CHEMISTRY

BOOKS - BRILLIANT PUBLICATION

CARBOXYLIC ACID & THEIR DERIVATIVES

Level I

1. 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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2. Which of the following acids is isomeric with phthalic acid?

A. Succinic acid

B. Salicylic acid

C. 1,4-Benzenedicarboxylic acid

D. Methyl benzoate

Answer: C

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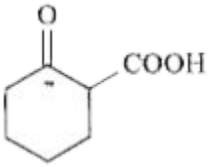
3. Which of the following compound is decarboxylated on heating?



A.

B. $C_2H_5CH_2COOH$

C. CH_3COCH_2COOH

D. $\begin{array}{l} CH_2COOH \\ | \\ CH_2COOH \end{array}$

Answer: A

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4. Benzoic acid may be converted to ethyl benzoate by reaction with:

Sodium ethoxide Ethyl chloride Dry H C l – C 2 H 5 O H Ethanol

A. Sodium ethoxide

B. Ethyl chloride

C. Dry $HCl - C_2H_5OH$

D. Ethanol

Answer: C

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5. The compound formed when malonic ester is heated with urea is

Cinnamic acid Butyric acid Barbituric acid Crotonic acid

A. Cinnamic acid

B. Butyric acid

C. Barbituric acid

D. Crotonic acid

Answer: C

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6. Acetic acid can be chlorinated in presence ofred phosphorus and chlorine. Formic acid cannot be chlorinated the same way because of

A. presence of α -H atom in formic acid

B. presence of α -H atom in acetic acid

C. absence of α-H atom in CH_3COOH

D. higher acidic strength of acetic acid than formic acid

Answer: B

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7. $-OH$ group present in alcohols is neutral while it is acidic in carboxylic acid because

A. in carboxylic acid-OH group is attached to electron withdrawing carbonyl group

B. in alcohols -OH group is attached to alkyl group which is electron withdrawing

C. carboxylic group is an electron releasing group

D. alcoholic group is an electron withdrawing group

Answer: A

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8. Indicate correct synthesis of carboxylic acid from organometallic compound.

A. $CH_3MgBr \xrightarrow{CO_2} X \xrightarrow{H_3O^+}$

B. $CH_3MgBr \xrightarrow[(ii)\,CO_2]{(i)\,H_3O^+}$

C. $CH_3\overset{\overset{O}{||}}{C}CH_2CH_2MgBr \xrightarrow[(ii)\,LiAlH_4]{(i)\,H_2O}$

D. All of the above

Answer: A

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9. Select the correct statement about a carboxylic acid, $R-\overset{\overset{O}{||}}{C}-O-H$

A. C=O bond length is equal to C-O bond length due to resonance

B. C=0 bond length is larger than C-O bond length

C. C=O bond length is shorter than C-O bond length

D. C-O, C=O and O-H bond lengths are equal

Answer: C

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10. As the molecular weight of a carboxylic acid increases, solubility in water decreases. It is due to

A. hydrophobicity of the hydrocarbon portion overweighs the hydrophilicity of the carboxyl group

B. hydrophobicity of the carboxyl group overweighs the hydrophilicity of the hydrocarbon portion

C. ionisation of the carboxylic acid is increased

D. carboxylic acid exists as dimer

Answer: A

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11. Which of the following is a correct IUPAC name for the compound shown?

$$(CH_3CH_2)_2\overset{\overset{COOH}{|}}{C}CH_2CH(CH_2CH_3)_2$$

A. 1, 1, 3-triethylhexanoic acid

B. 2,2,4-triethylhexanoic acid

C. 3,5-diethyl-3-heptylcarboxylic acid

D. 3,5,5-triethyl-6-hexanoic acid

Answer: B

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12. Select the acid(s) which cannot be prepared from Grignard reagent

Acetic acid Succinic acid Formic acid All of these

A. Acetic acid

B. Succinic acid

C. Formic acid

D. All of these

Answer: C

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13. Which of the following on alkaline hydrolysis followed by acidification will give carboxylic acid?

A. $R - CH_2X$

B. R_2CX_2

C. RCX_3

D. CX_4

Answer: C

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14. Which of the following reagents can be used to separate carboxylic acid from its mixture with phenol?

A. Na

B. CH_3MgBr

C. NaOH

D. $NaHCO_3$

Answer: D

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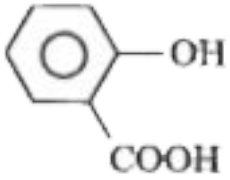
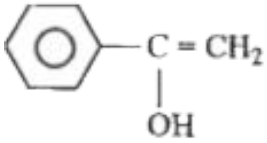
15. Which of the following cannot be acetylated with CH_3COCl / Py?

A. MeCOOH

B. CH_3NH_2

C. 

D. 

Answer: D

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16. Which of the following is the strongest acid?

A. Benzoic acid

B. 4-Nitrobenzoic acid

C. 4-Methoxybenzoic acid

D. 4-Methyl benzoic acid

Answer: B

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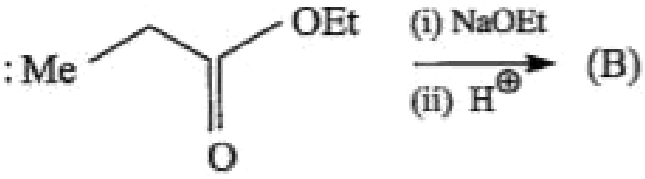
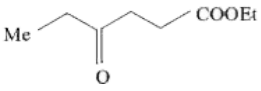
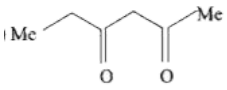
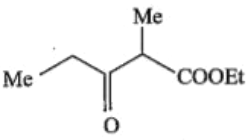
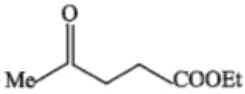
17. Product (B) in the reaction is :



A. 

B. 

C. 

D. 

Answer: C

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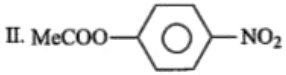
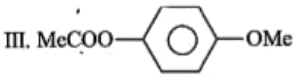
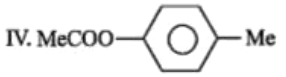
18. The decreasing order of ease of hydrolysis of the following esters is:

I. $MeC(=O)OPh$

II. 

III. 

IV. 

A. $(II) > (I) > (IV) > (III)$

B. $(I) > (II) > (III) > (IV)$

C. $(III) > (IV) > (I) > (II)$

D. $(IV) > (III) > (II) > (I)$

Answer: A

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19. Which of the following is the best method for the synthesis of ester $(I)(Me_3C - COOMe)$?

A. $Me_3C - COCl + MeOH \rightarrow$

B. $Me_3C - COOH + MeOH \rightarrow$

C. $Me_3C - COOH + CH_2N_2 \rightarrow$

D. $Me_3C - COCl + MeONa \rightarrow$

Answer: C

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20. $\underset{(A)}{PhCOOH} \xrightarrow[(ii)\,CH_2N_2]{(i)\,SOCl_2} (B)$ Product (B) is :

A. $PhCONH_2$

B. $PhCH_2COOH$

C. $PhCH_2COOMe$

D. $PhCONHMe$

Answer: C

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21. $\underset{(A)}{EtCOOMe} \xrightarrow[(iii)\,\overset{\ominus}{O}H \quad (iv)\,H_3O^{\oplus}]{(i)\,NH_2NH_2 \quad (ii)\,HNO_2} (B)$ The product (B) is: $MeNH_2$, $EtNH_2$, $MeCONH_2$, $EtCONHMe$

A. $MeNH_2$

B. $EtNH_2$

C. $MeCONH_2$

D. EtCONHMe

Answer: B

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22. Which of the following tests would help in the distinction of HCOOH and CH_3COOH?

