

CHEMISTRY

BOOKS - CENGAGE CHEMISTRY (ENGLISH)

CARBOXYLIC ACIDS AND THEIR DERIVATIVES

Illustration

- 1. (a) What is glacial acid and why is it called so ?
- (b) What is vinegar and how is it prepared ?
- (c) The experimentally determined (by colligative properties method)
- molecular weight of acetic acid in the vapour state is 120. Explain why.

2. (a) Write the resonance structure of *RCOOH*.

(b) Why is (C - O) bond shorter in RCOOH than in ROH

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3. Convert Benzene to Adipic Acid.



4. Explain the following :

(a) In gaseous phase, the acidic characters of the following are :

 $CH_3CH_2COOH(I) > CH_3COOH(II)$

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5. Explain the following :

Highly

branched



are less acidic

than unbranched acids.



6.

Convert 1-chlorobutane (A) to valeric acid (B).

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7. Can we store Copper sulphate solution in iron vessel?





Identify (C)



9. Complete the following the following missing reagents :





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11. Complete the following reactions and explain the formation of the products.

(a) $HCOOH \xrightarrow{Conc. H_2SO_4}$ $CH_3COOH \xrightarrow{Conc. H_2SO_4}$ c. Ph COOH $\xrightarrow{Conc. H_2SO_4}$ (c) Ph COOH $\xrightarrow{Conc. H_2SO_4}$ 12. Calculate the ΔT_f (depression in freezing point) of 0.4m solution of

 CH_3COOH in benzene solution. $K_f = xKkgmol^{-1}$.

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13. Give the decreasing order of ease of decarboxylation of the following

acids on heating with soda lime.

(I) *CH*₃*COOH*



(III) $Cl_3C - COOH$.

14. How do the following react when heated and when treated with concentrated H_2SO_4 :

(i) HCOOH and (ii) $\left(COOH\right)_2$?



16. (a) Write the resonance structure of carboxylic acid derivative $\begin{pmatrix} R - C - G \\ || \\ O \end{pmatrix}$ and account for the stability and electrophilic character of the (C = O) group.



than the (R - G) bond in alkyl derivative ?



19. $ROOR'+H2O(HCI) \rightarrow RCOOH+R'OH$

What type of reaction is this?



23. Convert the following :

(A) to (B)



24. (a) Why do acyl chlorides undergo nucleophilic attack more readily than alkyl chlorides ?

(b) What is hydroxamic acid test and which functional group is determined by this test ?

25. Complete the following reactions :



27. Complete the following reaction :



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Solved Examples

1. The number of lone pairs of electrons in the nitrogen atom in ammonia

molecule is?

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2. There are two paths for the preparation of 2 - methyl pentanoic acid

(III) from $pen \tan - 2 - ol(I)$. Which path is feasible and why?



3. Complete the following reactions :



4. Explain the formation of the compound in the following reaction.



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5. What is the observation when NH4Cl reacts with KOH?

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6. The gas liberated when Sodium Sulphite reacts with dilute sulphuric acid is

7. Distinguish between the following :

MeCOCl (ethanoyl chloride) and (II)MeCOOH (ethanoic acid)

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8. Complete the following reaction :

(a) CH3CH2COCl + N3H gives (B). (B) on heating forms (C), which on

hydrolysis gives (D)

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9. Complete the reaction: Ammonium hydroxide is added to the aqueous

solution of FeCl3?



10. The simplest ratio of the atoms of carbons and hydrogen is 1:1 identify

the possible molecular formula

(a)C6H6

(b)C2H4

(c)C6H2

(d)C3H4

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11. Differentiate between the following acids :





12. Explain the machanism of the following reaction :





14. Give the reaction of oxide of metal that reacts with acid and alkali to

form salt and water.

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15. On the basis of Electronic Configuration the period and group of B(5)

is?

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16. Identify (A) and (B).

2 mol Ester (A)
$$\xrightarrow[\text{EiOH}]{\text{EiOH}}$$

Pentan-3-one $\xleftarrow[(i) H_3O^{\oplus}]{(ii) \Delta}$ (B) (β -Keto ester) + EtOH
(C)

17. Explain :

Ethyl isobutyrate does not undergo Claisen condensation in the presence

of NaOEt.

