatic acids of comparable molecular masses.

(II) The planar benzene ring in the aromatic acids can pack more closely in the crystal lattice than zigzag structure of aliphatic acids.

Select the correct option.

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50. Explain the following about acetic acid:

(i) Its boiling point is higher than that of n-propanol.

(ii) It is a weaker acid than chloroacetic acid and formic acid.

(iii) Acetic acid is a stronger acid than phenol.

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51. Account for the following:

(i) Chloroacetic acid is a stronger acid than acetic acid.

(ii) Trichloroacetic acid is a stronger acid than dichloroacetic acid.

(iii) Fluoroacetic acid is a stronger acid than chloroacetic acid.

(iv) Dichloroacetic acid is a stronger acid than chloroacetic acid.

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52. Formic acid is stronger acid than acetic acid. Explain.

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53. (i) Explain why pK_a value of chloroacetic acid is lower than pK_a value of acetic acid.

(ii) Why pK_a of FCH_2COOH is lower than that of $ClCH_2COOH$?

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54. Explain why pK_a of methanoic acid is lower than that of ethanoic acid.

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55. State reasons for the following:

(i) Monochloroethanoic acid has a higher pK_a value than dichloroethanoic acid.

(ii) Ethanoic acid is a weaker acid than benzoic acid.



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56. Out of methanoic acid and ethanoic acid, which has higher pK_a value and why?



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57. Justify: Dichloroacetic acid is a stronger acid than acetic acid.



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58. Compare the acid strengths of the following:

(i) Formic acid (ii) Acetic acid (iii) Benzoic acid.

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59. Arrange the following compounds in increasing order of their acidity:

$(CH_3)_2CH - COOH$, $H - COOH$, $CH_3 - COOH$, $(CH_3)_3C - COOH$

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60. Although phenoxide ion has more number of resonance structures than carboxylate ion, carboxylic acid is a stronger acid than phenol. Give two reasons.

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61. Why is carboxylic acid a stronger acid than phenol ?

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62. What happens when acetic acid is treated with

(i) $NaHCO_3$ (ii) Zn metal (iii) $LiAlH_4$ (iv) ethanol and a drop of conc. H_2SO_4 (v) NH_3 , then heat (vi) PCl_5 (vii) Soda-lime?

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63. Write balanced chemical equations for the following reactions:

(i) Thionyl chloride reacts with benzoic acid

(ii) Decarboxylation of malonic acid.

(iii) Acetic acid is heated with red phosphorus and HI.

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64. How will you obtain trichloroacetic acid from acetic acid?

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65. Convert (i) $RCOOH \rightarrow RCOCl$

(ii) $CH_3CH_2COOH \rightarrow CH_3CH_2Br$.

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66. What is ammonolysis of esters? Explain.

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67. What is esterification? Explain the mechanism of esterification of carboxylic acids in detail.

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68. How will you convert :

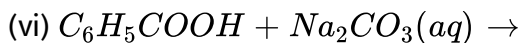
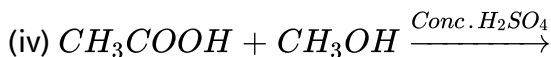
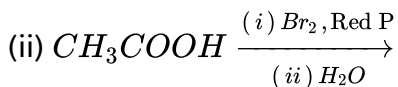
(i) Benzoic acid to benzaldehyde (ii) Acetophenone to benzoic acid (iii)

Ethanoic acid to 2-hydroxyethanoic acid ?



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69. Write the products of the following reactions:



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70. What happens when: (i) sodium acetate is heated with soda-lime

(ii) Aqueous solution of potassium acetate is electrolysed

(iii) Calcium acetate alone is heated strongly

(iv) calcium acetate is heated with calcium formate

(v) malonic acid is heated.

(vi) Ethanoic acid (acetic acid) is treated with $LiAlH_4$.

(vii) acetic acid is treated with Cl_2 in presence of red phosphorus.

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71. Write short notes on the following:

(i) Kolbe's electrolytic reaction.

(ii) Hell-Volhard-Zelinsky reaction. ,brgt (iii) Esterification reaction.

(iv) Decarboxylation reaction.

(v) Hunsdiecker reaction.

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72. How can a phenol be distinguished from a carboxylic acid?

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73. If formic acid, acetic acid, propanoic acid and benzoic acid is mixed with phosphorus and bromine then how many product are formed

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74. Give two uses each of methanoic acid and ethanoic acid.

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ADDITIONAL QUESTIONS (LONG ANSWER QUESTIONS)

1. Which functional group are present in the family of (i) alcohols (ii) aldehydes (iii) carboxylic acids?

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2. Explain the following reactions with an example for each :

(i) Reimer-Tiemann reaction

(ii) Friedel - Crafts reaction.

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3. Discuss briefly the mechanism of nucleophilic addition reactions.

Explain the relative reactivities of aldehydes and ketones towards these reactions.

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4. How does acetaldehyde react with

(a) dilute aqueous caustic soda.

(b) Hydrazine

(c) Ammoniacal silver nitrate.

(d) phosphorus pentachloride.

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5. Discuss oxidation and reduction reactions of aldehydes and ketones.

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6. what is common in both aldehydes and ketones? In what respects, acetaldehyde resembles and differs from acetone?

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7. An organic compound contains 69.77% carbon, 11.63% hydrogen and the rest is oxygen. The molecular mass of the compound is 86 u. the compound does not reduce tollens' reagent but reacts with Brady's reagent to give a yellow precipitate. On vigorous oxidation, the, the molecule produces ethanoic acid and propanoic acid. the compound also shows iodoform test. identify and name the compound, and write the reactions.

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8. Describe briefly the general methods of preparation of carboxylic acids.

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9. Explain why carboxylic acids behave as acids? Discuss briefly the effect of electron donating and electron-withdrawing substituents on the acidity of aliphatic carboxylic acids.

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10. An organic compound (A) (molecular formula, $C_4H_8O_2$) was hydrolysed with dilute H_2SO_4 to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). Write possible structures of (A), (B) and (C) and give their IUPAC names. Write chemical equations involved in the process.

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HIGHER ORDER THINKING SKILLS (QUESTIONS AND PROBLEMS WITH ANSWER/SOLUTION)

1. Account for the following : (i) Oxidation of toluene to C_6H_5CHO with CrO_3 is carried out in presence of acetic anhydride.

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2. What is the function of Rochelle salt in Fehling's solution ?

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3. Addition of Grignard reagents to dry ice followed by hydrolysis gives carboxylic acids while that of organolithium compounds under similar conditions gives ketones. Explain.

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4. Assertion : Alkyl benzene is not prepared by Friedel Craft alkylation of benzene.

Reason : Grignard reagents react with hydroxyle group

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5. Tert-Butylbenzene does not benzoic acid on oxidation with acidic $KMnO_4$. Give reason.

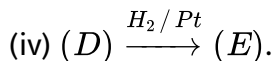
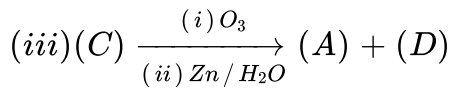
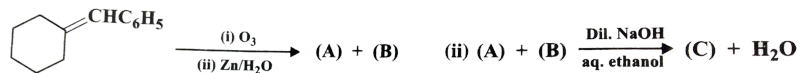
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6. Explain why the carbonyl oxygen atom of a carboxylic acid is more basic than hydroxyl oxygen.

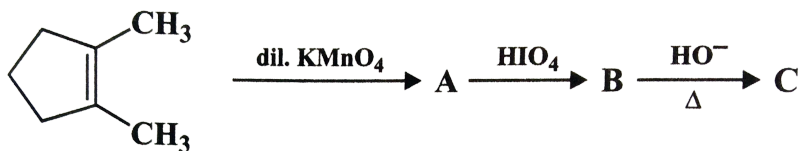
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7. Me_3CCH_2COOH is more acidic than Me_3SiCH_2COOH .

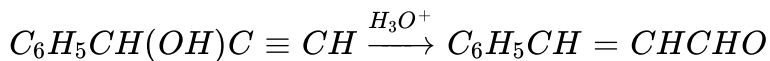
8. Identify compounds (A-D) in the following reactions:



9. Suggest appropriate structures for the missing compound. (The number of carbon atoms remains the same throughout the reaction).



10. Write the intermediate steps for the following reaction.



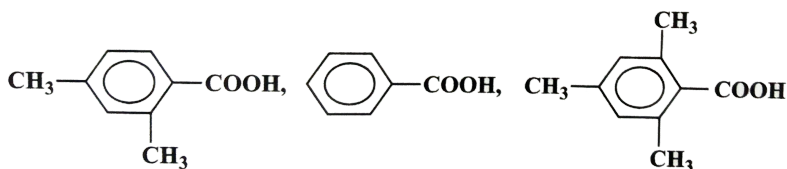
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11. Identify A,B and C are give their structures.



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12. Arrange the following in decreasing ease of acid-catalysed esterification:



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1. A compound with molecular formula $C_6H_{10}O_4$ on acylation with acetic anhydride gives a compound with molecular formula $C_{12}H_{18}O_8$. How many hydroxyl groups are present in the compound?

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2. A ketone A, which undergoes haloform reaction, gives compound B on reduction B on heating with sulphuric acid gives compounds C, which forms mono-ozonide D. D on hydrolysis in the presence of zinc dust gives only acetaldehyde. Identify A, B and C. Write down the reaction involved.

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3. An organic compound (A) on treatment with ethyl alcohol gives a carboxylic acid (B) and compound (C). The hydrolysis of (C) under acidic conditions gives (B) and (D). Oxidation of (D) with $KMnO_4$ also

gives (B). (B) on heating with $Ca(OH)_2$ gives (E) (molecular formula, C_3H_6O). (E) does not give Tollens test and does not reduce Fehling's solution but forms a 2,4 – dinitrophenyl hydrazone. Identify (A), (B), (C), (D), and (E).

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4. A compound A on oxidation gives $B(C_2H_4O_2)$. A reacts with dil. NaOH and on subsequent heating forms C. C on catalytic hydrogenation gives D. Identify A,B,C,D and write down the reactions involved.

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5. An organic compound (A) (C_5H_7OCl) reacts rapidly with ethanol to give (B) ($C_7H_{12}O_2$). (A) also reacts with water to produce an acid which reacts with bromine to give (C) ($C_5H_8Br_2O_2$). (B) on boiling with H_2SO_4 forms an acid (D). When (D) is oxidised with $KMnO_4$ an acid (E) ($C_4H_6O_3$) is produced. On mild heating, (E) gives (F) (C_3H_6O) which

cannot be oxidised by ammoniacal $AgNO_3$. Identify the compounds (A) to (F).

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VALUE BASED QUESTIONS WITH ANSWERS

1. Almonds are recommended for good health. They not only tend to lower the blood pressure but also contain oils which prevent coronary heart disease responsible for heart attacks. But hemant, a class XII student, told his mother that some of the almonds are bitter in taste. these bitter almonds contain a poison and eating a few of these in one sitting may kill a child.

After reading the above passage, answer the following questions:

- (i) Name the chemical present in bitter almonds and write its hydrolysis products.
- (ii) How does this chemical act as a poison?
- (iii) Write the uses of the other hydrolysis products.
- (iv) What values are displayed by hemant?



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2. One day Nitin was discussing with his class fellows the composition of oils and fats and their effect on our health. He suggested that fats and hydrogenated oils should not be used for cooking purposes but emphasized that only olive oil, canola oil, soyabean oil, sarson oil, groundnut oil, etc. should be used.

After reading the above passage, answer the following questions.

- (i) What is the basic difference in the composition of oils and fats?
- (ii) What type of health problem is caused by consumption of saturated fats and how can this problem be checked by using olive oil, canola oil or any other oil?
- (iii) What values are displayed by Nitin regarding use of oils instead of fats for cooking purposes?



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3. Arun a class XII student remarked that diesel is being used worldwide for running trucks, buses, boats, ships, trains, etc. due to the presence of nitrogen and sulphur compounds in it, the exhaust gases contain oxides of nitrogen and sulphur which are the major pollutants in our environment. he discussed this problem with his teacher and suggested that in place of diesel, we can use biodiesel which is non-toxic as well as biodegradable.

After reading the above passage, answer the following questions:

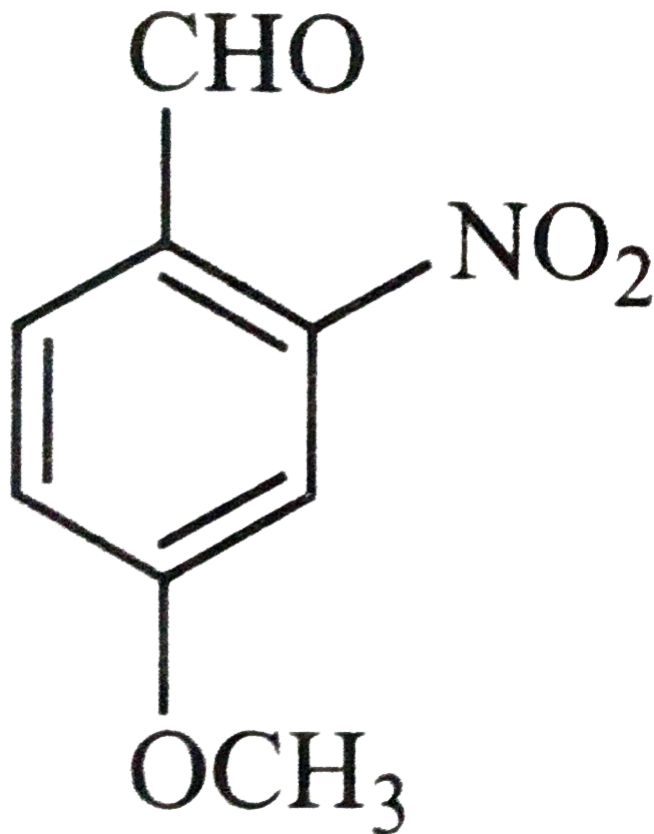
- (i) What is biodiesel and how can it be prepared?
- (ii) What is the by-product of the above process and how can it be used?
- (iii) What values are expressed by Arun by Suggesting the use of biodiesel in place of diesel?



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**COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (MULTIPLE CHOICE QUESTIONS-I WITH ONE CORRECT ANSWER)**

1. The IUPAC name of the compound



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2. Acetic acid is treated with $Ca(OH)_2$ and the product so obtained is subjected to dry distillation. The final products is

A. propanal

B. ethanol

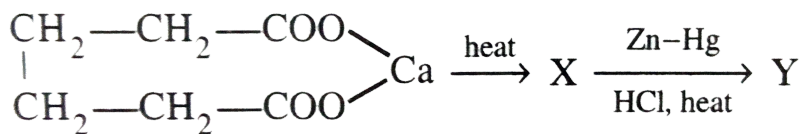
C. ethanal

D. propanal

Answer: D

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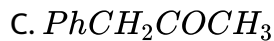
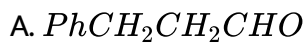
3. Identify the product Y in the following reaction sequence.