A. Treatment with Tollens reagent

B. Treatment with NaOH

C. Treatment with Na

D. Formation of their respective amides

Answer: A

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23. Acids do not give the characteristic reaction of (C=0) group because of

A. Dimerisation

B. Resonance

C. Cyclic structures

D. Attached alkyl radical

Answer: B

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24. $CH_3COOH \xrightarrow{Br_2/P} (Y) \xrightarrow[(ii)\,H_3O^+]{(i)\,KCN} (X)$. Here, (X) is :

A. Glycolic acid

B. α-Hydroxypropionic acid

C. Succinic acid

D. Malonic acid

Answer: D

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25. When lactic acid is subjected to oxidation with Fenton's reagent, the main product formed is:

A. Acetic acid

B. Oxalic acid

C. Pyruvic acid

D. Citric acid

Answer: C

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26. On heating calcium acetate and calcium formate, the product formed is:

A. CH_3COCH_3

B. CH_3CHO

C. $HCHO + CaCO_3$

D. $CH_3CHO + CaCO_3$

Answer: D

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27. $CH_3CH = CHCHO$ is oxidised to $CH_3CH = CHCOOH$ using:

A. Alkaline $KMnO_4$

B. Selenium dioxide

C. Ammoniacal $AgNO_3$

D. All

Answer: C

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28. Formic acid is obtained when:

A. Calcium acetate is heated with conc. H_2SO_4

B. Calcium formate is heated with calcium acetate

C. Glycerol is heated with oxalic acid

D. Acetaldehyde is oxidised with $K_2Cr_2O_7$ and H_2SO_4

Answer: C

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29. $CH_3CH_2COOH \xrightarrow{Cl_2 / \text{Red phosphorus}} (X) \xrightarrow{\text{Alc.KOH}} (Y)$. Compound (Y) is :

A. CH_3CH_2OH

B. CH_3CH_2CN

C. $CH_2 = CHCOOH$

D. $CH_3CHClCOOH$

Answer: C

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30. 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 group

Answer: D

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31. Benzoyl chloride is prepared from benzoic acid by

A. Cl_2, hv

B. SO_2Cl_2

C. $SOCl_2$

D. Cl_2, H_2O

Answer: C

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32. When benzene sulphonic acid and p-nitrophenol are treated with $NaHCO_3$, the gases released, respectively, are :

A. SO_2, NO_2

B. SO_2NO

C. SO_2, CO_2

D. CO_2, CO_2

Answer: D

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33. Phenol $\xrightarrow[\text{dust}]{Zn} X \xrightarrow[\text{Alhyd.AlCl}_3]{CH_3Cl} Y \xrightarrow[(ii)\,H^+]{(i)\,Alk.KMnO_4} Z$ the product Z is

A. benzaldehyde

B. benzoic acid

C. berizene

D. toluene

Answer: B

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34. The correct order of acidic strength of carboxylic acids is

A. formic acid $<$ benzoic acid $<$ acetic acid

B. formic acid $<$ acetic acid $<$ benzoic acid

C. acetic acid $<$ formic acid $<$ benzoic acid

D. acetic acid $<$ benzoic acid $<$ formic acid

Answer: D

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

A. CH_3COCl

B. CH_3COOCH_3

C. CH_3CONH_2

D. $CH_3COOCOCH_3$

Answer: A

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

A. $CH_3 - CH_2 - CHO$

B. $CH_3 - CH_2 - COOH$

C. $CH_2 = CH - CH_2OH$

D. $CH_3 - CH_2 - COOH$

Answer: C

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38. Which of the following carboxylic acids undergoes decarboxylation easily?

A. $C_6H_5 - CO - CH_2 - COOH$

B. $C_6H_5 - CO - COOH$

C. $C_6H_5 - \underset{\underset{OH}{|}}{CH} - COOH$

D. $C_6H_5 - \underset{\underset{NH_2}{|}}{CH} - COOH$

Answer: A

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39. Among the following acids, which has the lowest pK_a value?

A. CH_3COOH

B. $HCOOH$

C. $(CH_3)_2CH - COOH$

D. CH_3CH_2COOH

Answer: B

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40. The compound formed as a result of oxidation of ethylbenzene by $KMnO_4$

A. benzyl alcohol

B. benzophenone

C. acetophenone

D. benzoic acid

Answer: D

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41. In the presence of a small amount of red phosphorous, aliphatic carboxylic acids react with chlorine or bromine to yield a compound in which α-hydrogen has been replaced by halogen. This reaction is known as

A. Wolff-Kishner reaction

B. Etard reaction

C. Hell-Volhard-Zelinsky reaction

D. Rosenmund reaction

Answer: C

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42. The carboxyl functional group (-COOH) is present in

A. picric acid

B. barbituric acid

C. ascorbic acid

D. aspirin

Answer: D

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43. The reagent that can be used to convert butane -2-one to propanoic acid is

A. $NaOH, NaI / H^+$

B. Fehling solution

C. Tollens reagent

D. $NaOH, I_2 / H^+$

Answer: D

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44. The reactivity of carboxylic acid derivative from highest to lowest reactivity is

A. acid anhydride $>$ acid chloride $>$ ester $>$ amide

B. acid chloride $>$ acid anhydride $>$ ester $>$ amide

C. acid anhydride $>$ ester $>$ amide $>$ acid chloride

D. amide $>$ ester $>$ acid anhydride $>$ acid chloride

Answer: B

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45. Which of the following carboxylic acids is not reduced to the corresponding 1° alcohol by B_2H_6/THF?

A. $CH_3CH(CH_3)CH_2COOH$

B. $p-CH_3COC_6H_4COOH$

C. $m-O_2NC_6H_4COOH$

D. $(z)-CH_3CH=CHCH_2COOH$

Answer: D

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46. Which of the following dicarboxylic acids gives a cyclic anhydride on heating?

A. $CH_2(COOH)_2$

B. $\begin{array}{l} CH_2COOH \\ | \\ CH_2COOH \end{array}$

C. $HOOC(CH_2)_4COOH$

D. $HOOC(CH_2)_5COOH$

Answer: B

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47. Which of the following acids has the smallest dissociation constant?

A. $CH_3CHFCOOH$

B. FCH_2CH_2COOH

C. $BrCH_2CH_2COOH$

D. $CH_3CHBrCOOH$

Answer: C

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48. In which of the following, the number of carbon atoms does not remain same when carboxylic acid is obtained from it by oxidation?

A. CH_3COCH_3

B. CCl_3CH_2CHO

C. $CH_3CH_2CH_2OH$

D. CH_3CH_2CHO

Answer: A

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Level Ii

1. Tertiary alcohols (3°) having at least four carbon atoms upon drastic oxidation yield carboxylic acids with

A. One carbon atom less

B. Two carbon atoms less

C. hree carbon atoms less

D. Same number of carbon atoms

Answer: B

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2. In the reaction, $C_6H_5OH \xrightarrow{NaOH} (A) \xrightarrow[140^\circ C,\,(4-7)\,\text{atm}]{CO_2} (B) \xrightarrow{HCl} (C)$, the compound (C) is

A. Benzoic acid

B. Salicylaldehyde

C. Chlorobenzene

D. Salicylic acid

Answer: D

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3. Carboxylic acid group does not give the usual addition and elimination reactions of aldehydes and ketones because

A. O-H bond is more polar than $\rangle C = O$ group

B. carboxylate ion gets ionised

C. carboxylate ion gets stabilised by resonance

D. it exists as-COOH and there is no carbonyl group

Answer: C

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4. In a set of the given reactions, acetic acid yielded a product C.

$CH_3COOH + PCl_5 \rightarrow A \xrightarrow[\text{Anh.}AlCl_3]{C_6H_6} B \xrightarrow[\text{Ether}]{C_2H_5MgBr} C$. Product C would be:

A. $CH_3{}^{|C(2)H(5)}C(OH)$ C(6)H(5)`

B. $CH_3CH(OH)C_2H_5$

C. $CH_3COC_6H_5$

D. $CH_3CH(OH)C_6H_5$

Answer: A

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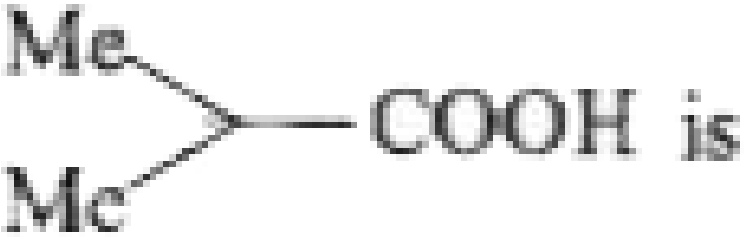
5. The correct order of increasing acid strength of the following compounds

I) CH_3COOH

II) $MeOCH_2COOH$

III) CF_3COOH

IV  is

A. $IV < I < II < III$

B. $I < IV < II < III$

C. $II < IV < I < III$

D. $IV < I < III < II$

Answer: A

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6. α-Hydroxypropanoïc acid can be prepared from ethanal by following the steps given in the sequence.

A. Treat with HCN followed by acidic hydrolysis

B. Treat with $NaHSO_3$ followed by reaction with Na_2CO_3

C. Treat with H_2SO_4 followed by hydrolysis

D. Treat with $K_2Cr_2O_7$ in presence of sulphuric acid

Answer: A

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7. Which of the following methods give a carboxylic acid without homologation?

A. $RCH_2OH \xrightarrow{Cr_2O_7^{2-} / H_3O^+}$

B. $RCH_2Br \xrightarrow{CN^-, H_3O^+}$

C. $CH_3OH \xrightarrow[\text{Rhcatalyst}, I^-]{CO, \text{pressure}}$

D. $CH_3CH_2ONa \xrightarrow[\text{pressure}]{CO, \Delta} X \xrightarrow{H_2O^+}$

Answer: A

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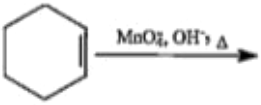
8. In which case number of carbon atoms is retained?