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Exercises (Subjective)

1. Acetyl chloride is hydrolysed rapidly by water, whereas benzoyl chloride

is not.

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2. Complete the following reactions :

- (i) H 2 (g)+M m O o (s) $\rightarrow \Delta$
- (ii) CO(g)+H 2 (g) Δ catalyst

3. H2Y is the formula of a compound. What is the valency exhibited by Y?



5. (a) Define the term neutralisation equivalent of an acid.

(b) Find the number of ionisable H atoms for a polycarboxyclic acid $(Mw = 210 gmmol^{-1})$ with a neutralisation equivalent if $70 gmeq^{-1}$. How many equivalents of NaOH would be neutralised by 1mol of this acid ?

(c) Find the neutralisation equivalent of mellitic acid, $C_6(COOH)_6$.

6. Neutralisation of 0.3504gm of acid (A) requires 27.24ml of 0.15MNaOH, and the Mw is found from the mass spectral data to be $172.1gmmol^{-1}$.

(a) Calculate the N. R of (A).

(b) How many ionisable H atom are there in (A) ?

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7. Which carboxylic acid $(B)(N. E = 52gmeq^{-1})$ loses CO_2 when heated to give an acid $(C)N. E = 60gmeq^{-1}$?

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8. (a)Define saponification equivalent (S. E) of an ester.

(b) When is S. E equal to molecular weight of an ester

(c) What is the S. E of diethyl fumarate ?

9. The molecular formula of an organic compound is C6H12O6 and the empirical formula is CH2O the value of n is

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10. A compound with empirical formula XY2 has vapour density equal to its empirical formula weight its molecular formula is

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11. An organic compound (A) composed of C, H, and O gives a characteristic colour with ceric ammonium nitrate. Treatement of (A) with PCl_5 gives (B) which reacts with KCN to form (C). The reduction (C) with warm Na/C_2H_5OH produces (D) which on heating gives (E) with the evolution of ammonia. Pyridine is obtained on treatment of (E) with nitrobenzene.

12. An acidic compound $(A)(C_4H_8O_3)$ loses its optical activity on strong heating yielding $(B)(C_4H_6O_2)$ which reacts readly with $KMnO_4$. (B)forms a dervative (C) with $SOCl_2$ which on reaction with $(CH_3)_2NH$ gives (D). The compound (A) on oxidation with dilute chromic acid gives an unstable compound (E) which decarboxylates readily to give $(F)(C_3H_6O)$. The compound (F) gives a hydrocarbon (G) on treatment with amalgamated Zn and HCl. Give the structures of (A) to (G) with proper reasoning.

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13. Write down the structures of the (E) and (F).

14. Write down the structures of (G) and (H) where (G) is $C_4H_8O_3$.



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15. A compound (X) with the molecular formula $C_6H_{10}O_4$ is a neutral liquid. On heating (X), under reflux with aqueous sodium hydroxide and distilling the product. A colourless liquid is obtained which on warming with iodine and aqueous sodium hydroxide gives a pale yellow precipatate (Y). The residue in the distilling flask is the sodium salt of an acid (Z), which decolourises aqueous acidified potassium permaganate (VII) on heating. Identify (X), (Y), and (Z) and give all the reactions involved.

16. A dibasic organic acid gave the following results on analysis : 0.2496gm of acid gave $0.3168gmCO_2$ and $0.0864gmH_2O$ Further, 0.1092gm of acid was exactly neutralised by 21ml of N/10NaOH. Calculate the molecular formula of the acid and write down its structural formula.

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17. An organic diabasic acid (A) gave the following on analysis :

C = 57.8 %, H = 3.6 %. Its silver salt contained 56.8 % Ag. On heating (A) gives a product (B) which on heating with NH_3 gives $(C)(C_8H_5O_2N)$. Compound (C) forms potassium salt with alc. KOHand is converted into o-aminobenzoic acid with NaClO. Assign structures to (A), (B), and (C).