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4. Identify the product in the reaction

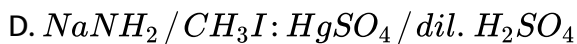
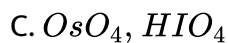
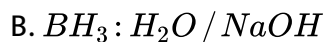
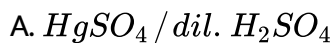




Answer: B

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5. The reagents to carry out the following conversion are:



Answer: D

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6. One mole of a symmetrical alkene on ozonolysis gives two moles of an aldehyde having a molecular mass of 44u. The alkene is:

A. 2-butene

B. ethene

C. propene

D. 1-butene

Answer: A

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7. Ozonolysis of an organic compound (A) produces acetone and propionaldehyde in equimolar mixture. Identify 'A' from the following compounds

A. 2-Methyl-1-pentene

B. 1-pentene

C. 2-pentene

D. 2-methyl-2-pentene

Answer: D

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8. Ozonolysis of an organic compound gives formaldehyde as one of the products. This confirms the presence of

A. a vinyl group

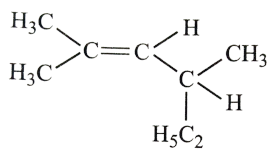
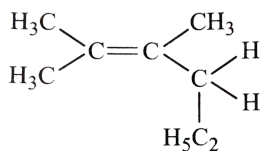
B. an isopropyl group

C. an acetylene triple bond

D. two ethylenic double bonds

Answer: A

9. An optically active compound having molecular formula C_8H_{10} on ozonolysis gives acetone as one of the products. The structure of the compound is

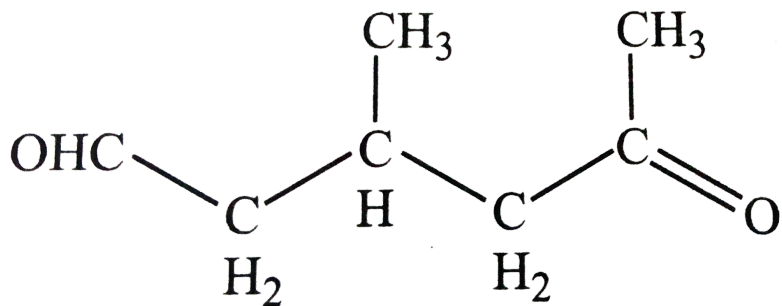


C. 

D. 

Answer: B

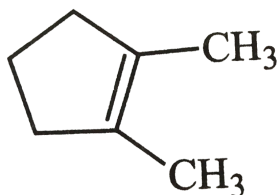
10. A single compound of the structure:



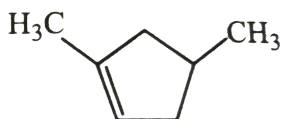
is obtainable

from ozonolysis of which of the following cyclic compounds?

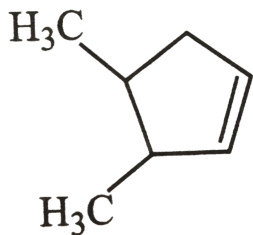
A. 



B.



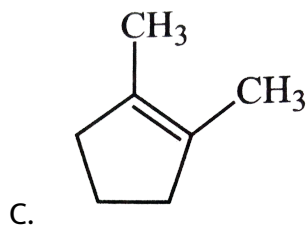
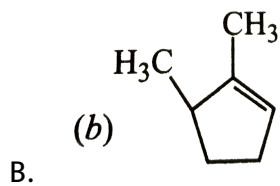
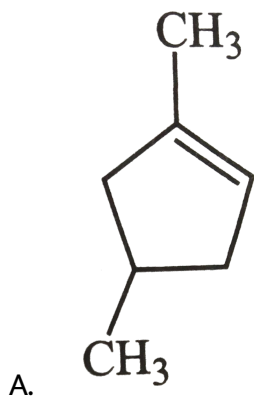
C.



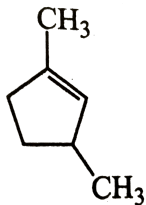
D.

Answer: C

11. Which compound would give 5-keto-2-methylhexanal on ozonolysis ?



(d)

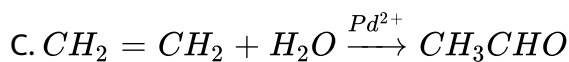
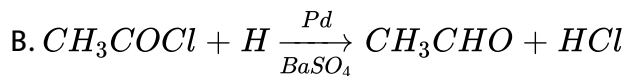
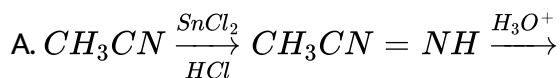


D.

Answer: D

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12. Which of the following is the industrial method of preparation of acetaldehyde

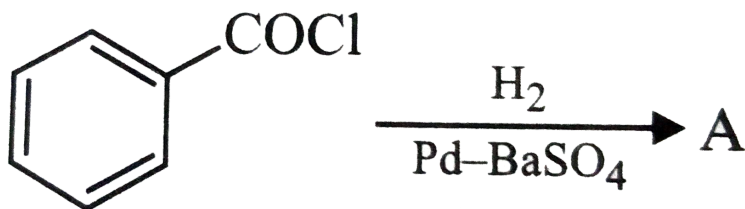


D. All of the above

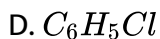
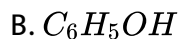
Answer: C

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13. Consider the following reaction,



The product A is

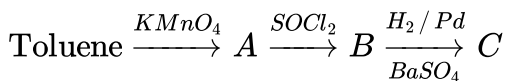


Answer: A

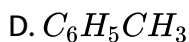
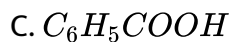
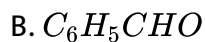
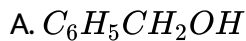


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14. In the following sequence of reactions :

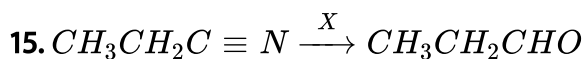


the product C is :

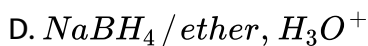
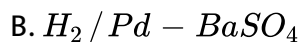


Answer: B

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The compound X is



Answer: A

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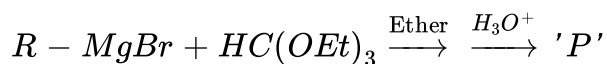
16. By which one of the following reactions ketones cannot be prepared ?

- A. Hydration of alkynes
- B. Hydrolysis of gem-dihalides
- C. Dry distillation of calcium carboxylates
- D. Stephen's reaction

Answer: D

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17. In the following reaction:



The product 'P' is :

A. RCHO

B. R_2CHOEt

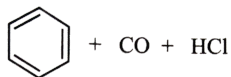
C. R_3CH

D. $RCH(OEt)_2$

Answer: A

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18. Reaction by which benzaldehyde cannot be prepared is :



A. in presence of anhyd. $AlCl_3$

B. 

C. 

D. 

Answer: B



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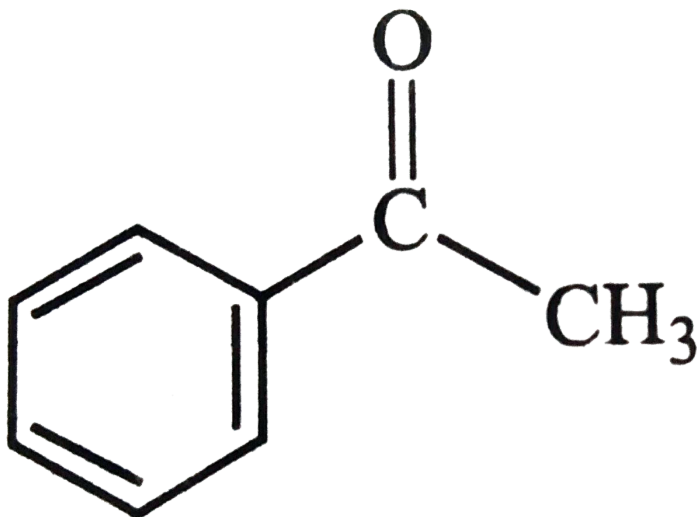
19. 4-Methoxyacetophenone can be prepared from anisole by :

- A. Reimer-Tiemann reaction
- B. Kolbe's reaction
- C. Friedel-Crafts reaction
- D. Wurtz reaction

Answer: C



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20.

The above ketone will not be formed by

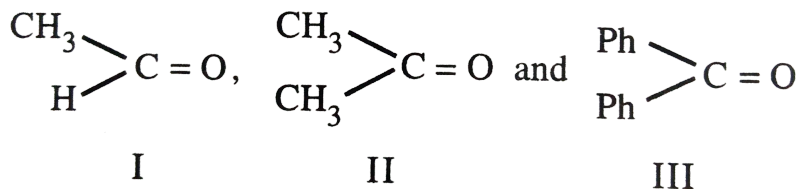
- A. reaction of benzene and acetyl chloride in the presence of $AlCl_3$
- B. reaction of acetonitrile with phenylmagnesium bromide in ether followed by hydrolysis
- C. Treatment of acetyl chloride with dibenzyl-cadmium
- D. addition of water to phenylacetylene in the presence of mercuric sulphate and dilute sulphuric acid

Answer: C



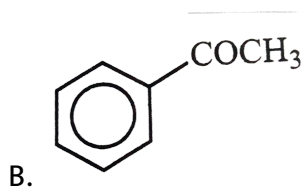
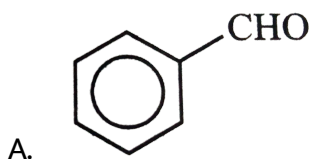
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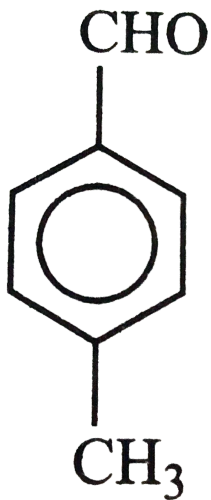
21. The order of reactivity of phenylmagnesium bromide ($PhMgBr$) with the following compounds:



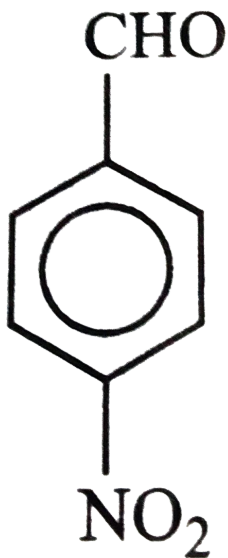
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22. Which one is most reactive towards nucleophilic addition reaction?





c.



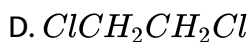
D.

Answer: D



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23. Which of the following will react with water



Answer: B



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24. A carbonyl compound reacts with hydrogen cyanide to form cyanohydrin which on hydrolysis forms a racemic mixture of α -hydroxy acid. The carbonyl compound *D*.

A. formaldehyde

B. acetaldehyde

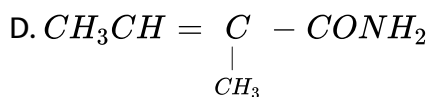
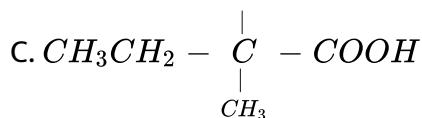
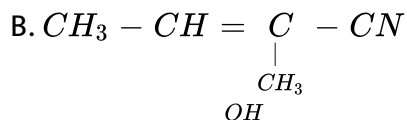
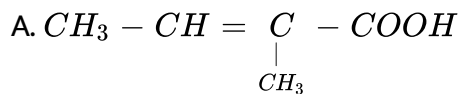
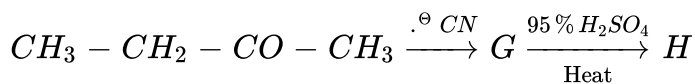
C. acetone

D. diethyl ketone

Answer: B

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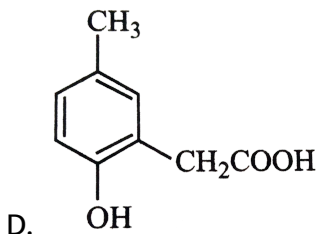
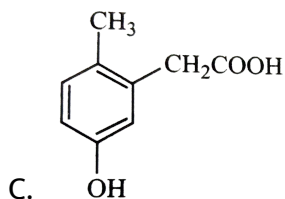
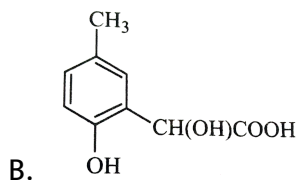
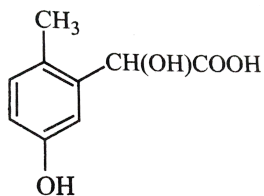
25. The major product 'H' of the given reaction sequence is



Answer: B

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26. p-cresol reacts with chloroform in alkaline medium to give the compound A which adds hydrogen cyanide to form, the compound B. the latter on acidic hydrolysis gives chiral caboxylic acid. The structure of the carboxylic acid is

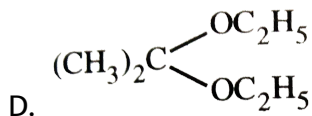
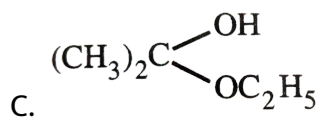
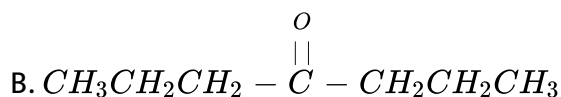
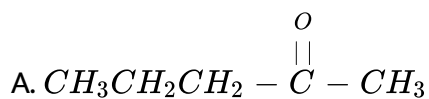


Answer: B



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27. Acetone is treated with excess of ethanol in the presence of hydrochloric acid. The product obtained is



Answer: D

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28. Which of the following reagents would distinguish cis-cyclopentane-1,2-diol from the trans-isomer?

A. MnO_2

B. Aluminium isopropoxide

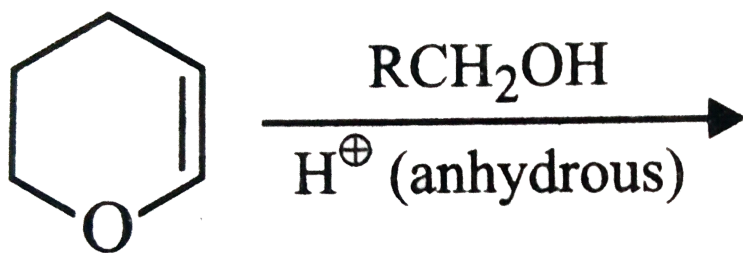
C. Acetone

D. Ozone

Answer: C

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29. The major product of the following reaction is



A. a hemiacetal

B. an acetal

C. an ether

D. an ester

Answer: B

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30. The reagent used for the separation of acetaldehyde from acetophenone is

A. $NaHSO_3$

B. $C_6H_5NHNH_2$

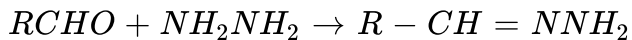
C. NH_2OH

D. $NaOH - I_2$

Answer: A

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31. Consider the reaction



What sort of reaction is it?