A. $CH_3CH = CHCH_3 \xrightarrow{O_3 / H_2O / Zn}$

B. $CH_3C \equiv CCH_3 \xrightarrow[\Delta]{KMnO_4, OH^-}$

C. 

D. $CH_3CH_2CH = CH_2 \xrightarrow{O_3 / H_2O}$

Answer: C

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9. Select the incorrect statement.

A. NaOH is strong enough to remove the proton from phenols and carboxylic acids

B. $NaHCO_3$ is only strong enough to remove the proton of carboxylic acids

C. Mixture of phenol and succinic acid can be separated using $NaHCO_3$

D. Mixture of phenol and succinic acid can be separated using NaOH

Answer: D

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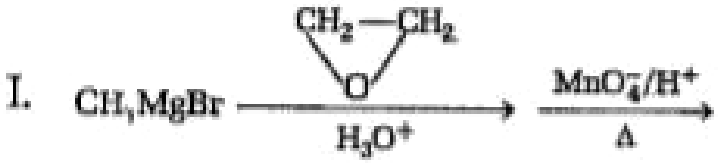
10. Consider the following reactions,

I. 

I.

II. $CH_3CH_2Br \xrightarrow{KCN} \xrightarrow{H_3O^+}$

III. $CH_3CH_2\overset{\overset{O}{||}}{C}OC_2H_5 \xrightarrow[H_3O^+]{CH_3MgBr\,(2\text{mol})}$ Propanoic acid is the final product in

A. I, II and III

B. I and II

C. I and III

D. II and III

Answer: B

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11. Which one of the following compounds will react with $NaHCO_3$ solution to give sodium salt and carbon dioxide?

A. Acetic acid

B. n-hexanol

C. Phenol

D. Both B) and C)

Answer: A

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12. $CH_2 = CH(CH_2)_2COOH$ and HBr reacts in presence of peroxide to give

A. $BrCH_2CH_2(CH_2)_2COOH$

B. $CH_3CH(CH_2)_2COOH$

C. $CH_3CHCH_2(CH_2)_2COOH$

D. $CH_3CHBr(CH_2)_2COOH$

Answer: A

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13. Which of the following types of hydrolysis of esters give directly carboxylic acids and carboxylates respectively?

A. Acidic hydrolysis and basic hydrolysis

B. Basic hydrolysis and acidic hydrolysis

C. Acidic hydrolysis and acidic hydrolysis

D. Basic hydrolysis and basic hydrolysis

Answer: A

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14. Why the aromatic carboxylic acids do not undergo Friedel-Crafts reaction?

A. Carboxyl group acts as an activating and meta-directing group

B. Carboxyl group is deactivating and act as Lewis base

C. Carboxyl group acts as an activating and ortho-directing group

D. Carboxyl group acts as deactivating group and the catalyst

Answer: B

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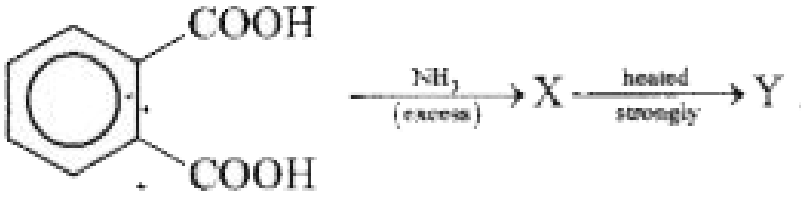
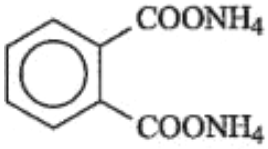
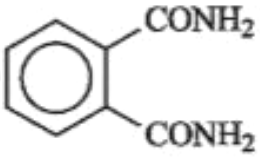


15. . The product Y is :

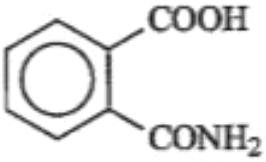


A.

B.



C.



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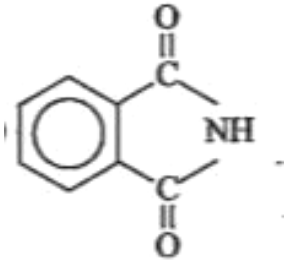

Answer: D

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16. A hydrocarbon C_6H_{12} decolourises bromine and gives n-Hexane on hydrogenation. On oxidation with $KMnO_4$ it forms two different monobasic acids of the type R-COOH. The compound is

A. Cyclohexene

B. 2-Hexene

C. 1-Hexene

D. 3-Hexene

Answer: B

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17. $\underset{(A)}{PhMe} \xrightarrow[\Delta, H_3O^{\oplus}]{KMnO_4/\overset{\ominus}{O}H} (B) \xrightarrow[\text{or } PCl_5]{SOCl_2} (C) \xrightarrow{PhCOONa} (D)$. Compound D (is)

:

A. $PhCOCl$

B. $PhCONH_2$

C. $PhCOOH$

D. $(PhCO)_2O$

Answer: D

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18. Carboxylic acid, although unreactive to alcohols, reacts in the presence of small amount of conc. H_2SO_4 or with 2-3% of HCl?

$$RCOOH + R'OH \overset{H^{\oplus}}{\Longleftrightarrow} RCOOR' + H_2O$$

Which of the following is correct about the above reaction?

I. This reaction is called Fischer esterification reaction.

II. The equilibrium is shifted to R.H.S. if H_2O is removed by azeotropic distillation with benzene.

III. The reaction of RCOCl and R'OH to give ester(RCOOR') is irreversible and more feasible than esterification of RCOOH

IV. If the above esterification of RCOOH is carried out in excess of R'OH, the equilibrium is shifted to R.H.S.

A. (I), (II)

B. (I), (II), (III)

C. (I), (II), (IV)

D. All

Answer: D

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19. The acid D obtained through the following sequece of reactions is $C_2H_5Br \xrightarrow{Alc.KOH} A \xrightarrow[CCl_4]{Br_2} B \xrightarrow[(excees)]{KCN} C \xrightarrow{H_3O^+}$: Succinic acid, Malonic acid, Maleic acid, Oxalic acid

A. succinic acid

B. malonic acid

C. maleic acid

D. oxalic acid

Answer: A

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

A.

$$FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$$

B.

$$CH_3COOH > BrCH_2COOH > ClCH_2COOH > FCH_2COOH$$

C.

$$FCH_2COOH > CH_3COOH > BrCH_2COOH > ClCH_2COOH$$

D.

$$BrCH_2COOH > ClCH_2COOH > FCH_2COOH > CH_3COOH$$

Answer: A

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21. 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 most probably is

A. HCHO

B. CH_3COCH_3

C. CH_3COOH

D. CH_3OH

Answer: C

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22. 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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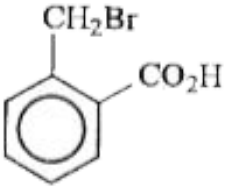
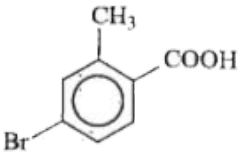
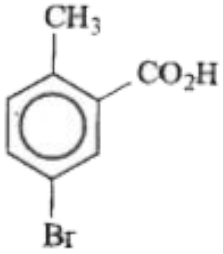
23. o-Toluic acid on reaction with $Br_2 + Fe$ gives

A. 

B. 

C.



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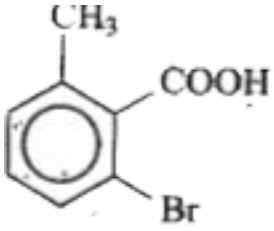

Answer: C

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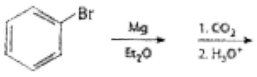
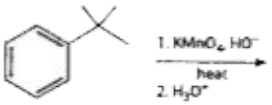
24. Which of the following produces benzoic acid?

A.



B.



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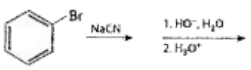
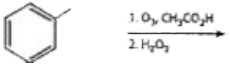


D. 

Answer: A

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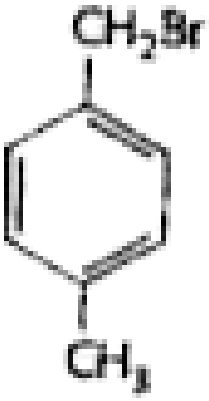
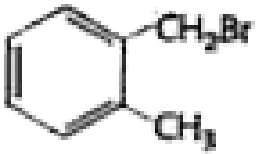
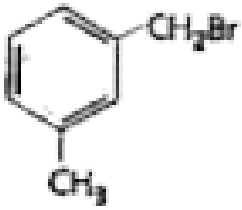
25. Compound (A), C_8H_9Br, gives a white precipitate when warmed with alcoholic $AgNO_3$ Oxidation of (A) gives an acid (B),$C_6H_6O_4$. (B) easily forms anhydride on heating. Identify the compound (A)

A. 