18. 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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19. An organic compound $(A)(C_5H_8O_3)$ on heating with soda lime gives (B) which reacts with HCN to give (C). The compound (C) reacts with thionyl chloride to produce (D) which on reaction with KCN gives a compound (E). Alkaline hydrolysis of (E) gives a salt (F) which on heating with soda lime produces $n - bu \tan e$. Careful oxidation of (A) with dichromate give acetic acid and malonic acid. Give the structures to (A) to (F) with proper reasoning.

Exercises (Linked Comprehension)

1. Write the product when Chlorine gas is passed through H2S.

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Ester (A)
$$(C_7H_{14}O_2) + 2MeMgBr \xrightarrow{H_3O^{\oplus}}(B)$$
 (Alcohol)
 $\downarrow_{H_3O^{\oplus}}(Conc. H_2SO_4)$
(E) (Acid) + (F) (Alcohol) $\xrightarrow{PCC}(D) < \xrightarrow{O_3/Red.}(C)$
Alcohol (F) or Compound (D) $\xrightarrow{I_2 + Ca(OH)_2}{\Delta}$
 $CHI_3 + (G)$ (Calcium salt of acid)
 $\downarrow \Delta$
Acetone

2.

Alcohol (B) is :





Answer: B

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Ester (A)
$$(C_7H_{14}O_2) + 2MeMgBr \xrightarrow{H_3O^{\oplus}}(B)$$
 (Alcohol)
 $\downarrow_{H_3O^{\oplus}}$ (E) (Acid) + (F) (Alcohol) $\xrightarrow{PCC}(D) \xleftarrow{O_3/Red.}(C)$
Alcohol (F) or Compound (D) $\frac{I_2 + Ca(OH)_2}{\Delta}$
 $CHI_3 + (G)$ (Calcium salt of acid)
 $\downarrow \Delta$
Acetone

3.

Alcohol (F) is :





Answer: A

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4.

Acid (E) is :

A. Me COOH



D. MeCOOH

Answer: C

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Ester (A)
$$(C_7H_{14}O_2) + 2MeMgBr \xrightarrow{H_3O^{\oplus}}(B)$$
 (Alcohol)
 $\downarrow_{H_3O^{\oplus}}(Conc. H_2SO_4)$
(E) (Acid) + (F) (Alcohol) $\xrightarrow{PCC}(D) < \xrightarrow{O_3/Red.}(C)$
Alcohol (F) or Compound (D) $\frac{I_2 + Ca(OH)_2}{\Delta}$
 $CHI_3 + (G)$ (Calcium salt of acid)
 $\downarrow \Delta$
Acetone

5.

Compound (D) is :

A. **a.**
$$\frac{Me}{Me} \ge 0$$



C. MeCHO

D. Et-CHO

Answer: A

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Carboxylic acid
$$\xrightarrow{H_2/Pt}$$
 (C) $(C_9H_{10}O_2) \xrightarrow{[O]}$
(A) $(C_9H_8O_2)$ (E)
Carboxylic acid $\xrightarrow{H_2/Pt}$ (D) $(C_9H_{10}O_2) \xrightarrow{[O]}$ (PhCOOH)
(B) $(C_9H_8O_2)$ Achiral
[Isomeric with (A)]

Carboxylic acid (A) is:







D. Both (a) and (c)

Answer: B

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Carboxylic and (B) is :



D. Both (a) and (c)

Answer: D





Answer: C



Compound (D) is :



Answer: A



Carboxylic acid
$$\xrightarrow{H_2/Pt}$$
 (C) $(C_9H_{10}O_2)_{KMnO_4}^{[O]}$ (E)
(A) $(C_9H_8O_2)$ (E)
Carboxylic acid $\xrightarrow{H_2/Pt}$ (D) $(C_9H_{10}O_2)_{[O]}^{[O]}$ (PhCOOH)
(B) $(C_9H_8O_2)$ Achiral
[Isomeric with (A)]

Compounds (C) and (D) can be distinguished by :

A. $NaHCL_3$

B. H. V. Z. reaction

C. $KMnO_4 / H^{\oplus}$

D. $AgNO_3$

Answer: B

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11.Fourisomericopticallyactivecompounds $\stackrel{NaHCO_3}{\longrightarrow} CO_2(g)(A, B, C, D)(C_4H_8O_3)$ Compound $(A) \stackrel{LAH}{\longrightarrow} (E)$ (Archiral compound)Compound (A)Compound (A)