- A. Electrophilic addition-elimination reaction
- B. Free radical addition-elimination reaction
- C. Electrophilic substitution-elimination reaction
- D. Nucleophilic addition-elimination reaction

Answer: D



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32. Reaction of carbonyl compound with one of the following reagents involves nucleophilic addition followed by elimination of water. The reagent is:

- A. hydrazine in presence of feebly acidic solution

- B. hydroxyanic acid
- C. sodium hydrogen sulphite
- D. Grignard reagent

Answer: A

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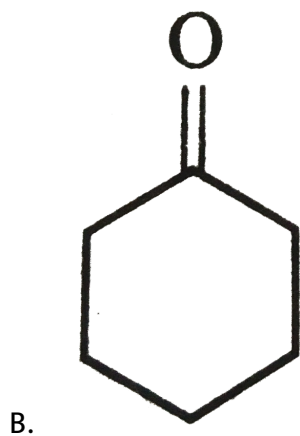
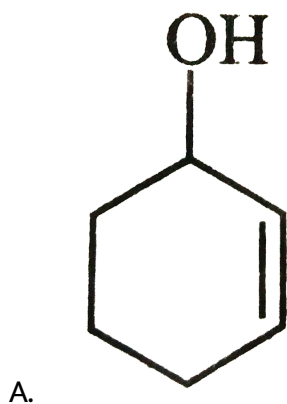
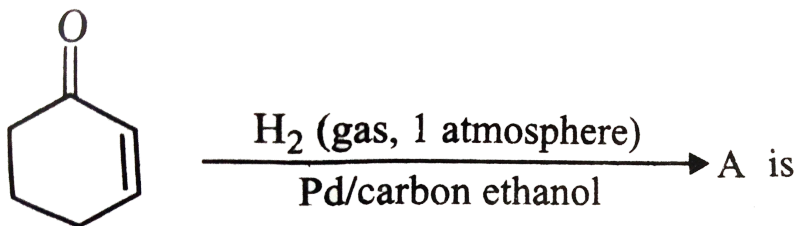
33. The smallest ketone and its next homologue are reacted with NH_2OH to form oxime.

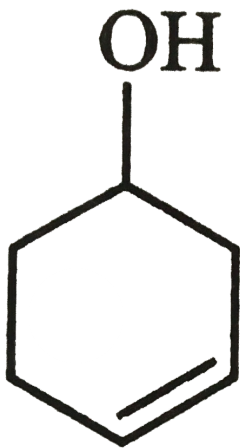
- A. two different oximes are formed
- B. three different oximes are formed
- C. two oximes are optically active
- D. all oximes are optically active

Answer: B

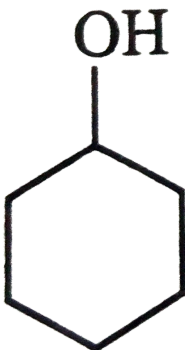
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34. The correct structure of the product 'A' formed in the reaction.





C.



D.

Answer: B

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35. 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

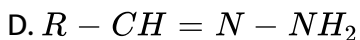
D. butan-2-one

Answer: D



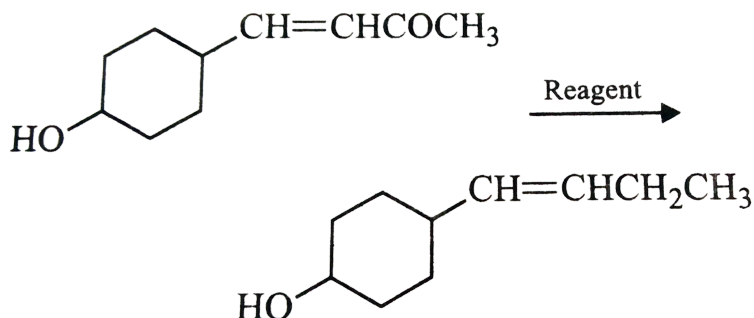
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36. During reduction of aldehydes with hydrazine and potassium hydroxide, the first is formation of



Answer: D

37. In the given transformation, which of the following is the most appropriate reagent?



A. $\text{Zn} - \text{HG} / \text{HCl}$

B. Na in liq. NH_3

C. NaBH_4

D. $\text{NH}_2 - \text{NH}_2, \text{OH}^-$

Answer: D

38. Benzaldehyde and acetone can be best distinguished using ..

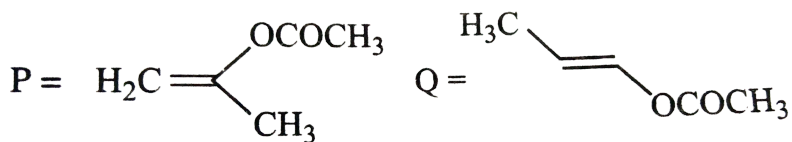
- A. Fehling's solution
- B. sodium hydroxide solution
- C. 2,4-DNP
- D. Tollens' reagent

Answer: D



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39. The product of acid hydrolysis of P and Q can be distinguished by



- A. Lucas reagent
- B. 2,4-DNP
- C. Fehling's solution

D. NaHSO_3

Answer: C

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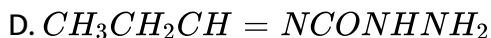
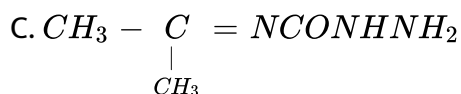
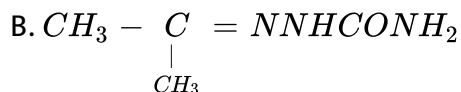
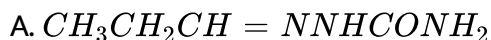
40. $\text{C}_3\text{H}_6\text{O}$ did not give a silver mirror with Tollen's reagent, but gave an oxime with hydroxylamine. It can give positive

- A. iodoform test
- B. Fehling's test
- C. Schiff's test
- D. Carbylamine test

Answer: A

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41. 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 ammoniacal silver nitrate, B when treated with an aqueous solution of $NH_2NHCONH_2$ and sodium acetate gives a product C. identify the structure of C.



Answer: A



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42. Oxidation of acetaldehyde with selenium dioxide produces:

A. Ethanoic acid

B. Methanoic acid

C. Glyoxal

D. Oxalic acid.

Answer: C

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43. Iodoform test is not given by

A. 2-pentanone

B. 3-pentanone

C. ethanal

D. ethanol

Answer: B

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44. Iodoform can be prepared from all except

- A. butan-2-one
- B. acetophenone
- C. propan-2-ol
- D. propan-1-ol

Answer: D



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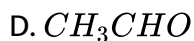
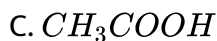
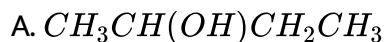
45. CH_3CHO and $C_6H_5CH_2CHO$ can be distinguished chemically by

- A. Benedict's test
- B. Iodoform test
- C. Tollens' reagent test
- D. Fehling's solution test

Answer: B

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46. Amongst the following compounds, the one which would not respond to iodoform test is



Answer: C

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47. An organic compound 'X' having molecular formula $C_5H_{10}O$ yield phenylhydrazone and gives negative response to the iodoform test and

Tollens test . It produces n-pentane on reduction. 'X' could be

- A. 3-pentanone
- B. n-amyl alcohol
- C. pentanal
- D. 2-pentanone

Answer: A



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48. A carbonyl compound with molecular mass 86, does not reduce Fehling's solution but forms crystalline bisulphite derivative and gives iodoform test. The possible compound is

- A. 2-pentanone and 3-pentanone
- B. 2-pentanone and 3-methyl-2-butanone
- C. 2-pentanone and pentanal

D. 3-pentanone and 3-methyl-2-butanone

Answer: B

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49. $(CH_3)_2C = CHCOCH_3$ can be oxidised to $(CH_3)_2C = CHCOOH$ by

A. Chromic acid

B. $NaOI$

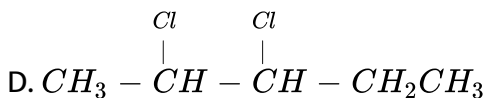
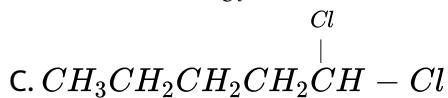
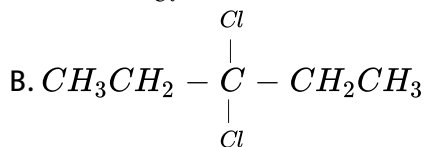
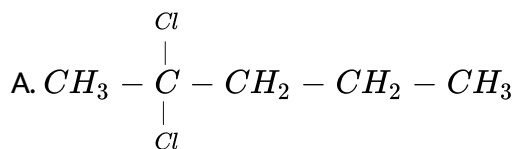
C. Cu at $300^\circ C$

D. $KMnO_4$

Answer: B

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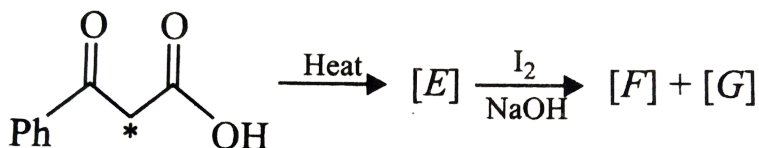
50. A compound (A) $C_5H_{10}Cl_2$ on hydrolysis gives $C_5H_{10}O$ which reacts with NH_2OH , forms iodoform but does not give Fehling test (A) is :

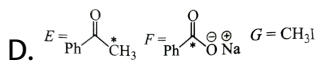
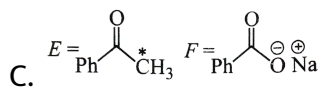
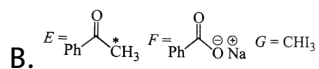
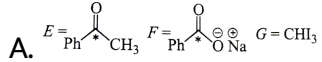


Answer: A

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51. In the following reaction, the correct structures of E, F and G are





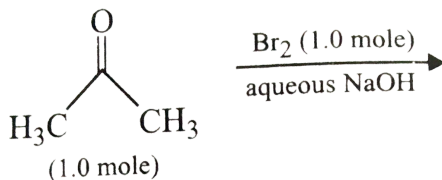
Answer: C



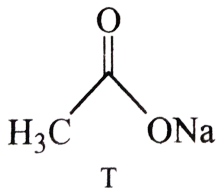
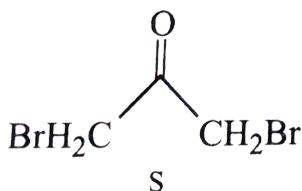
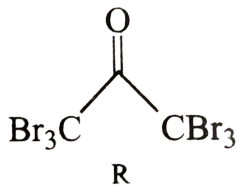
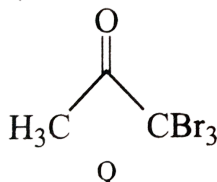
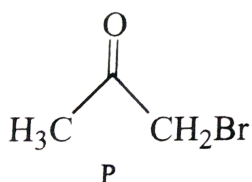
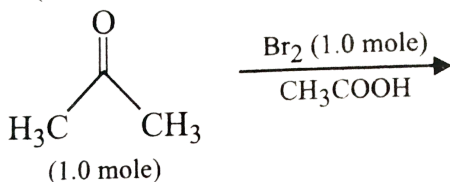
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52. After completion of reaction (I and II), the organic compound(s) in the reaction mixture is (are)

Reaction I :



Reaction II :



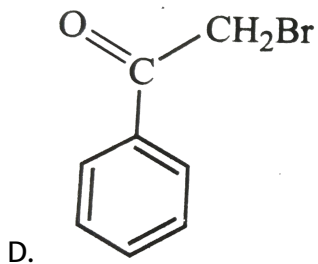
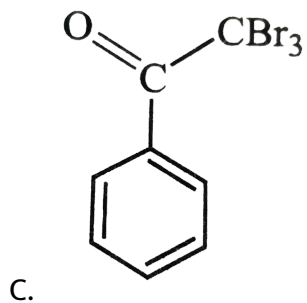
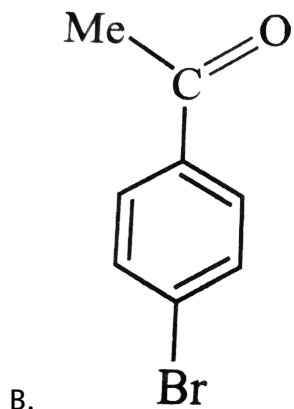
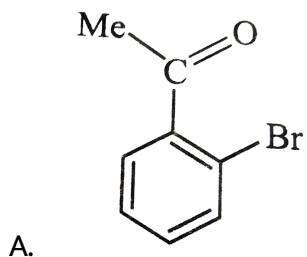
- A. Reaction I:P and Reaction II:P
- B. Reaction I: U, acetone and reaction II: Q, acetone
- C. Reaction I:T,U, acetone and Reaction II: P
- D. Reaction I: R, acetone and reaction II:S, acetone

Answer: C



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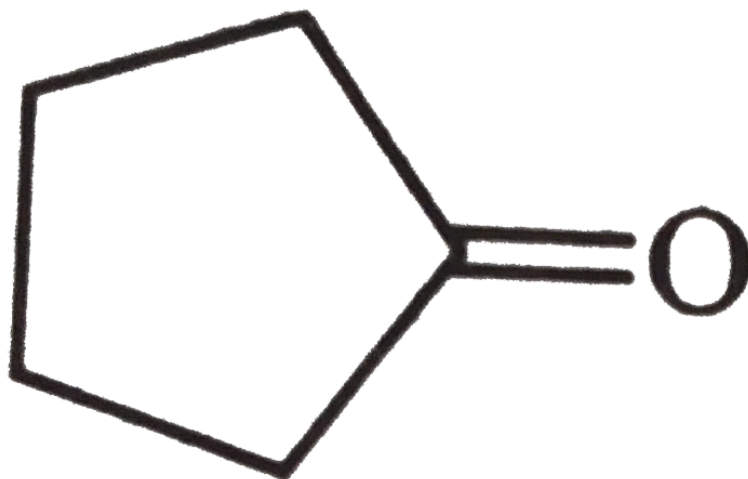
53. Bromination of PhCOMe in acetic acid medium produces mainly



Answer: D

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54. Treatment of cyclopentanone



with

methyl lithium gives which of the following species?

- A. Cyclopentanonyl radical
- B. Cyclopentanonyl biradical
- C. Cyclopentanonyl anion

D. Cyclopentanonyl cation

Answer: C

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55. The cross aldol product formed when propanal acts as the electrophile and butanal as nucleophile is

A. 3-hydroxy-2-methylpentanal

B. 3-hydroxy-2-methylhexanal

C. 2-ethyl-3-hydroxypentanal

D. 2-ethyl-3-hydroxyhexanal

Answer: C

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56. Aldol condensation between which of the following two compounds followed by dehydration gives methyl vinyl ketone?

- A. Formaldehyde and acetone
- B. Formaldehyde and acetaldehyde
- C. Two molecules of acetaldehyde
- D. Two molecules of acetone

Answer: A



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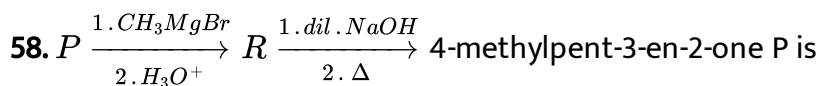
57. Identify the combination of compounds that undergo aldol condensation followed by dehydration to produce but-2-enal.