B. 

C. 

D. 

Answer: C

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26. Maleic acid and fumaric acid are two unsaturated dicarboxylic acids. Which of the following statements is incorrect.

A. The boiling point of fumaric acid is greater than maleic acid

B. Dehydration product of both acids is maleic anhydride

C. Maleic acid dehydrates at lower temperature than fumaric acid

D. The pK_{a1} of maleic acid is greater than fumaric acid, whereas pK_{a2} of fumaric acid is greater than maleic acid.

Answer: D

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27. In which of the following reactions, the number of carbon atoms does not decreases

A. Electrolysis of sodium salt of monocarboxylic acid

B. Reaction of ethanamide with bromine and NaOH

C. Heating the beta keto carboxylic acid.

D. Heating carboxylic acid in the presence of sodalim

Answer: A

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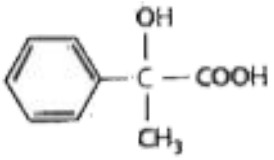
28. In a set of reactions, acetic acid gives the following product 'D'

$$CH_3 - COOH \xrightarrow{SOCl_2} A \xrightarrow[\text{anhy. } AlCl_3]{C_5H_6} B \xrightarrow{HCN/OH^-} C \xrightarrow{H-OH/OH^-} D.$$

The structure of product 'D' is

A.



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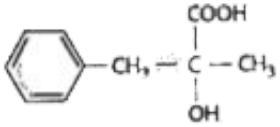
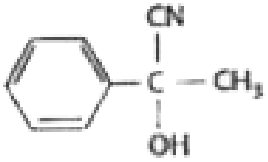
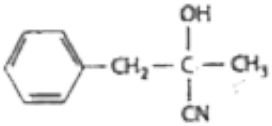


C.



D.



Answer: A

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29. (A), (B) and (C) are three dicarboxylic acids such that:

(A) $\xrightarrow{\Delta}$ carboxylic acid $+CO_2 \uparrow$

(B) $\xrightarrow{\Delta}$ acid anhydride $+H_2O \uparrow$

(C) $\xrightarrow{\Delta}$ cyclic ketone $+H_2O + CO_2 \uparrow$ then:

A. $\underset{\text{adipic acid}}{(\mathrm{A})} \quad \underset{\text{malonic acid}}{(\mathrm{B})} \quad \underset{\text{succinic acid}}{(\mathrm{C})}$

B. $\underset{\text{malonic acid}}{(\mathrm{A})} \quad \underset{\text{adipic acid}}{(\mathrm{B})} \quad \underset{\text{succinic acid}}{(\mathrm{C})}$

C. $\underset{\text{adipic acid}}{(\mathrm{A})} \quad \underset{\text{succinic acid}}{(\mathrm{B})} \quad \underset{\text{malonic acid}}{(\mathrm{C})}$

D. $\underset{\text{malonic acid}}{(\mathrm{A})} \quad \underset{\text{succinic acid}}{(\mathrm{B})} \quad \underset{\text{adipic acid}}{(\mathrm{C})}$

Answer: D

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30. $HCOOH \xrightarrow{\text{Conc.}H_2SO_4} X + Y$. Products X and Y are respectively:

A. CO, H_2O

B. CO_2, H_2O

C. CO_2, H_2

D. CO, H_2

Answer: A

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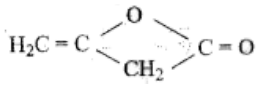
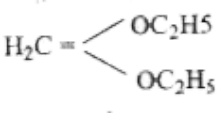
31. $CH_3CO_2C_2H_5$ on reaction with sodium ethoxide in ethanol gives (A), which on heating in the presence of ac gives (B). Compound (B) is:

A. CH_3COCH_2COOH

B. CH_3COCH_3

C. 

D. 

Answer: C

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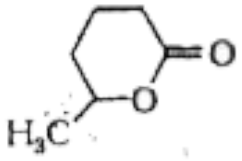
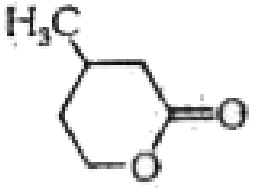
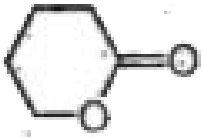
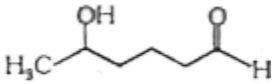
32. End product of this conversion

$$CH_3 - \overset{O}{\overset{||}{C}} - CH_2 - CH_2 - CH_2 - CO_2H \xrightarrow[(ii)\, H_2OH^{\oplus}]{(i)\, NaBH_4} \text{ is?}$$

A. 

B. 

C. 

D. 

Answer: A

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33. When acetic acid reacts with ketene, product formed is:

A. ethyl acetate

B. aceto-acetic ester

C. acetic anhydride

D. no reaction

Answer: C

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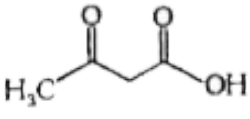
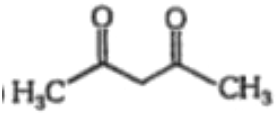
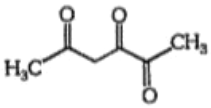
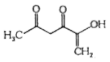
34. Which of the following compound would be expected to decarboxylate when heated:

A. 

B. 

C. 

D. 

Answer: A

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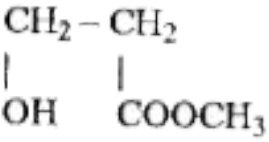
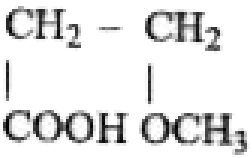
35. 

, A is ?

A. 



B.

C. both are correct

D. none is correct

Answer: A

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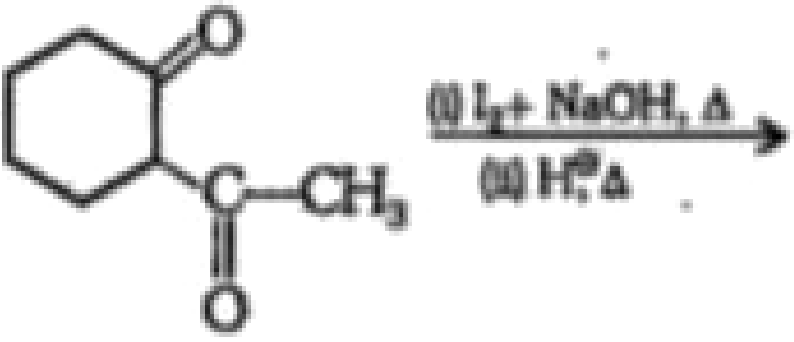
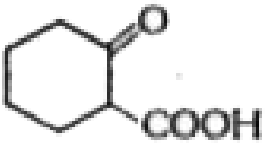
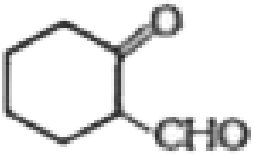
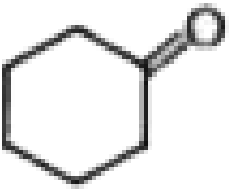
36. End product of the following sequence of reaction is:



A. Yellow ppt. of 

B. Yellow ppt. of 

C. Yellow ppt. of 

D. Yellow ppt. of 

Answer: C

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37. On subjecting mesityl oxide to the iodoform reaction, one of the products is the sodium salt of an organic acid. Which acid is obtained?

A. $(CH_3)_2C = CH - CH_2COOH$

B. $(CH_3)_2CH - COOH$

C. $(CH_3)_2C = CH - COOH$

D. $(CH_3)_2 = CH - CO - COOH$

Answer: C

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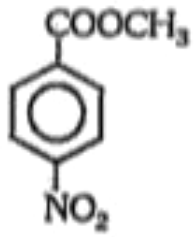
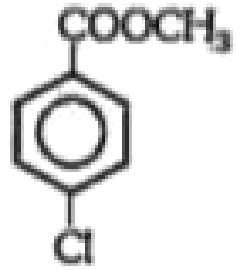
38. The ease of alkaline hydrolysis is more for:

A. 

B.



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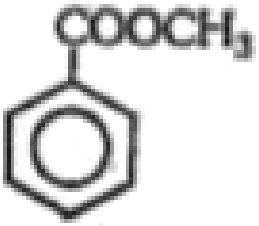
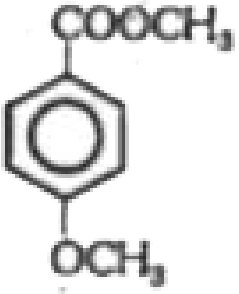


D.



Answer: A

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39. Which of the following does not form benzoic acid on oxidation with $KMnO_4 / H^+$?

A. Toluene

B. Cumene

C. tert-Butylbenzene

D. Ethylbenzene

Answer: C

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40. p-Nitrobenzoic acid is a stronger acid than benzoic acid. This is due to

A. direct resonance interaction between $-NO_2$ and $-COOH$ groups.

B. $-NO_2$ group generates a strong-electron withdrawing inductive effect due to positive charge on carbon bearing -COOH group.

C. $-NO_2$ group generates a strong-electron withdrawing inductive effect due to positive charge on meta position to -COOH group.

D. strong inductive effect of $-NO_2$ group.

Answer: B

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41. The reagents used in the reduction reactions

i)$CH_3COC_6H_4COOH \rightarrow CH_3COC_6H_4CH_2OH$

ii) $CH_3CH = CHCH_2COOH \rightarrow CH_3CH = CHCH_2CH_2OH$

respectively are:

A. B_6H_6/THF followed by H_3O^+ and $LiAlH_4$

B. B_2H_6/THF and B_2H_6/THF

C. $LiAlH_4$ and $LiAlH_4$

D. $LiAlH_4$ and B_2H_6/THF

Answer: A

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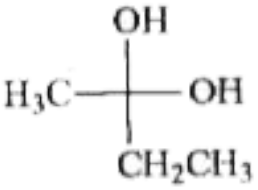
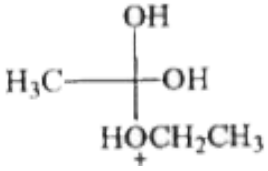
42. The intermediate formed when CH_3COOH react with CH_3CH_2OH in presence of HCl

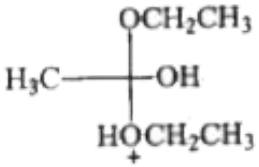


A.

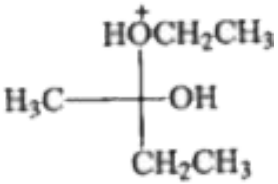


B.

C.



D.



Answer: B

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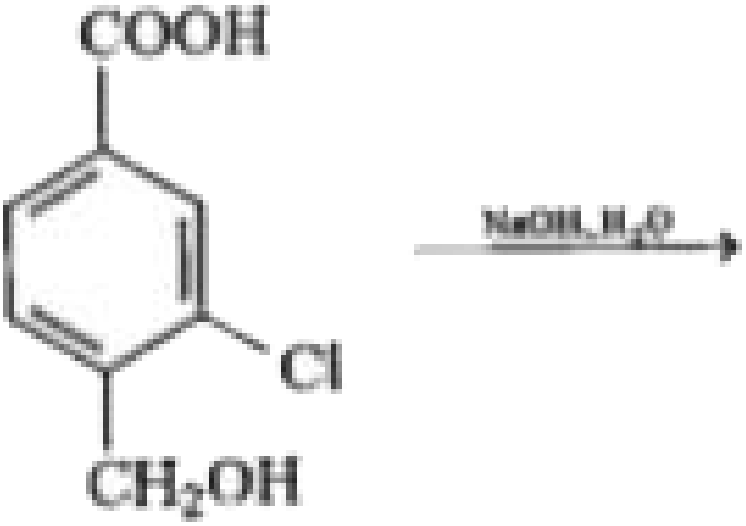
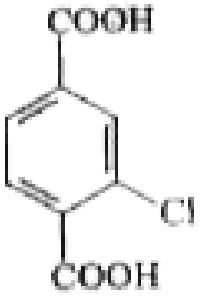
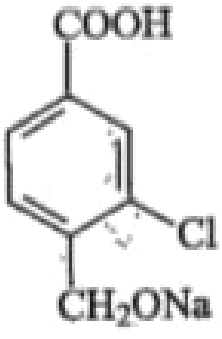
43. The product of the reaction shown below is,



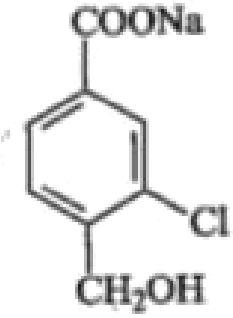
A. (a)



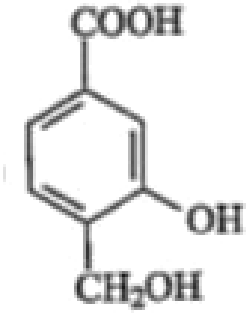
B. (b)



C. (c)



D. (d)



Answer: C

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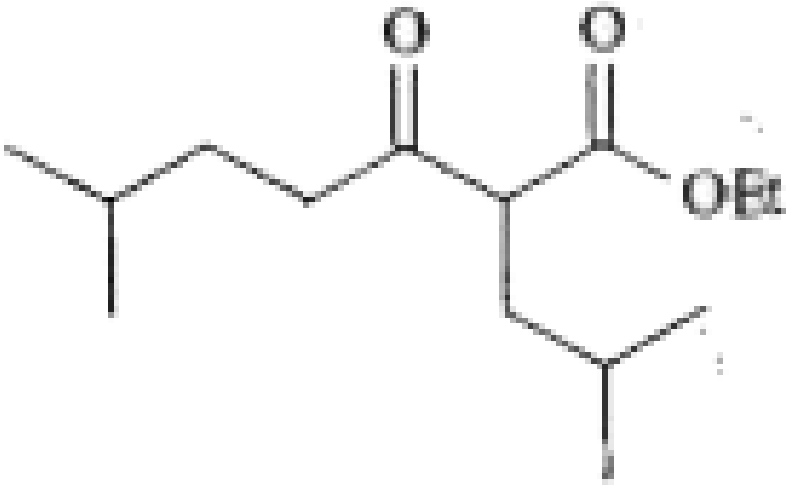
44. The compound



formed by Claisen condensation of

A. ethyl 2-methyl pentanoate

B. ethyl 5-methyl hexanoate

C. ethyl 4-methyl pentanoate

D. ethyl 3,3-dimethyl butanoate

Answer: C

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45. Which of the following orders is true regarding the boiling point of organic substances?

A. $CH_3COCl > CH_3COOH > (CH_3CO)_2O$

B. $CH_3COCl < CH_3COOH < (CH_3CO)_2O$

C. $CH_3COCl > CH_3COOH < (CH_3CO)_2O$

D. $CH_3COCl < CH_3COOH > (CH_3CO)_2O$

Answer: B

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46. Which of the following statements is not correct?

A. The reduction of RCOOH with $LiAlH_4$ produces RCH_3.

B. The -COOH group attached to benzene ring is meta directing.

C. In $R-\overset{O}{\overset{||}{C}}-O^{-}$, both the carboni-oxygen bond lengths are identical. It is more than carbon-oxygen double bond length, and less than carbon-oxygen single bond length.

D. Electron-withdrawing substituents stabilises the carboxylate anion and hence increase the acidity of carboxyli acid.

Answer: A

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47. Which of the following statements is correct?

A. Alkaline hydrolysis of an ester is a reversible reaction

B. In the alkaline hydrolysis of an ester, the bond broken is the bond between oxygen and alkyl group.

C. Alkaline hydrolysis of an ester follows second order kinetics and is thus S_N2.

D. An electron-withdrawing group G in p-$GC_6H_4COOC_2H_5$ decreases the rate of hydrolysis as compared to $C_6H_5COOC_2H_5$.

Answer: C

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Level Iii Single Correct Answer Type

1. Omega indicates the position of the first double bond in an unsaturated carboxylic acid counting from methyl end. The omega-3 fatty acid among the following is

A. (9z) - hexadecanoic acid

B. (9z) - octadecanoic acid

C. (9z, 12z) - octadecanedioic acid

D. (9z, 12z, 15z)- octadecanetrioic acid

Answer: D

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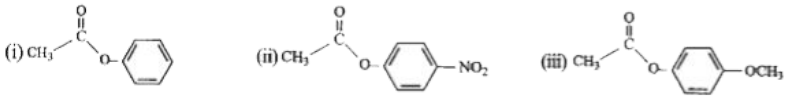
2. The correct order of reactivity of the following esters towards hydrolysis is



A. $(i) > (ii) > (iii)$

B. $(ii) > (i) > (iii)$

C. $(ii) > (iii) > (i)$

D. $(iii) > (i) > (ii)$

Answer: B

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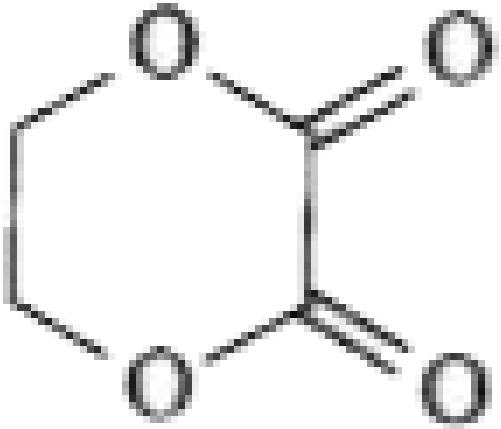
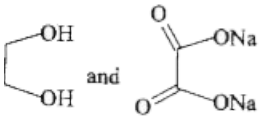
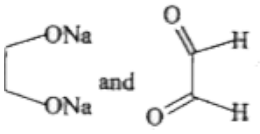
3. The products of reaction of aqueous NaOH on the compound

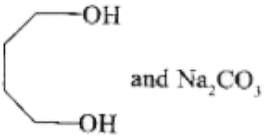


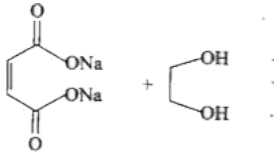
are

are

A. 