- A. methanal and ethanal
- B. two mols of ethanal
- C. methanal and propanone

D. ethanal and propanone

Answer: B

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A. propanone

B. ethanamine

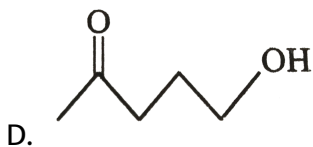
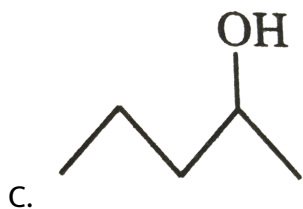
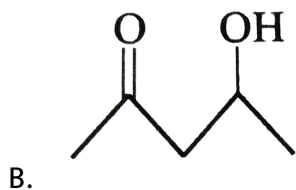
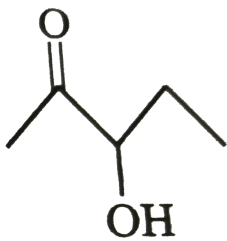
C. ethanenitrile

D. ethanal

Answer: C

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59. Which of the following will be dehydrated most readily in alkaline medium?



Answer: B

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60. Acetone on heating with conc. H_2SO_4 gives :

A. Phorone

B. Acrolein

C. mesitylene

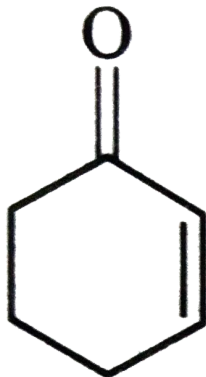
D. mesityl oxide

Answer: C

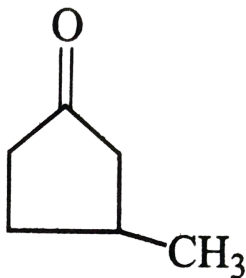


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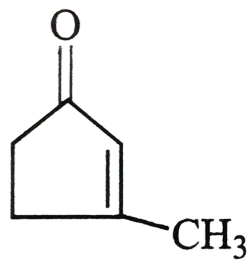
61. The diketone $CH_3 - \overset{\overset{O}{\parallel}}{C} - (CH_2)_2 - \overset{\overset{O}{\parallel}}{C} - CH_3$ on intermolecular aldol condensation gives the final product



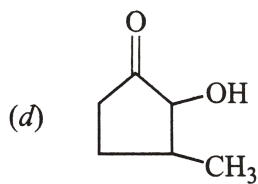
A.



B.



C.

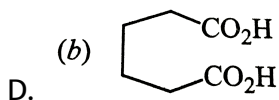
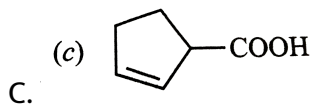
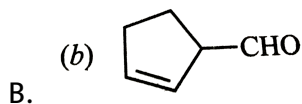
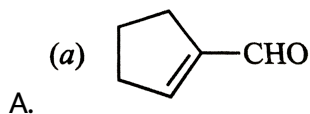


D.

Answer: C

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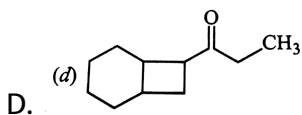
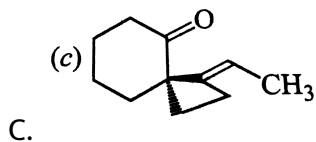
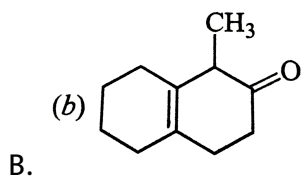
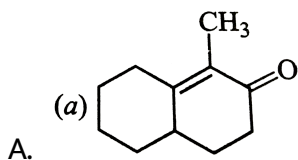
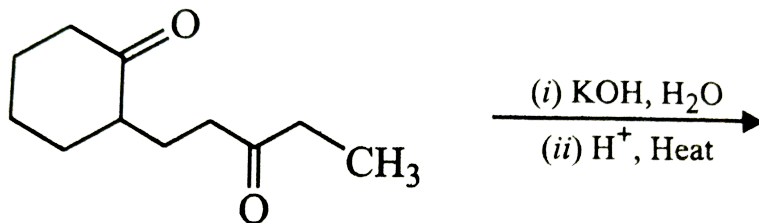
62. Cyclohexene on ozonolysis followed by reaction with zinc dust and water gives compound E. Compound E on further treatment with aqueous KOH yields compound F. Compound F is



Answer: A

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63. The major product of the following reaction is



Answer: A

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64. Aldol condensation does not occur between

- A. two different aldehydes
- B. two different ketones
- C. an aldehydes and a ketone
- D. an aldehyde and an ester

Answer: D



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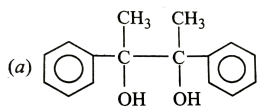
65. If the enolate ion combines with carbonyl group of ester, we get

- A. aldol
- B. α , β -unsaturated ester
- C. β -ketoaldehyde
- D. acid.

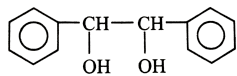
Answer: C

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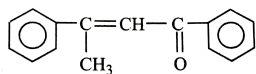
66. Acetophenone when reacted with a base, C_2H_5ONa , yields a stable compound which has the structure :



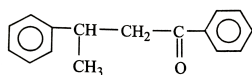
A.



B.



C.



D.

Answer: C

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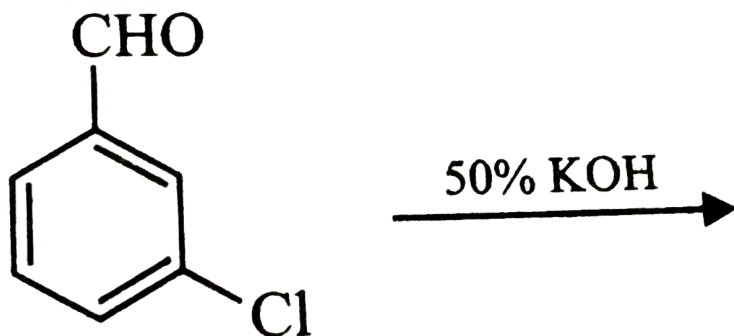
67. Self-condensation of two moles of ethyl acetate in presence of sodium ethoxide yields

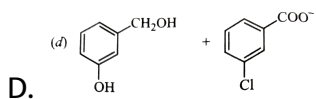
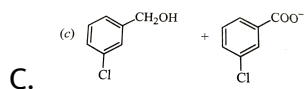
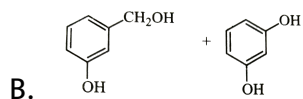
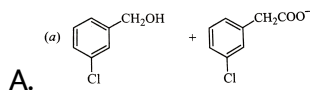
- A. ethyl propionate
- B. ethyl butyrate
- C. acetoacetic ester
- D. methyl acetoacetate

Answer: C

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68. Predict the product in the given reaction.

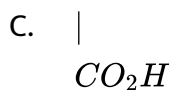
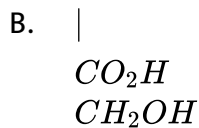
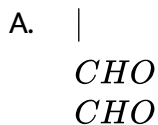
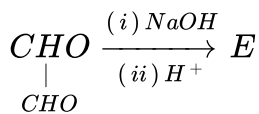


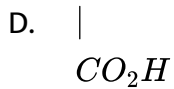
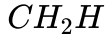


Answer: C

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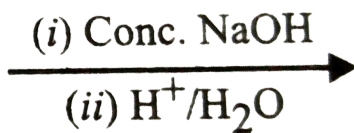
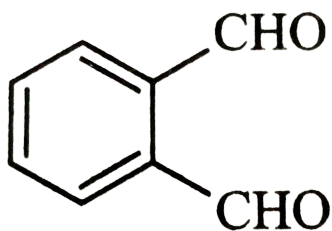
69. In the following reaction the product E is





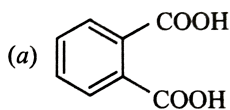
Answer: C

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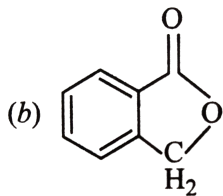


70.

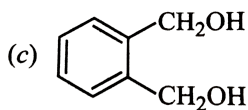
The product of the above reaction is



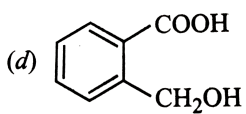
A.



B.



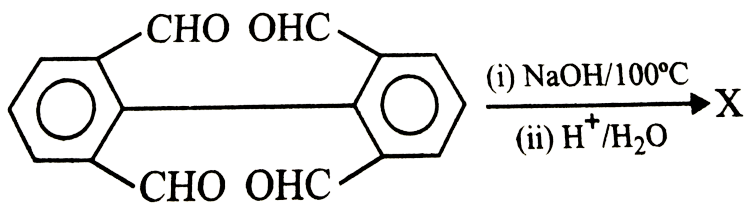
C.



D.

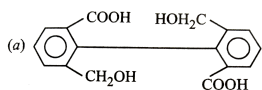
Answer: B

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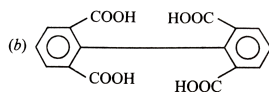


71.

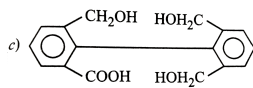
Major product 'X' is



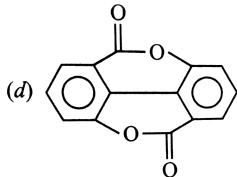
A.



B.



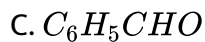
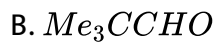
C.



Answer: A

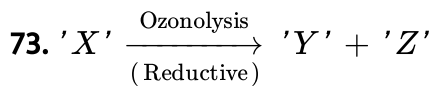
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72. Among the following compounds, which will not respond to Cannizzaro's reaction, upon treatment with alkali?

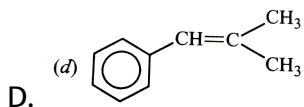
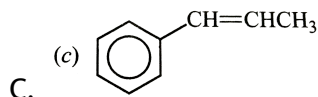
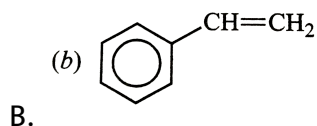
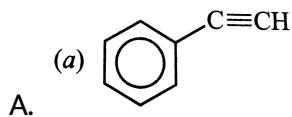


Answer: A

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'Y' can be obtained by Etard's reaction. 'Z' undergoes disproportionation reaction with concentrated alkali. 'X' could be :

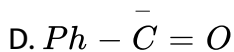
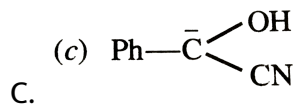
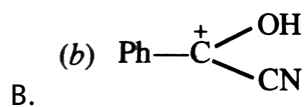
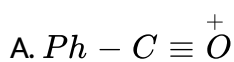


Answer: B



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74. In the following species, the one which is likely to be intermediate during benzoin condensation of benzaldehyde, is

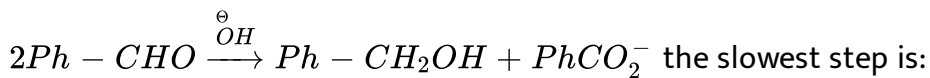


Answer: C



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75. In the Cannizzaro reaction given below:

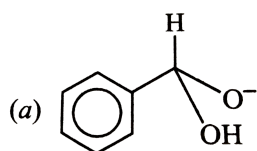


- A. the attach of $\ominus OH$ at the carbonyl group
- B. the transfer of hydride ion to the carbonyl group
- C. the abstraction of a proton from the carboxylic acid
- D. the deprotonation of $Ph - CH_2OH$.

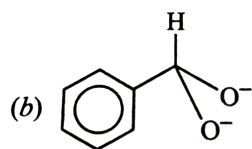
Answer: B

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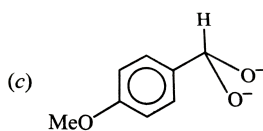
76. In a Cannizzaro reaction, the intermediate that will be best hydride donor is



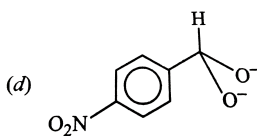
A.



B.



C.

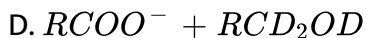
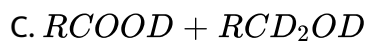
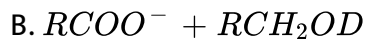
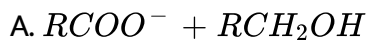


D.

Answer: D

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77. If heavy water is taken as solvent of normal water while performing cannizzaro reaction, the products of the reaction are



Answer: B



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78. Which of the following combination of aldehydes gives cross cannizzaro reaction ?



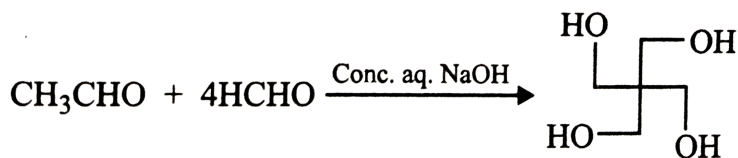
C. C_6H_5CHO , $HCHO$

D. all of these

Answer: C

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79. The number of aldol reaction (s) that occurs in the given transformation is



A. 1

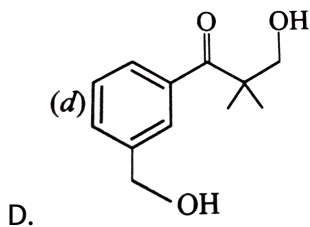
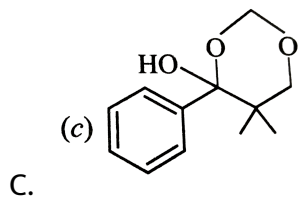
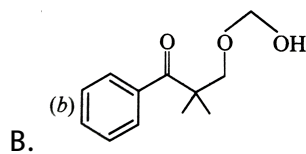
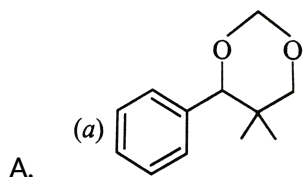
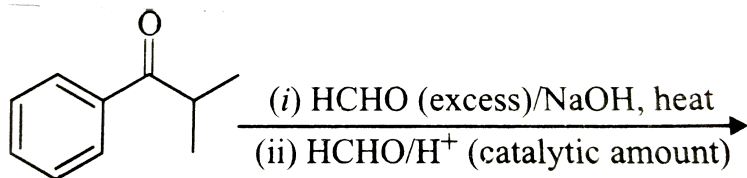
B. 2

C. 3

D. 4

Answer: C

80. The major product of the following reaction sequence is



Answer: A



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81. Which of the following reagents converts C_6H_5COCHO to $C_6H_5CHOHCOOH$?

A. Aq. NaOH

B. Acidic Na_2SO_3

C. Na_2CrO_4 / H_2SO_4

D. $NaNO_2 / HCl$.

Answer: A



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82. Which of the following reactions will not result in the formation of carbon-carbon bond?