B. 

C. 

D. 

Answer: A

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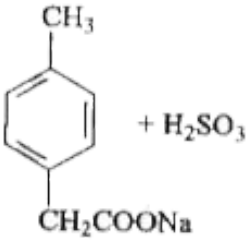
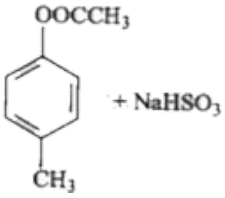
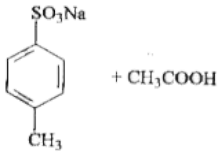
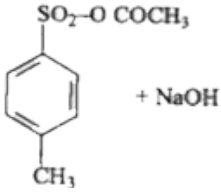
4. Reaction of sodium ethanoate with 4-methylbenzene sulphonic acid produce

A. 

B. 

C. 

D. 

Answer: C

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5. Grignard reagents and organo lithium 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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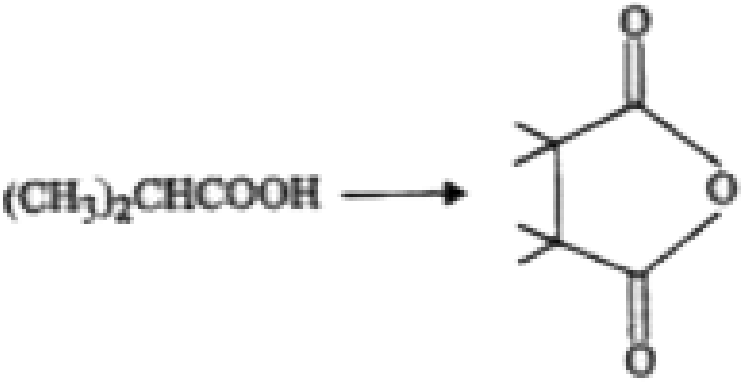
6. The correct set of reagents for the following conversion is,



A. $P_4 / I_2, Na,$ conc. H_2SO_4

B. $P_2O_5, LiAlH_4$

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

D. $P\&Br_2 / I_2, Na, P_2O_5 / \Delta$

Answer: D

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7. Consider the following compounds :

(i) C_6H_5COCl

(ii) 

(iii) 

(iv) 

The correct decreasing order of their reactivity towards hydrolysis is:

A. $(ii) > (iv) > (i) > (iii)$

B. $(ii) > (iv) > (iii) > (i)$

C. $(i) > (ii) > (iii) > (iv)$

D. $(iv) > (ii) > (i) > (iii)$

Answer: A

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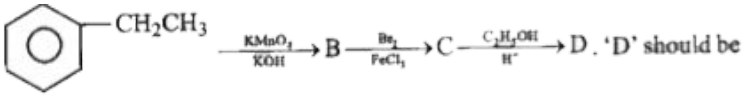
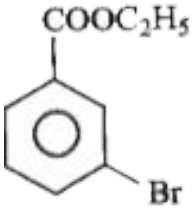
8. In a set of reactions, ethylbenzene yielded a product D.

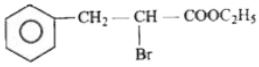


. 'D' should be

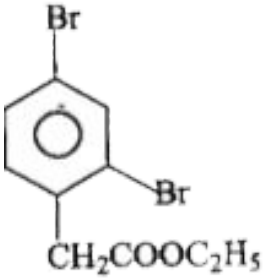
'D' should be



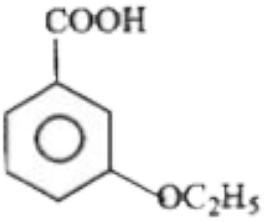
A.



B.



C.



D.

Answer: A

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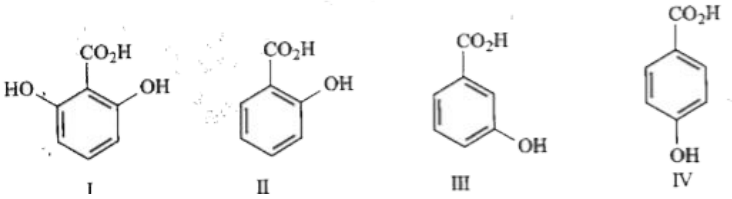
9. The correct order of acidity for the following compounds is



A. $I > II > III > IV$

B. $III > I > II > IV$

C. $III > IV > II > I$

D. $I > III > IV > II$

Answer: A

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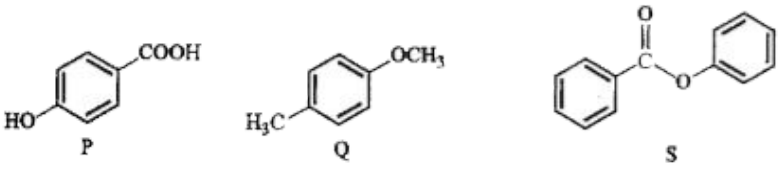
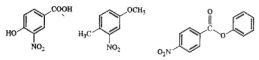
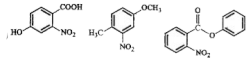
10. The compounds P, Q and S

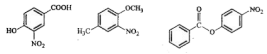


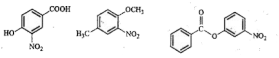
were separately subjected to nitration using HNO_3 / H_2SO_4 mixture.

The major product formed in each case respectively, is

A. 

B. 

C. 

D. 

Answer: C

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Level Iii Multiple Correct Answer Type

1. Which one of the following pairs gives effervescence with aqueous $NaHCO_3$

(I) $CH_3 - \overset{O}{\overset{||}{C}} - Cl$ (II) $CH_3 - \overset{O}{\overset{||}{C}} - CH_3$

(III) $CH_3 - \overset{O}{\overset{||}{C}} - O - CH_3$ (IV) $CH3COOCOCH3$: I and II I and IV II and III I and III

A. CH_3COCl

B. CH_3COOCH_3

C. $(CH_3CO)_2O$

D. $(CH_3)_2CO$

Answer: A::C

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2. The final products formed when urea undergoes alkali catalysed hydrolysis.

A. N_2

B. NH_3

C. Na_2CO_3

D. H_2O

Answer: B::C

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3. Which among the following are esters.

A. aspirin

B. heroin

C. nitroglycerine

D. trinitrotoluene

Answer: A::B::C

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4. Which carboxylic acids among the following have pk_a value less than that for methanoic acid

A. Benzene carboxylic acid

B. chloroethanoic acid

C. bromoethanoic acid

D. phenyl ethanoic acid

Answer: B::C

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

A. toluene

B. ethylbenzene

C. isopropylbenzene

D. tert-butylbenzene

Answer: A::B::C

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6. 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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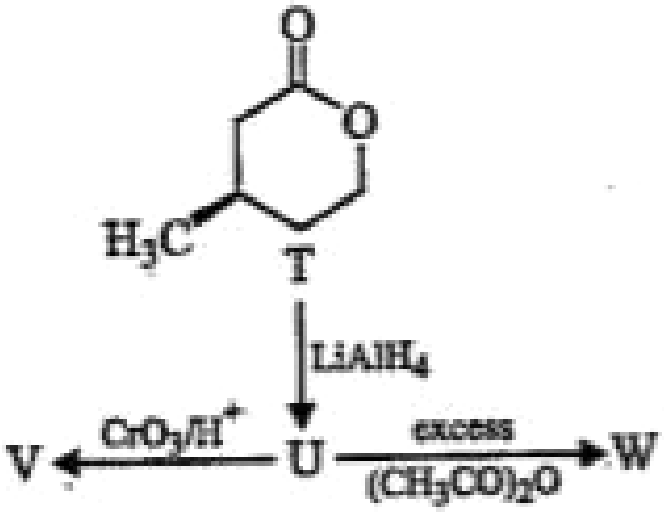
7. With reference to the scheme given, which of the given statement(s) about T, U, V and W is (are) correct?



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

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8. Which of the following statements are correct about the following reaction: $RCOOH + LiAlH_4 \rightarrow$

A. First step in the above reaction is:

$RCOOH + LiAlH_4 \rightarrow RCOO^{\ominus}Li^{\oplus} + H_2 + AlH_3$

B. Second step is the transfer of $H^{\ominus}$ ion from AlH_3 to (C=O) of $RCOO^{\ominus}$

C. The intermediate product (RCH=O) is formed

D. (RCH=O) is further reduced to $RCH_2O^{\ominus}$ which on acidification gives RCH_2OH

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

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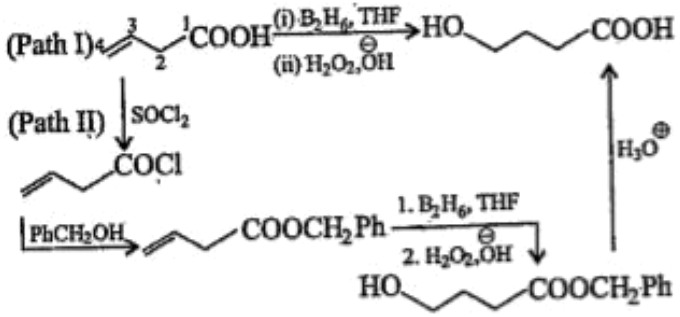
9. Which of the following statements are correct about the following reactions:



A. Path (I) is feasible but path (II) is not

B. Path (II) is feasible but path (I) is not

C. $B_2H_6 / H_2O_2, \overset{\ominus}{O}H$ adds to (C=C) bond to give alcohol by anti-Markovnikov addition.

D. B_2H_6 / THF does not react with (COOH) group.

Answer: B::C

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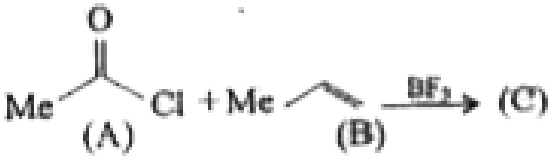
10. Which of the following statements are correct about the given reaction?



A. The product (C) is 

B. The product (C) is

C. The formation of (C) proceeds via the formation of acylium ion

D. The formation of (C) proceeds via the formation of carbocation.

Answer: A::C

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Level Iii Numerical Type

1. Normal boiling point of ethanoic acid is 391K. How many of the following have normal boiling point higher than that for ethanoic acid

$CH_3OOCH, CH_3CH_2CH_2OH, CH_3CH_2OCH_3,$

$CH_3COCl \ , CH_3CONH_2,$

$CH_3CH_2CN, CH_3CH_2CH_2CH_3, CH_3COCH_3, CH_3CH_2CHO$

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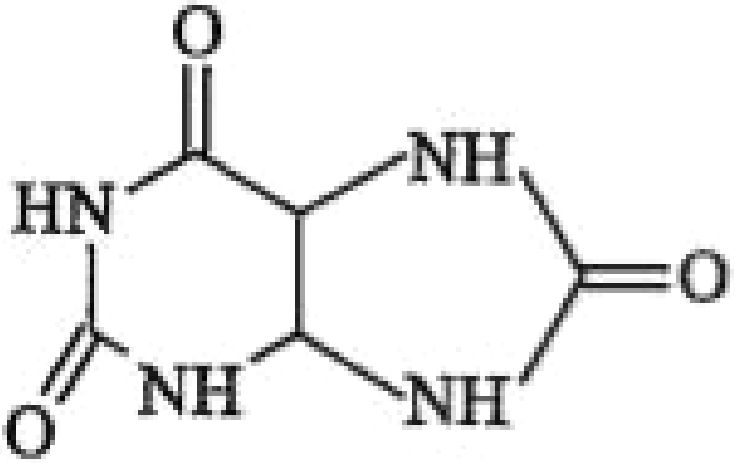
2. When amino acids are metabolised excess nitrogen is concentrated into uric acid



How many amide bonds present in uric acid.

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3. How many isomeric carboxylic acids with formula $C_5H_{10}O_2$ undergo HVZ reaction.

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4. $CH_3(CH_2)_6CH_3$ on aromatisation using Cr_2O_3/V_2O_3 catalyst at 770K produce a mixture of isomeric aromatic hydrocarbons. The number of different aromatic carboxylic acids that are formed when

each of the isomeric hydrocarbon formed is oxidised with alkaline $KMnO_4$ followed by acidification.

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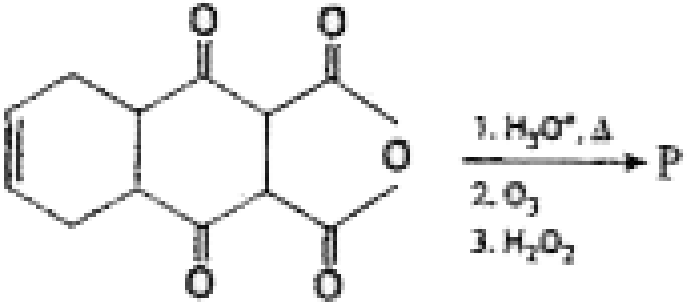
5. The total number of carboxylic acid groups in the product P is:



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6. The number of carboxylic acids obtained when all the isomeric arenes having the molecular formula C_8H_{10} are oxidized with alkaline $KMnO_4$ followed by acidification, is .....

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

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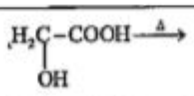
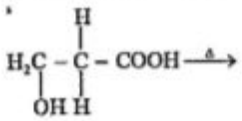
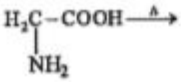
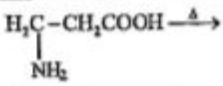
Level Iii Matching Column Type

1. Match the following columns :

A)		p)	Cyclic compound is formed
B)		q)	Water is eliminated during product formation
C)		r)	NH_3 is evolved
D)		s)	α,β msaturated carboxylic acid is formed

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2. Match the reaction with the product obtained.

Column I	Column II
A) $CH_3CH_2COOH \xrightarrow[Cl_2]{Red\ P}$	p) $CH_3COCH_2CH_2OH$
B) $CH_3COCH_3 + C_6H_5CHO \xrightarrow{OH^-}$	q) $(CH_3CO)_2O$
C) $HCHO + CH_3COCH_3 \xrightarrow{OH^-}$	r) CH_3CCl_2COOH
D) $CH_3COOH \xrightarrow[\Delta]{P_2O_5}$	s) $C_6H_5CH=CHCOCH_3$

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Level Iii Statement Type Questions

1. Statement 1 : The melting points and boiling points of aliphatic acids are usually higher than those of aromatic acids of comparable molecular masses.

Statement 2 : The planar benzenering in the aromatic acids can fit more closely in the crystal lattice than zig-zig structure of aliphatic acids.

A. Statement 1 is True, statement 2 is True, Statement 2 is 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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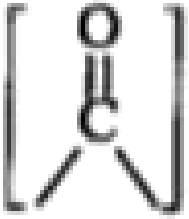
2. Statement 1 : Carboxylic acids $\left(R - \overset{O}{\overset{\|}{C}} - OH \right)$ have a carbonyl group but it does not give the test of carbonyl group.

Statement 2 : Due to resonance, the double bond character of  group is greatly reduced

A. Statement 1 is True, statement 2 is True, Statement 2 is 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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3. Statement 1 : $RCOCl$, $(RCO)_2$ and RCOOR' all react with Grignard reagents to form 3° alcohols.

Statement 2 : RCOCl reacts with R_2Cd to form ketones but $(RCO)_2O$ and RCOOR' do not react at all.

A. Statement 1 is True, statement 2 is True, Statement 2 is 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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4. 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 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. Statement 1 : Dichloro and trichloro acids are stronger than monochloroacetic acid.

Statement 2 : An increase in the number of electronegative groups on the alkyl chain increases the strength of the acid.

A. Statement 1 is True, statement 2 is True, Statement 2 is 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

6. Statement 1 : Peracids are stronger acids than corresponding carboxylic acids.

Statement 2 : 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 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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Level Iii Linked Comprehension Type

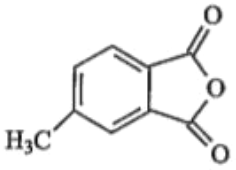
1. Paragraph

An organic compound $A(C_9H_6O_3)$ does not react with aqueous solution of $NaHCO_3$ as well as does not change the colour of litmus paper. Aon acid hydrolysis gives $B(C_9H_8O_4)$ as major product whereas A on treatment with one equivalent of methanol in acidic medium gives $C(C_{10}H_{10}O_4)$ as the major product (other minor isomer of C is also formed). B on heating with sodalime gives toluene.

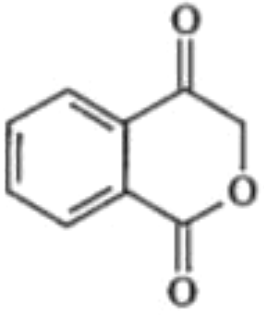
Answer the following questions based on the above information.

The structure of A satisfying above conditions is

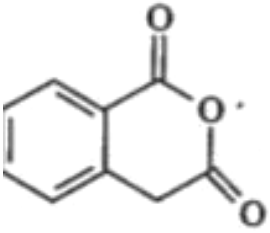
A.