- A. Freidel-crafts acylation
- B. Reimer-Tiemann reaction
- C. Cannizzaro reaction
- D. Wurtz reaction

Answer: C

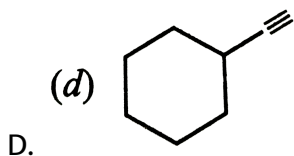
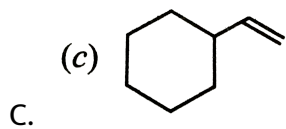
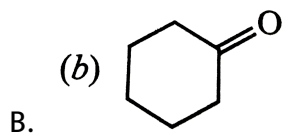
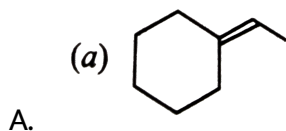
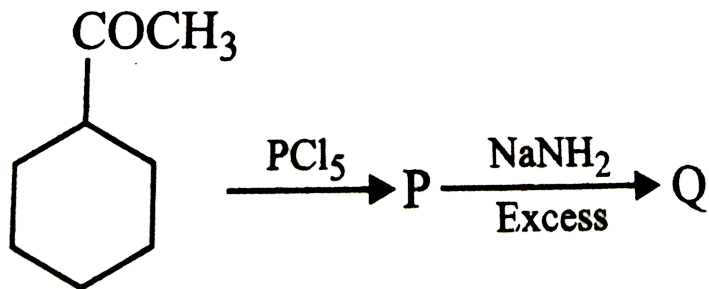
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83. Which of the following reagents react differently with HCHO , CH_3CHO and CH_3COCH_3 ?

- A. HCN
- B. NH_2NH_2
- C. NH_2OH
- D. NH_3

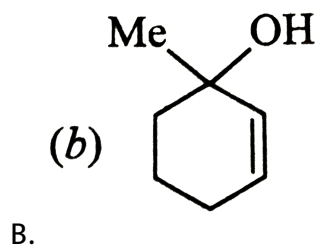
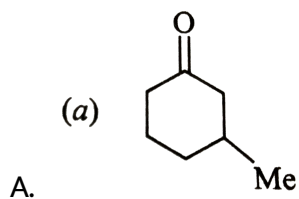
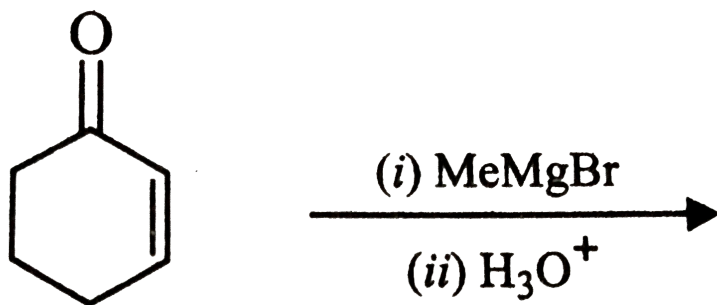
Answer: D

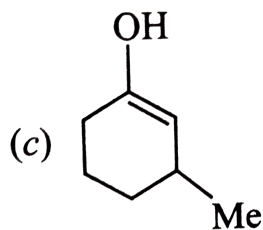
84. Identify 'Q' in the following sequence of reactions



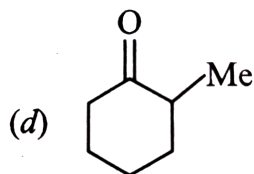
Answer: D

85. Predict the product





C.



D.

Answer: A

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86. An organic compound with the molecular formula, C_8H_8O forms, 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzron reaction. On vigorous oxidation it gives 1,2-benzene di-carboxylic acid. The organic compound is :

A. 2-ethylbenzaldehyde

B. 2-methylbenzaldehyde

C. acetophenone

D. 3-methylbenzaldehyde

Answer: B

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87. An aromatic compound X with molecular formula $C_9H_{10}O$ gives following chemical tests:

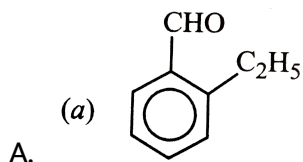
(i) Form 2,4-DNP derivative

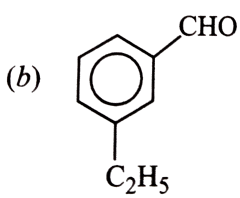
(ii) Reduces Tollen's reagent

(iii) undergoes Cannizzaro's reaction

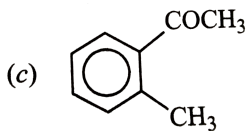
(iv) On vigorous oxidation 1, 2-Benzene dicarboxylic acid is obtained

The compound X is ,

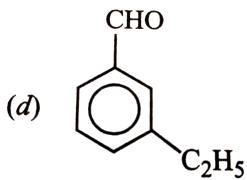




B.



C.



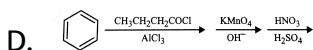
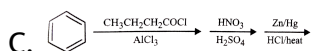
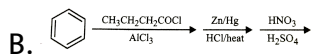
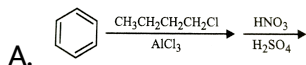
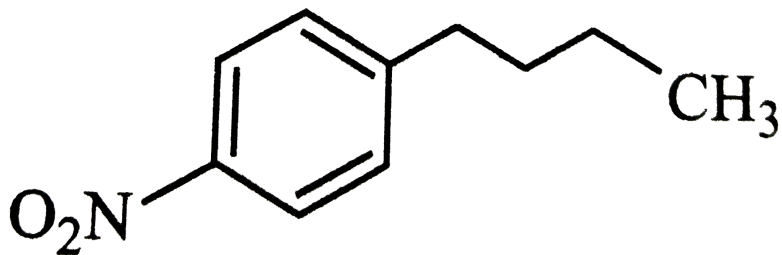
D.

Answer: A



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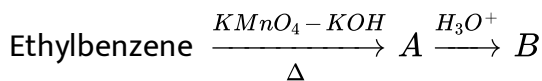
88. Identify the correct method for the synthesis of the compound shown below from the following alternatives.



Answer: B

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89. Predict the product (B) in the following sequence of reactions:



A. benzaldehyde

B. benzophenone

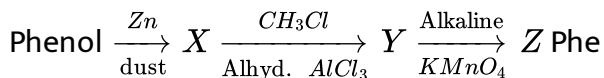
C. benzene

D. acetophenone

Answer: C

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90. What is Z in the following sequence of reactions?



A. benzaldehyde

B. benzoic acid

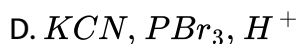
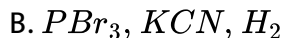
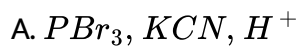
C. benzene

D. toluene

Answer: B

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91. $R - CH_2 - CH_2OH$ can be converted into RCH_2CH_2COOH the correct sequence of reagent is:

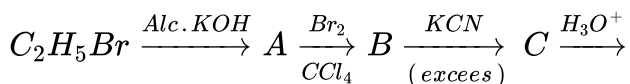


Answer: A



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



A. succinic acid

B. malonic acid

C. maleic acid

D. Oxalic acid.

Answer: A

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93. Grignard reagents and organolithium compounds on addition to dry ice separately, followed by hydrolysis gives

A. ketones and carboxylic acids respectively

B. carboxylic acids and ketones respectively

C. only carboxylic acids

D. only ketones

Answer: B

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94. Butan-2-one can be converted to propanoic acid by which of the following ?

A. $\text{NaOH}, \text{NaI} / \text{H}^+$

B. Fehling solution

C. $\text{NaOH}, \text{I}_2 / \text{H}^+$

D. Tollens' reagent

Answer: C



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95. $\text{C}_6\text{H}_5^{11}\text{COOH}$ on heating with Na_2CO_3 releases

A. CO_2

B. $^{14}\text{CO}_2$

C. CO

D. none of these

Answer: A

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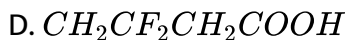
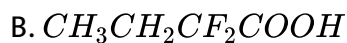
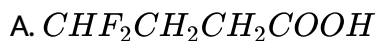
96. The correct order of acidic strength of carboxylic acid is

- A. formic acid <math><math>\text{benzoic acid} <math><math>\text{acetic acid}
- B. formic acid <math><math>\text{acetic acid} <math><math>\text{benzoic acid}
- C. acetic acid <math><math>\text{formic acid} <math><math>\text{benzoic acid}
- D. acetic acid <math><math>\text{benzoic acid} <math><math>\text{formic acid}

Answer: D

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97. Which of the following compounds would have the smallest value of pK_a ?

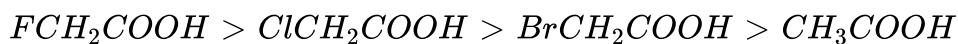


Answer: B

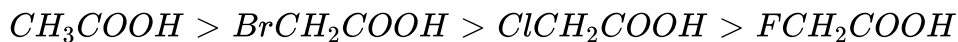
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98. Which of the following presents the correct order of the acidity in the given compounds?

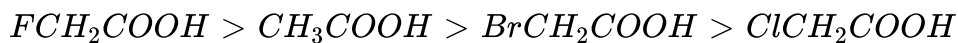
A.



B.



C.



D.



Answer: A



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99. The correct order of decreasing acid strength of trichloroacetic acid

(A), trifluoroacetic acid

(B) acetic acid

(C) and formic acid

(D) is:

A. AgtBgtCgtD

B. AgtCgtBgtD

C. BgtAgtDgtC

D. BgtAgtCgtD

Answer: C

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100. The strongest acid amongst the following compounds is?

A. HCOOH

B. $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CO}_2\text{H}$

C. $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{COOH}$

D. CH_3COOH

Answer: B

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101. The decreasing order of acidity among the following compounds is :

ethanol, 2,2,2-trifluoroethanol, trifluoroacetic, acetic acid
(I) (II) (III) (IV)

A. IIIgtIIgtIVgtI

B. IVgtIIIgtIIgtI

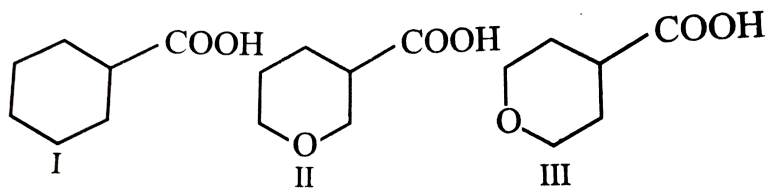
C. IgtIIgtIIIgtIV

D. IIIgtIVgtIIgtI

Answer: D

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102. The correct order of strengths of the carboxylic acids



A. IgtIIgtIII

B. IIgtIIIgtI

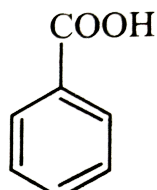
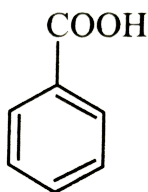
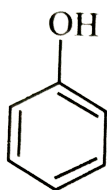
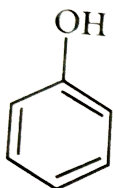
C. IIIgtIIgtI

D. IIgtIgtIII

Answer: B

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103. The correct acidity order of the following is



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104. Among the following compounds the most acidic is

A. p-nitrophenol

B. p-hydroxybenzoic acid

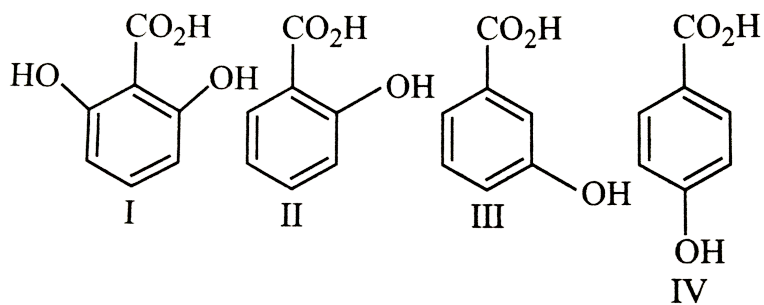
C. o-hydroxybenzoic acid

D. p-toluic acid

Answer: C

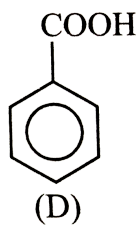
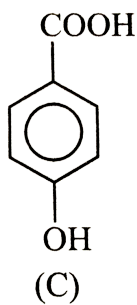
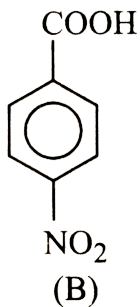
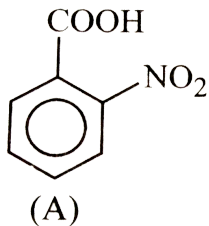
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105. The correct order of acidity for following compounds is



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106. Arrange the following acids in order of their increasing acidity



A. $A < B < C < D$

B. $B < C < A < D$

C. $C < B < D < A$

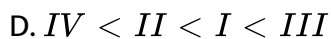
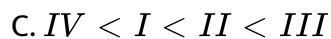
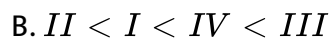
D. $C < D < B < A$

Answer: D

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107. The correct increasing order of the acid strength of benzoic acid (I), 4-nitrobenzoic acid (II), 3,4-dinitrobenzoic acid (III) and 4-methoxybenzoic

acid (IV) is

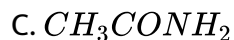
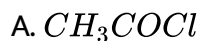


Answer: C



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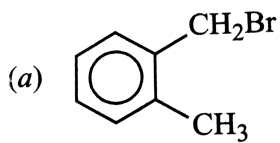
108. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is



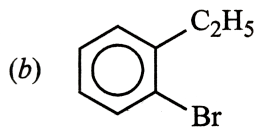
Answer: A

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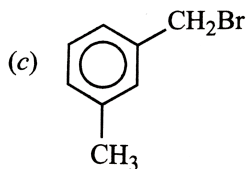
109. Compound (A), C_8H_9Br gives a white precipitate when warmed with alcoholic $AgNO_3$. Oxidation of (A) gives an acid (B) $C_8H_6O_4$. (B) easily forms anhydride on heating. Identify the compound (A)



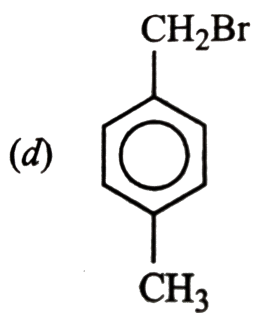
A.



B.



C.