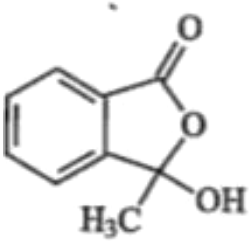
B.



C.



D.



Answer: C

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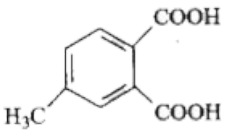
2. Paragraph

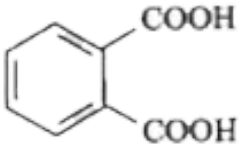
An organic compound $A(C_9H_6O_3)$ does not react with aqueous solution of $NaHCO_3$ as well as does not change the colour of litmus paper. Aon acid hydrolysis gives $B(C_9H_8O_4)$ as major product whereas A on treatment with one equivalent of methanol in acidic medium gives $C(C_{10}H_{10}O_4)$ as the major product (other minor

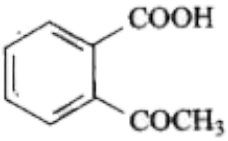
isomer of C is also formed). B on heating with sodalime gives toluene.

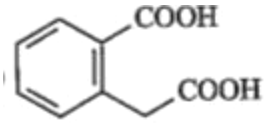
Answer the following questions based on the above information.

The most likely structure of B is

A. 

B. 

C. 

D. 

Answer: D

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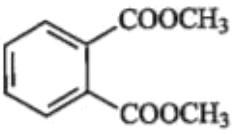
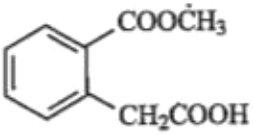
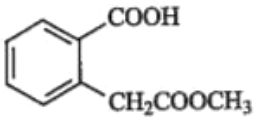
3. Paragraph

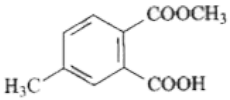
An organic compound $A(C_9H_6O_3)$ does not react with aqueous solution of $NaHCO_3$ as well as does not change the colour of litmus paper. Aon acid hydrolysis gives $B(C_9H_8O_4)$ as major product whereas A on treatment with one equivalent of methanol in acidic medium gives $C(C_{10}H_{10}O_4)$ as the major product (other minor isomer of C is also formed). B on heating with sodalime gives toluene. Answer the following questions based on the above information.

The structure of product C is

A. 

B. 

C. 

D. 

Answer: B

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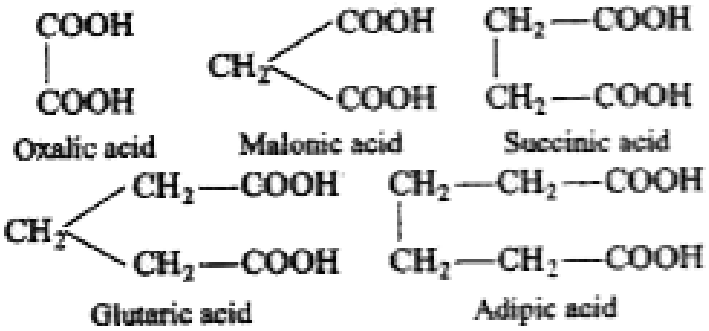
4. Paragraph

Dicarboxylic acids have two carboxylic groups, eg.,



Acidity of dicarboxylic acid depends upon the stability of intermediate ion and upon the distance between two carboxylic groups. Shorter the distance between two carboxylic groups, greater is the acidic character. Melting point of these acids depends on the symmetry. Greater the symmetry, higher will be the melting point.

Dicarboxylic acids on heating give monocarboxylic acid, alkanes, cyclic

ketones depending on the conditions

Which of the following is the most acidic?

A. Oxalic acid

B. Malonic acid

C. Succinic acid

D. Adipic acid

Answer: A

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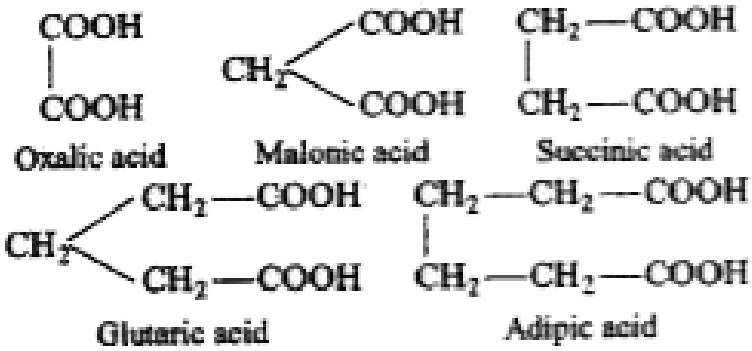
5. Paragraph

Dicarboxylic acids have two carboxylic groups, eg.,



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Dicarboxylic acids on heating give monocarboxylic acid, alkanes, cyclic ketones depending on the conditions

Which of the following dicarboxylic acids is used in the manufacture of nylon-66?

A. Succinic acid

B. Glutaric acid

C. Adipic acid

D. Oxalic acid

Answer: C

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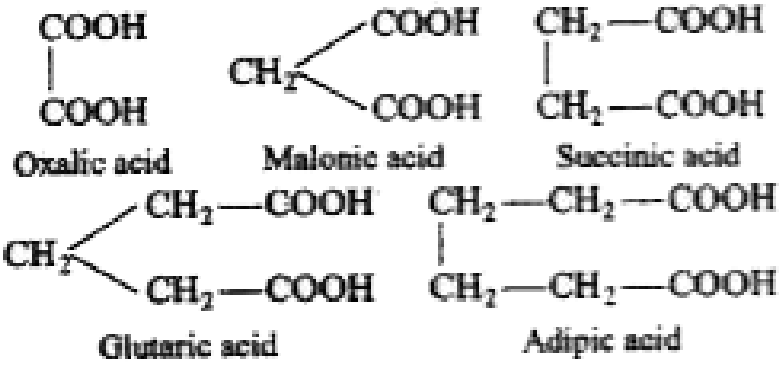
6. Paragraph

Dicarboxylic acids have two carboxylic groups, eg.,



Acidity of dicarboxylic acid depends upon the stability of intermediate ion and upon the distance between two carboxylic groups. Shorter the distance between two carboxylic groups, greater is the acidic character. Melting point of these acids depends on the symmetry. Greater the symmetry, higher will be the melting point.

Dicarboxylic acids on heating give monocarboxylic acid, alkanes, cyclic ketones depending on the conditions

Which of the following dicarboxylic acids, will give monocarboxylic acid on heating?

A. Malonic acid

B. Succinic acid

C. Glutaric acid

D. Adipic acid

Answer: A

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7. .

Which of the following has the smallest pK_a value?

A. $ClCH_2COOH$

B. $C_6H_5CH_2COOH$

C. CH_3CH_2COOH

D. $HOCH_2COOH$

Answer: A

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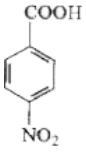
8.

Which of the following is the weakest acid?

A. 

B. 

C. 

D. 

Answer: A

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9.

(I) C_6H_5COOH

(II) $p - C_6H_4(OH)(COOH)$

(III) $p - (NO_2)C_6H_4COOH$

(IV) $o - (NO_2)C_6H_4COOH$

The correct order of acidic strength is

A. $IV > I > II > II$

B. $IV > III > II > I$

C. $IV > III > I > II$

D. $III > IV > I > II$

Answer: C

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10.

Which of the following statement is not correct?

A. Chloroacetic acid is stronger acid than acetic acid

B. Formic acid is stronger acid than iosbutyric acid

C. 3-Chlorobutanoic acid is weaker acid than 4-chlorobutanoic acid

D. Phenols are weaker acids than carboxylic acids.

Answer: C

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11. Paragraph

The acidic strength of saturated aliphatic carboxylic acids depends mainly upon the inductive effect of the substitutent and its position w.rt, the -COOH group. Whereas electron donating substitutents tend

to decrease, electron withdrawing substitutents 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 substitutents.

Among the following, the strongest acid is

A. CH_3COOH

B. C_6H_5COOH

C. $m - CH_3OC_6H_4COOH$

D. $p - CH_3OC_6H_4COOH$

Answer: C

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12. Paragraph

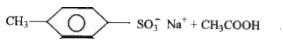
The acidic strength of saturated aliphatic carboxylic acids depends mainly upon the inductive effect of the substitutent and its position

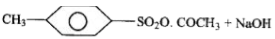
w.rt, the -COOH group. Whereas electron donating substitutents tend to decrease, electron withdrawing substitutents tend to increase the acid strength. The acidic strength of aromatic carboxylic acids, on the other hand, depends upon both the inductive and the resonance effect of the substitutents.

Which of the following is obtained when 4-methylbenzenesulphonic acid is hydrolysed with excess of sodium acetate?

A. 

B. 

C. 

D. 

Answer: C

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