Answer: A

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110. When acetyl chloride reacts with sodium propionate, the product formed is:

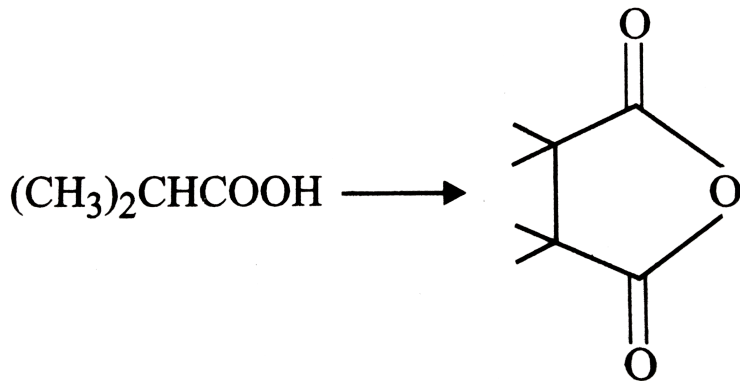
- A. acetic anhydride
- B. acetic propionic anhydride
- C. n-propyl acetate
- D. Pentane-2,4-dione

Answer: B



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111. The correct set of reagents for the following conversions is



A. $P_4 / I_2, Na, \text{conc. } H_2SO_4$

B. $P_2O_5, LiAlH_4$

C. $P_2O_5 / \Delta, H_2O, P_4 / I_2, Na$

D. $P_4 / I_2, Na, P_2O_5 / \Delta$

Answer: D



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112. Among the following compounds, the one (s) that gives (gives) effervescence with aqueous $NaHCO_3$ solution is (are) :

(I) $(CH_3CO)_2O$, (II) CH_3COOH

(III) $PhOH$, (IV) CH_3COCHO

A. I and II

B. I and III

C. Only II

D. I and IV

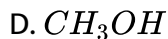
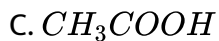
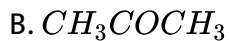
Answer: A



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113. A liquid was mixed with ethanol and a drop of concentrated H_2SO_4 was added. A compound with a fruity smell was formed. The liquid was

A. $HCHO$



Answer: C

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114. Sodium ethoxide has reacted with ethanoyl chloride. The compound that is produced in the above reaction is

A. 2-butanone

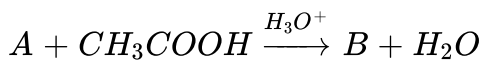
B. ethyl chloride

C. ethyl ethanoate

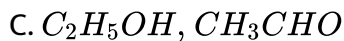
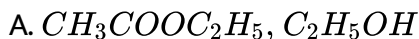
D. diethyl ether

Answer: C

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In the above reaction 'A' and 'B' respectively are

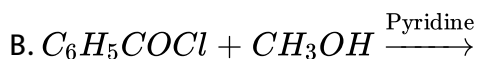
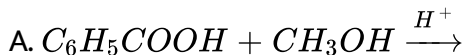


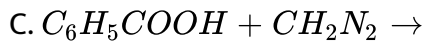
Answer: D



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116. Methyl benzoate can prepared by

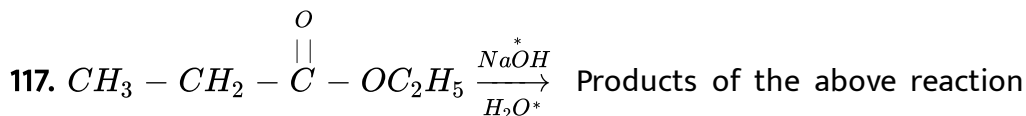




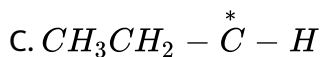
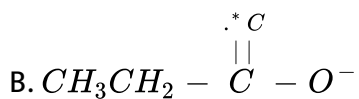
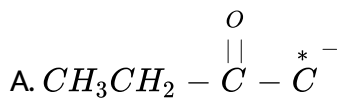
D. all the above methods

Answer: D

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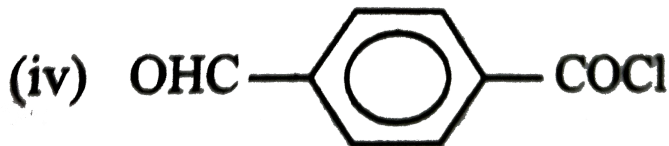
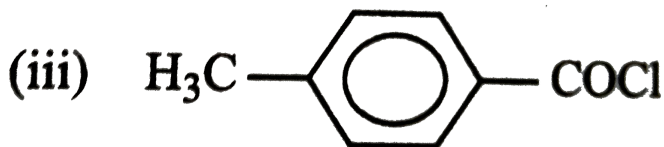
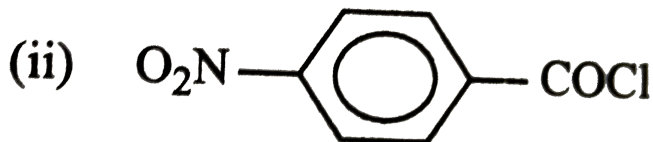


D. both (a) and (b)

Answer: D

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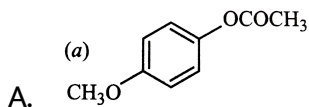
118. Consider the following compounds:

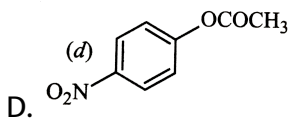
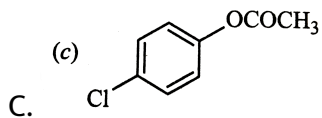
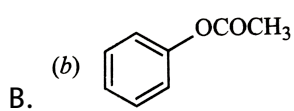


The correct decreasing order of their reactivity towards hydrolysis is:

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119. Which of the the following esters gets hydrolysed most easily under alkaline conditions?





Answer: D

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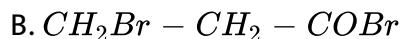
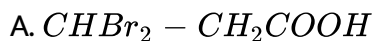
120. When $CH_2 = CH - COOH$ is reduced with $LiAlH_4$ the compound obtained will be



Answer: C

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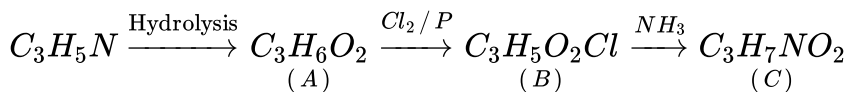
121. Propionic acid with Br_2/P yields a dibromoprodut. Its structure would be:



Answer: C

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122. A compound undergoes the following sequence of reactions:



The compound C is

- A. 1-nitropropane
- B. 2-nitropropane
- C. 2-aminopropanoic acid
- D. 2-hydroxypropanamide.

Answer: C

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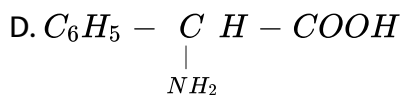
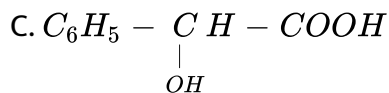
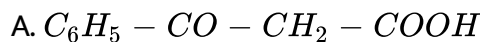
123. Which of the following acids on heating loses a molecule of H_2O to form an α, β -unsaturated acid?

- A. $CH_3CHOHCOOH$
- B. $HOCH_2COOH$
- C. $CH_3CHOHCH_2COOH$
- D. $HOCH_2CH_2CH_2COOH$

Answer: C

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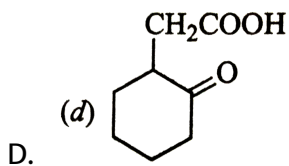
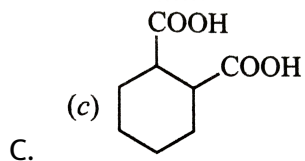
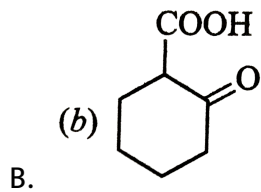
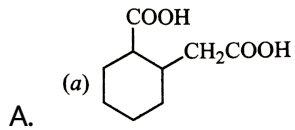
124. Which of the following carboxylic acids undergoes decarboxylation easily



Answer: A

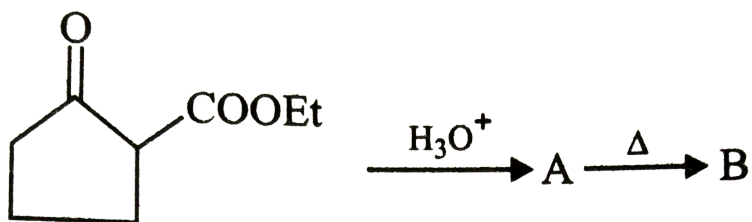
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125. The compound that undergoes decarboxylation most readily under mild condition is



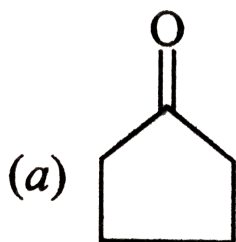
Answer: B

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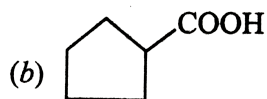


126.

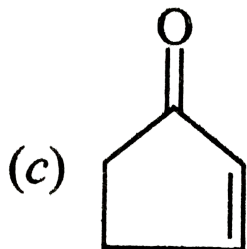
The compound B is



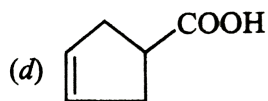
A.



B.



C.

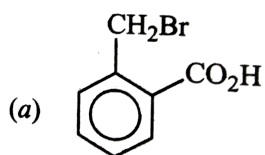


D.

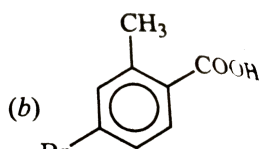
Answer: A

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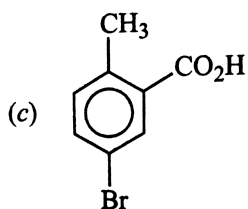
127. *o* - Toluic acid on reaction with $Br_2 + Fe$ gives



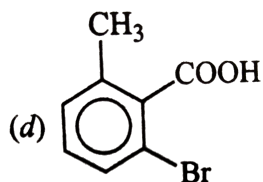
A.



B.



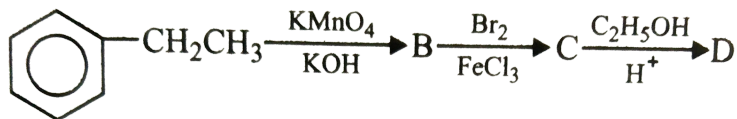
C.



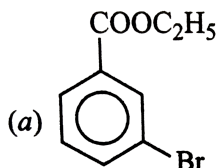
D.

Answer: C

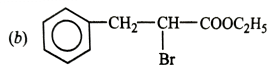
128. In a set of reaction, ethylbenzene yielded a product D.



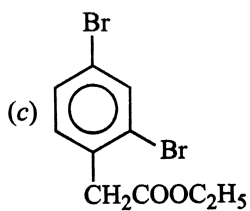
D should be



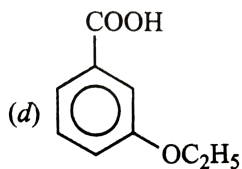
A.



B.



C.

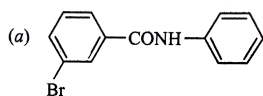


D.

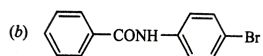
Answer: A

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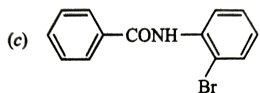
129. The major product in the reaction of N-phenylbenzamide with Br_2 / Fe is



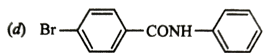
A.



B.



C.

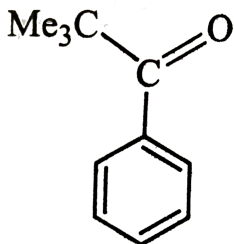


D.

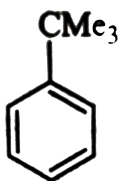
Answer: B

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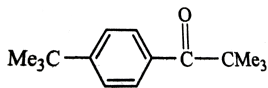
130. Reaction of benzene with Me_3CCOCl in the presence of anhydrous AlCl_3 gives



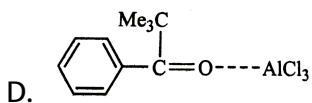
A.



B.



C.

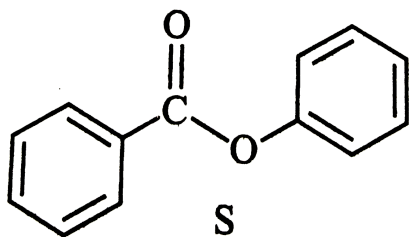
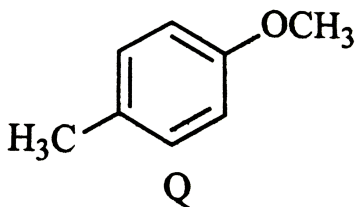
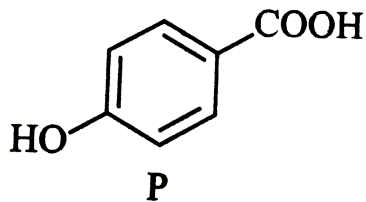


D.

Answer: B

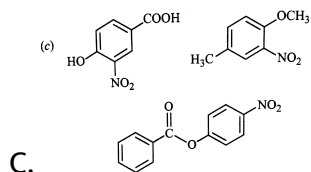
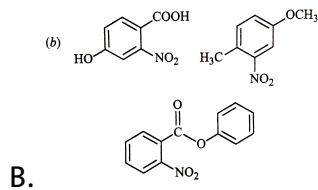
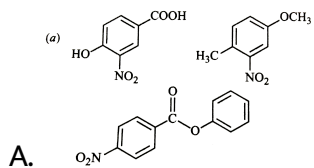
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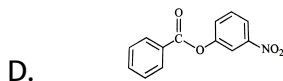
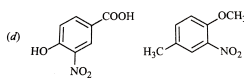
131. The compounds P, Q and S



were separately subjected to nitration using HNO_3/H_2SO_4 mixture.

The major product formed in each case respectively is



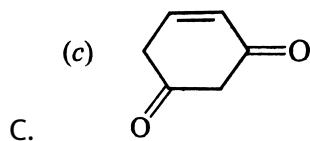
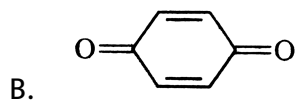
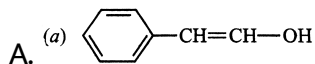


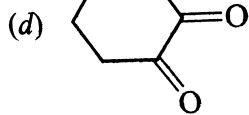
Answer: C

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COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (MULTIPLE CHOICE QUESTIONS-II WITH ONE OR MORE THAN ONE
CORRECT ANSWER)

1. Tautomerism is exhibited by





D.

Answer: A::C::D

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COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (MULTIPLE CHOICE QUESTIONS-II WITH ONE CORRECT ANSWER)

1. Which of the following reagents are used for detecting the presence of carbonyl group?

A. NH_2OH

B. NH_2NH_2

C. $H_2NCONHNH_2 \cdot HCl$

D. $C_6H_5NHNH_2 \cdot HCl$

Answer: A::B::C::D



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2. Benzophenone ($C_6H_5COC_6H_5$) will react with

A. $NaHSO_3$

B. CH_3OH

C. HCN

D. NH_2OH

Answer: D



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3. Which of the following statements about benzaldehyde is/are true?

A. Reduces Tollens' reagent

B. Undergoes aldol condensation

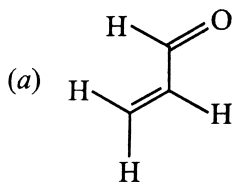
C. Undergoes cannizzaro reaction

D. Does not form an addition compound with sodium hydrogen sulphite

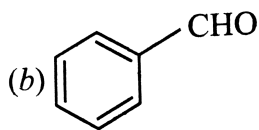
Answer: A::C::D

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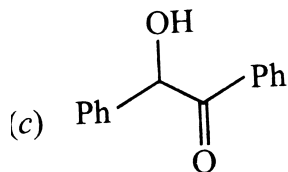
4. Positive Tollen's test is observed for



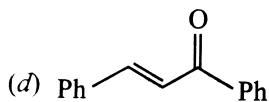
A.



B.



C.



D.

Answer: A::B::C

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5. Which of the following on oxidation with alkaline $KMnO_4$ followed by acidification with HCl gives benzoic acid ?

- A. toluene
- B. ethylbenzene
- C. isopropylbenzene
- D. tert-butylbenzene

Answer: A::B::C

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6. The distinguishing test between methanoic acid and ethanoic acid is :

- A. Tollens' test
- B. sodium bicarbonate test
- C. Litmus test
- D. esterification test

Answer: A

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7. Which of the following statements are correct about HCOOH

- A. It is a stronger acid than CH_3COOH
- B. It forms formyl chloride with PCl_5
- C. It gives CO and H_2O on heating with conc. H_2SO_4
- D. It reduces Tollens' reagent.

Answer: A::C::D

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8. When of the following can reduce Fehling's solution?

- A. Formic acid
- B. Formaldehyde and acetaldehyde
- C. acetic acid
- D. acetaldehyde

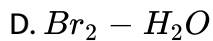
Answer: A::B::D



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9. Phenol and benzoic acid may be distinguished by their reaction with :

- A. aqueous NaOH
- B. aqueous $NaHCO_3$
- C. neutral $FeCl_3$

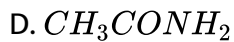
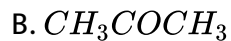
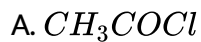


Answer: B::C::D



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10. Hydroxylamine reacts with

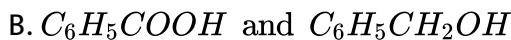
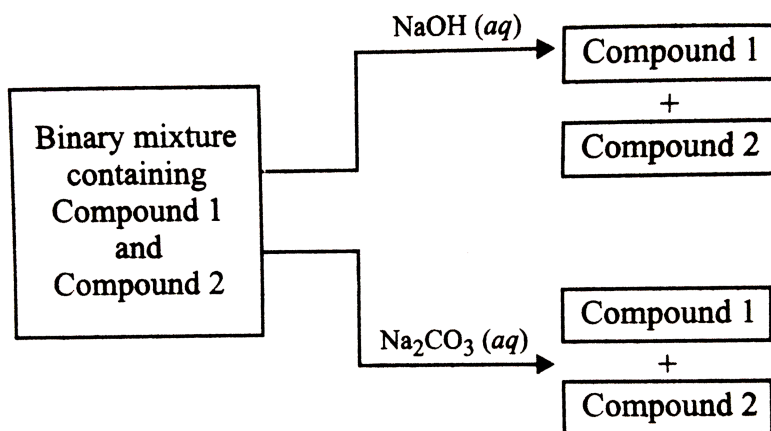


Answer: A::B::C



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11. Identify the binary mixture (s) that can be separated into individual compounds, by differential extraction, as shown in the given scheme.

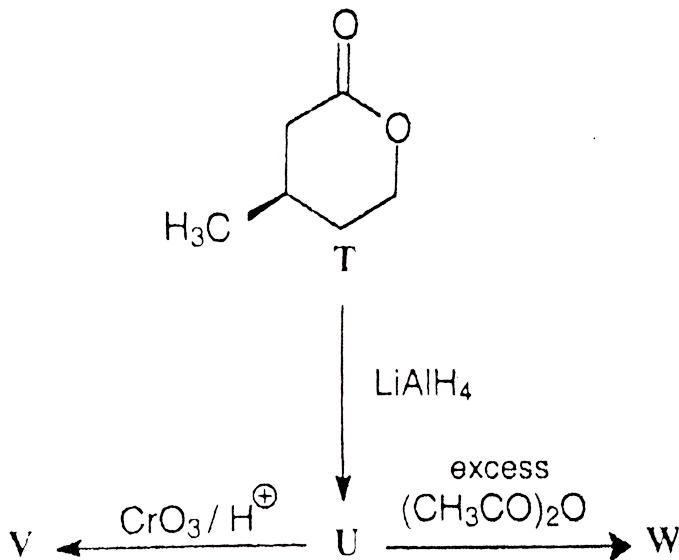


Answer: B::D



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12. With reference to the scheme given, which of the given statement(s) about T, U, V and W is (are) correct ?



- A. T is soluble in hot aqueous NaOH
- B. U is optically active
- C. Molecular formula of W is $C_{10}H_{18}O_4$
- D. V gives effervescence on treatment with aqueous NaHCO_3

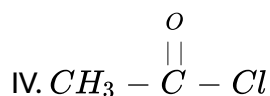
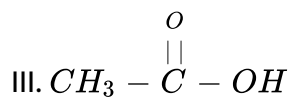
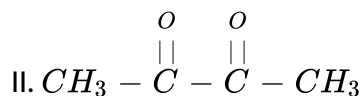
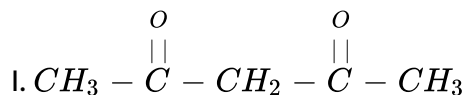
Answer: A::C::D



COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (MULTIPLE CHOICE QUESTIONS COMPREHENSION TYPE)

1. In chemical analysis, the presence of a methyl ketonic group is tested with I_2 in presence of an alkali like NaOH or KOH. In another chemical analysis, aldehyde group is tested either by Tollens' reagent ($AgNO_3NH_3OH$) which gives silver mirror or by Fehling's solution ($CuSO_4 + NaOH +$ Roschelle salt) which gives red ppt. of copper (I) oxide.

Q. Consider the following compounds:



Which will give iodoform test?

A. Only I

B. Both I and II

C. Only II

D. All

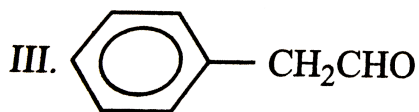
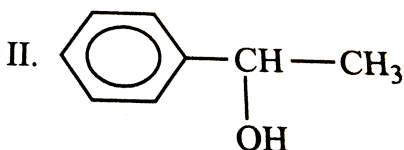
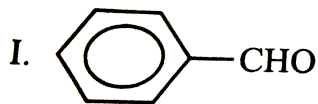
Answer: C



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2. In chemical analysis, the presence of a methyl ketonic group is tested with I_2 in presence of an alkali like NaOH or KOH. In another chemical analysis, aldehyde group is tested either by Tollens' reagent ($AgNO_3NH_3OH$) which gives silver mirror or by Fehling's solution ($CuSO_4 + NaOH +$ Roschelle salt) which gives red ppt. of copper (I) oxide.

Q. Fehling solution will oxidise



A. All

B. Only I and IV

C. Only II and IV

D. Only III and IV

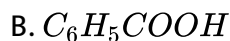
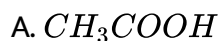
Answer: D

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3. The acidic strength of saturated aliphatic carboxylic acids depends mainly upon the inductive effect of the substituent and its position w.r.t., the -COOH group. Whereas electron donating substituents tend to decrease, electron withdrawing substituents tend to increase the acid

strength. the acidic strength of aromatic carboxylic acids, on the other hand, depends upon both the inductive and the resonance effect of the substituents

Q. Among the following, the strongest acid is



Answer: C



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4. The acidity of carboxylic acid is determined by the nature of the alkyl group attached and the substituent present on it. It is affected mainly by the inductive effect of the substituent and its position with respect to the $-COOH$ group. Electron-donating substituent tends to decrease the acidic strength whereas electron-withdrawing substituent tends to

increase acidic strength. The acidic strength of aromatic carboxylic acid on the other hand depends upon both the inductive and resonance effects of the substituents.

Which of the following is obtained when 4-methylbenzene sulphonic acid is hydrolyzed with excess of sodium acetate

A.

B.

C.

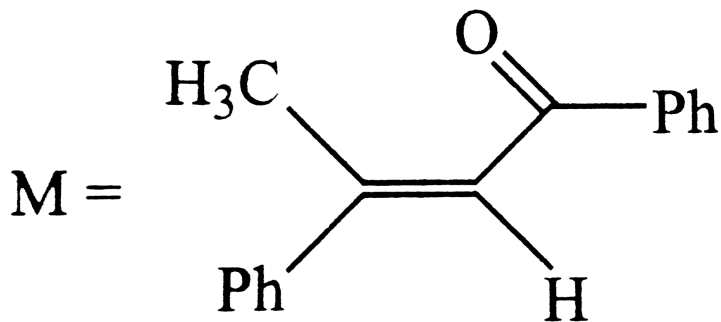
D.

Answer:

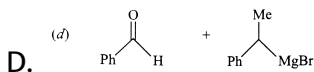
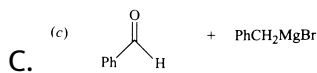
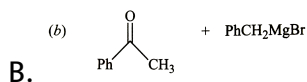
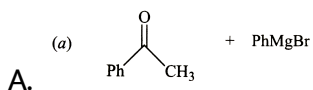


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5. A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and K. compound J upon reaction with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M.



Q. Compound H is formed by the reaction of

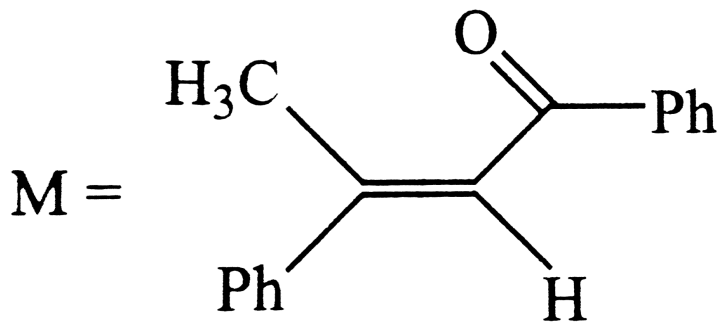


Answer: B

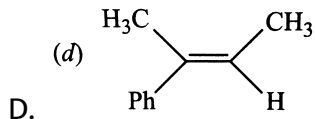
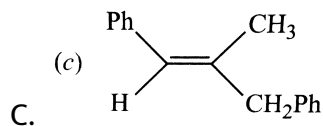
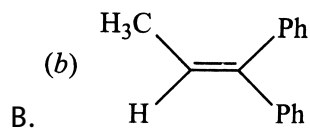
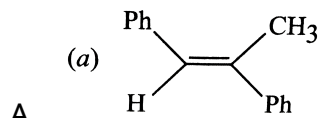
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6. A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and K. compound J upon reactio

with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M.



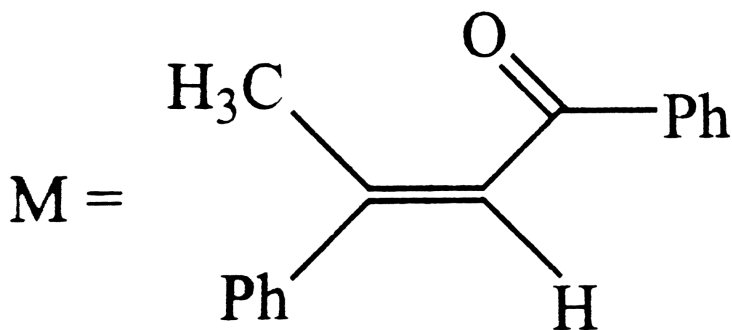
Q. The structure of compound I is



Answer: A

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7. A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and K. compound J upon reaction with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M.



Q. The structure of compound J, K and L, respectively are

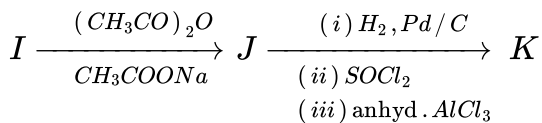
- A. $PhCOCH_3$, $PhCH_2COCH_3$ and $PhCH_2COO^- K^+$
- B. $PhCHO$, $PhCH_2CHO$ and $PhCOO^- K^+$
- C. $PhCOCH_3$, $PhCH_2CHO$ and $CH_3COO^- K^+$
- D. $PhCHO$, $PhCOCH_3$ and $PhCOO^- K^+$

Answer: D



8. In the following reaction sequence, the compound J is an

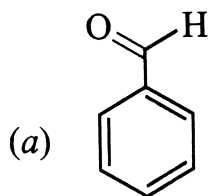
intermediate



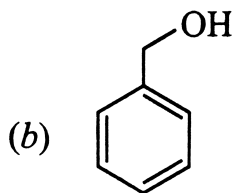
J ($\text{C}_9\text{H}_8\text{O}_2$) gives effervescence on the treatment with NaHCO_3

and positive Baeyer's test.

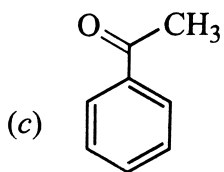
The compound I, is



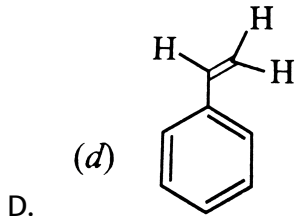
A.



B.



C.

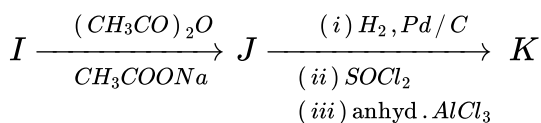


Answer: A

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9. In the following reaction sequence, the compound J is an

intermediate



$J(\text{C}_9\text{H}_8\text{O}_2)$ gives effervescence on the treatment with NaHCHO_3

and positive Baeyer's test.

The compound I, is

A.

B.

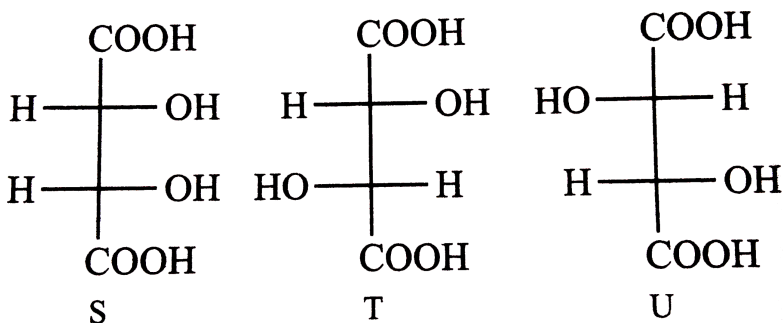
C.

D.

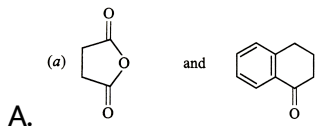
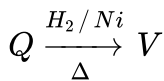
Answer:

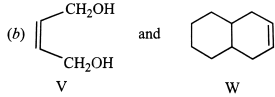
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10. P and Q are isomers of dicarboxylic acid $C_4H_4O_4$. Both decolourize Br_2/H_2O . On heating, P forms the cyclic anhydride. Upon treatment with dilute alkaline $KMnO_4$, P as well as Q could produce one or more than one S, T and U.

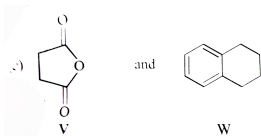


Q. in the following sequences V and W are, respectively

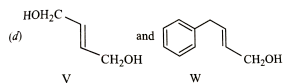




B.



C.

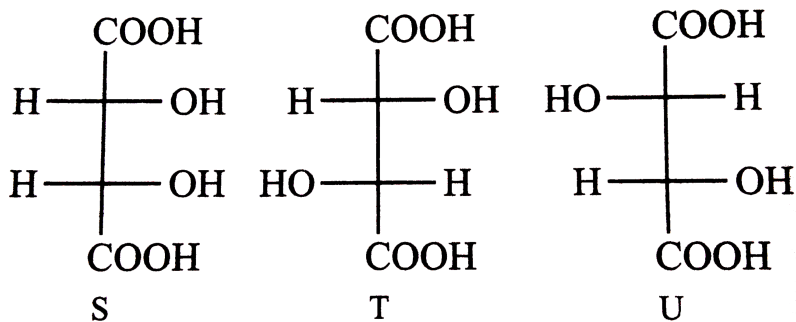


D.

Answer: A

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11. P and Q are isomers of dicarboxylic acid $C_4H_4O_4$. Both decolourize Br_2/H_2O . On heating, P forms the cyclic anhydride. Upon treatment with dilute alkaline $KMnO_4$, P as well as Q could produce one or more than one S, T and U.



Q. Compounds formed from P and Q are, respectively

- A. Optically active S and optically active pair (T,U)
- B. Optically inactive S and optically pair (T,U)
- C. Optically active pair (T,U) and optically inactive S
- D. Optically inactive pair (T,U) and optically active S

Answer: B

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COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (V. MATRIX-MATCH TYPE QUESTIONS)

1. (A) Acetaldehyde does not show aldol condensation.

(R) Compounds having atleast one α – hydrogen give aldol condensation

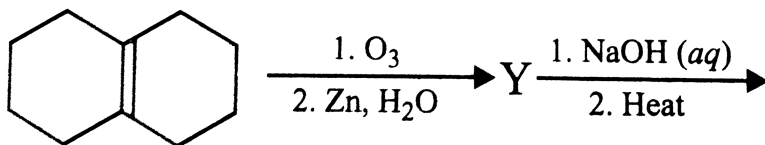
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COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (VI. INTEGER TYPE QUESTIONS)

1. Total number of isomeric aldehydes and ketones having the molecular formula $C_5H_{10}O$ are.

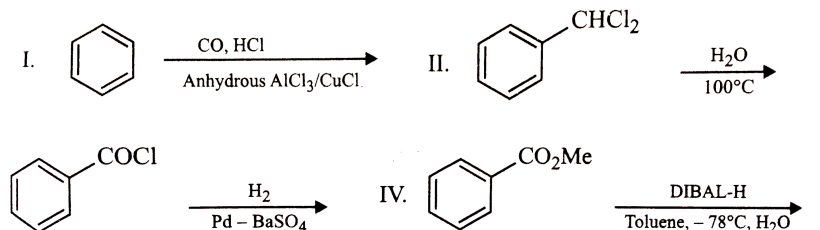
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2. In the scheme given below, the total number of intramolecular aldol condensation product formed from 'Y' is



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3. Among the following, the number of reaction (s) that produce (s) benzaldehyde is



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4. How many of the following compounds undergo aldol condensation?

Methanal, 2-methylpentanal, benzaldehyde, benzophenone, cyclohexanone.

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5. Which compound undergo Cannizzro's reaction ?

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6. How many of the osomeric ketones having the molecular formula $C_6H_{12}O$ undergo iodoform test?

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7. Consider all possible isomeric ketones, including stereoisomers, of MW = 100. All these isomers are independently reacted with $NaBH_4$ (NOTE: stereoisomers are also reacted separately). The total number of ketones that give a racemic product(s) is/are

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8. How many different carboxylic acids are obtained when all the isomeric arenes having the molecular formula C_8H_{10} are oxidised with alk. $KMnO_4$ followed by acidification ?

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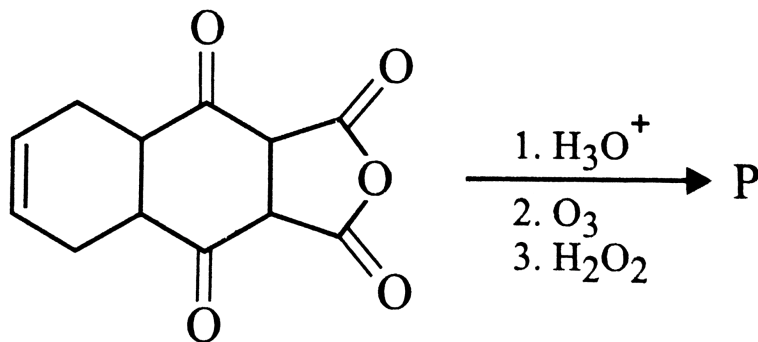
9. Amongst the following, total number of compounds soluble in sodium bicarbonate are: 2,4,6-trinitrophenol, benzoic acid, salicylic acid, acetyl chloride, acetic anhydride, trifluoroethanol, acetamide, benzenesulphonic acid

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10. How many β -ketoacids on heating undergo decarboxylation to give 2-methylcyclohexanone?

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11. The total number of carboxylic acid groups in the product P is



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COMPETITION FOCUS JEE (MAIN AND ADVANCED)/MEDICAL ENTRANCE
SPECIAL (VII. ASSERTION-REASON TYPE QUESTIONS) Type - I

1. Statement 1: Fehling solution oxidises acetaldehyde to acetic acid but not benzaldehyde to benzoic acid.

Statement 2: The C-H bond of CHO group in benzaldehyde is stronger than in acetaldehyde

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: A



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2. Assertion: Aromatic aldehydes can be distinguished from aliphatic aldehydes by fehling's solution

Reason : Fehing's solution is an alkaline solution of $CuSO_4$ containing Rochelle salt.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: B

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3. Statement 1: Acetoacetic ester ($CH_3COCH_2COOC_2H_5$) contains CH_3CO group but does not give iodoform test.

Statement-2: The H-atoms of the CH_3 group are more acidic than those of CH_2 group.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: C



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4. Statement 1: Acrylic acid ($CH_2 = CHCOOH$) is a weaker acid than benzoic acid (C_6H_5COOH).

Statement 2: Ethylenic double bond is less electron-donating than benzene ring.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: C

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5. p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.

o-Hydroxybenzoic acid has intramolecular hydrogen bonding.

- A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: D

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6. Assertion: Peracids are stronger acids than corresponding carboxylic acids

Reason : The anion of carboxylic acids is stabilized by resonance but not that of peracids.

A. Statement-1 is True, statement-2 is true,statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: D



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7. Statement 1: Esters on reduction with $LiAlH_4$ give alcohols while amides give primary amines.

Statement 2: Alkoxide ion is a better leaving group than amide ion.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: A



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1. Assertion (A) Benzaldehyde is less reactive in comparison to ethanal towards nucleophilic attack.

Reason (R) All the carbon atoms of benzaldehyde are sp^2 - hybridised.

A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: B



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2. Assertion: Both grignard reagent and dialkyl cadmium react with acid chlorides to form tert-alcohols.

Reason: Grignard reagents are as reactive as dialkyl cadmium.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

Answer: D



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3. Assertion: 2-Butenal lacks enolisable H-atom, α -to carbonyl group, still it has sufficient acidic character.

Reason: The conjugate base of 2-butenal is stabilised by resonance.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

Answer: A

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4. Assertion : 2, 2 – Dimethylpropanal undergoes Cannizzaro reaction with conc. $NaOH$

Reason : Cannizzaro reaction is a disproportionation reaction

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: B

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5. Statement -I: Crossed Cannizzaro reaction between formaldehyde and benzaldehyde gives benzyl alcohol and formate ion.

Statement -II: Formaldehyde is a better hydride donor than benzaldehyde.

A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: A

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6. Assertion : Aldol condensation is usually carried out in dilute solution of a strong base.

Reason : Concentrated solution of strong base involved Cannizzaro reaction.

A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: C



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7. Assertion: Carboxylic acids contain a carbonyl group but do not give characteristic reactions of the carbonyl group.

Reason: Due to resonance, the electrophilic nature of the carboxyl carbon is greatly reduced as compared to the carbonyl carbon in aldehydes and ketones.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

Answer: A



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8. Assertion: The pK_a of acetic acid is lower than that of phenol.

Reason : Phenoxide ion is more resonance stabilised.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

Answer: C



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9. Assertion: Benzoic acid is a weaker acid than formic acid

Reason: Phenyl group when attached to carbonyl group becomes electron donating.

A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: A



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10. Assertion: p-Chlorobenzoic acid is stronger than benzoic acid.

Reason: Chlorine has electron-donating resonance (+ *R*)- effect.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

Answer: B

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11. Assertion : Although fluorine is more electronegative than chlorine, p-chlorobenzoic acid is a stronger acid than p-fluorobenzoic acid.

Reason : Due to matching size of 2p-orbitals of F and C, F has stronger +R effect than Cl.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: A

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12. Assertion : Malonic acid ($HOOC-CH_2-COOH$) does not form cyclic anhydride on heating.

Reason : It is like β keto acid, on heating it prefer to decarboxylate.

A. if both assertion and reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. if assertion is true, but reason is false.

D. If both assertion and reason are false.

Answer: A

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13. Assertion: Formic acid reduces Tollens reagent.

Reason : Compounds containing CHO group reduce Tollens reagent.

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

Answer: B

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14. Assertion: Acetamide has more polar $>C=O$ group than ethyl acetoacetate.

Reason : $\ddot{N}H_2$ is more electron donating than OC_2H_5

- A. if both assertion and reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. if assertion is true, but reason is false.
- D. If both assertion and reason are false.

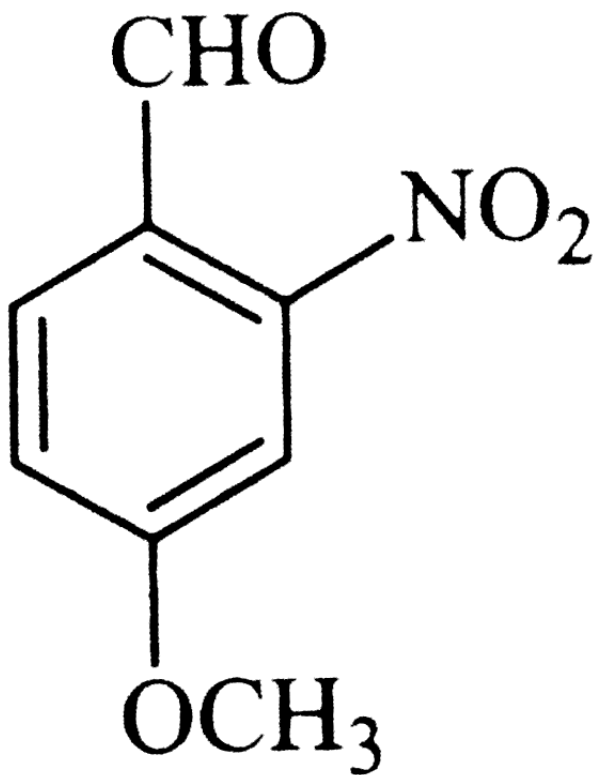
Answer: A



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IMPORTANT QUESTIONS FOR BOARD EXAMINATION

1. Give the IUPAC name of the following compound



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2. Write all possible isomeric ketones of MW=100. what type of structural isomerism is shown by them? Explain.

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3. Write the structure and use of DIBAL-H in organic chemistry.

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4. With a suitable example, explain Etard reaction.

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5. How is propionic acid converted to pentan-3-one?

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6. Illustrate the difference between Gattermann-Koch reaction and Gattermann formylation.

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7. How is dimethylcadmium prepared ? How can it be used to prepare acetophenone? Can you suggest another method for preparing acetophenone from benzene?

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8. Give the names of the reagents to bring about the following transformations.

(i) p-Fluorotoluene to p-fluorobenzaldehyde.

(ii) Ethanenitrile to ethanal.

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

$CH_3CH_2CH_2CHO$, $CH_3CH_2CH_2CH_2OH$, $CH_3CH_2COCH_3$, CH_3CH_2C

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10. Discuss the mechanism of nucleophilic addition reactions to aldehydes/ketones taking addition of HCN as an example.

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11. Arrange the following compound in an increasing order of their reactivity in nucleophilic addition reactions : ethanal, propanal, butanone, propanone.

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12. Give possible explanation for the following : (ii) There are two $-NH_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazone.

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13. 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 $NaHSO_3$ and gives positive iodoform test. On vigorous oxidation, it gives ethanoic acid and propanoic acid. write the possible structure of the compound.

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14. What product will be formed on reaction of propanal with 2-methylpropanal in the presence of NaOH? Write the name of the reaction also.

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15. A compound with molecular formula $C_5H_{10}O$ reduces Tollens' reagent but does not undergo aldol condensation. Can it undergo cannizzaro reaction? If yes, then write the products of this reaction.

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16. Benzene-1,2-dicarbaldehyde is subjected to Canizzaro reaction. Write the structure of the product formed after acidification.

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17. Consider the following reactions: $\text{C}_6\text{H}_5\text{CH}_2\text{Br} \xrightarrow{\text{NaOH}} \text{C}_6\text{H}_5\text{CH}_2\text{OH}$, $\text{C}_6\text{H}_5\text{CH}_2\text{Br} \xrightarrow{\Delta, \text{NaOH}} \text{C}_6\text{H}_5\text{CH}=\text{CH}_2$, $\text{C}_6\text{H}_5\text{CH}_2\text{Br} \xrightarrow{\text{C}_6\text{H}_5\text{MgBr}} \text{C}_6\text{H}_5\text{CH}_2\text{C}_6\text{H}_5$ The major product formed is:

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18. Explain why Tollens' reagent reduces both aliphatic and aromatic aldehydes but Fehling's solution reduces only the aliphatic aldehydes.

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19. Name two methods which are commonly used to convert $>C=O$ group into a $>CH_2$ group.

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20. What happens when:

(i) Acetaldehyde reacts with aluminium ethoxide.

(ii) Formaldehyde reacts with ammonia.

(iii) Benzaldehyde reacts with acetophenone in presence of dilute NaOH solution.

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21. Give one example to illustrate each of the following reactions:

(i) Rosenmund reduction.

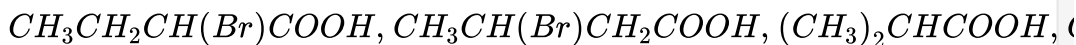
(ii) Cross cannizzaro reaction.

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22. Carboxylic acids do not give the characteristic reactions of carbonyl group. Explain.

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23. Arrange the following compounds in increasing order of their strength:



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24. Discuss the mechanism of esterification of an acid with an alcohol in presence of conc H_2SO_4 .

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25. An organic compound A (M.F. $C_8H_{16}O_2$) was hydrolysed with dil. H_2SO_4 to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-2-ene. Write equations for the reactions involved.

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26. Formic acid reduces Tollens' reagent but acetic acid does not. Explain.

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27. What is HVZ reaction? Explain why acetic acid gives HVZ reaction but formic acid does not?

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28. (a) How will you convert acetic acid into

(i) acetyl chloride, (ii) acetic anhydride, (iii) ethyl acetate and (iv) acetamide?

(b) With proper reasoning arrange them in decreasing order of their reactivity towards nucleophilic acyl substitution reactions.

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29. Give simple chemical tests to distinguish between the following pairs of compounds: (i) Benzoic acid and ethyl benzoate (ii) Salicylic acid and benzoic acid (iii) Propanal and propanone.

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