Compound $(B) \xrightarrow[]{KMnO_4}{\text{or } CrO_3}$ Inert to oxidation. Compound $(C) \xrightarrow[]{NaOI/H_3O^{\oplus}} CHI_3(Yellowppt.) + Compound(F).$ Compound (D) is :









Answer: A


Compound $(A) \xrightarrow{LAH} (E)$ (Archiral compound) Compound $(B) \xrightarrow{KMnO_4}$ Inert to oxidation. Compound $(C) \xrightarrow[NaOI/H_3O^{\oplus}]{} CHI_3(Yellowppt.) + Compound(F).$ Compound (B) is :

A. (I)

- B. (*II*)
- C. (III)

 $\mathsf{D}.(IV)$

Answer: D



13. Fourisomericopticallyactivecompounds $\stackrel{NaHCO_3}{\longrightarrow} CO_2(g)(A, B, C, D)(C_4H_8O_3)$ Compound $(A) \stackrel{LAH}{\longrightarrow} (E)$ (Archiral compound)Compound $(B) \stackrel{KMnO_4}{\underset{\text{or } CrO_3}{\longrightarrow}}$ Inert to oxidation.

 $ext{Compound} \ (C) \xrightarrow[NaOI/H_3O^{\oplus}]{} CHI_3(Yellowppt.) + Compound(F).$

Compound (C) is :

A. (I)

- $\mathsf{B.}\left(II\right)$
- C.(III)
- $\mathsf{D}.(IV)$

Answer: B

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14. Fourisomericopticallyactivecompounds
$$\stackrel{NaHCO_3}{\longrightarrow} CO_2(g)(A, B, C, D)(C_4H_8O_3)$$
Compound $(A) \stackrel{LAH}{\longrightarrow} (E)$ (Archiral compound)Compound $(B) \stackrel{KMnO_4}{\underset{\text{or } CrO_3}{}}$ Inert to oxidation.Compound $(C) \stackrel{DaOI/H_3O^{\oplus}}{\underset{NaOI/H_3O^{\oplus}}{}} CHI_3(Yellowppt.) + Compound(F).$ Compound (D) is :

A. (I)

B.(II)

 $\mathsf{C.}\left(III\right)$

D.(IV)

Answer: C

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15. Fourisomericopticallyactivecompounds $\stackrel{NaHCO_3}{\longrightarrow} CO_2(g)(A, B, C, D)(C_4H_8O_3)$ Compound $(A) \stackrel{LAH}{\longrightarrow} (E)$ (Archiral compound)Compound $(B) \stackrel{KMnO_4}{\underset{\text{or } CrO_3}{\longrightarrow}}$ Inert to oxidation.Compound $(C) \xrightarrow[NaOI/H_3O^{\oplus}]{\longrightarrow} CHI_3(Yellowppt.) + Compound(F).$ Compound (D) is :



Answer: B

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16. Write thermal decomposition reaction of Calcium carbonate.



17. Identify (D) in the reaction



(ii) Compound (D) is prepard by carbonation $\left(Mg/ether, CO_2/H_3O^+
ight)$





Answer: B



18. What is Royal Water and give its composition.

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19. Give the main properties of canal ray experiment.

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$$\underbrace{\bigcirc}_{(A)} \xrightarrow{\text{Conc.}}_{H_2\text{SO}_4} (B) \xrightarrow{\text{PCl}_5} (C) \xrightarrow{\text{NH}_3} (D) \xrightarrow{[O]}_{K\text{MnO}_4} (E) \xrightarrow{\Delta}_{-\text{H}_2\text{O}_4} (F)$$



Compound (B) is :







D. Both (a) and (c)

Answer: A







SO₂Cl

Β.



D. Both (a) and (c)

Answer: A







Compound (E) is :







Β.



Answer: B







Compound (F) is :





C. Both (a) and (b)

D. None

Answer: B

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24.

Compound (F) is used as an artificial sweetner and is known as saccharin. It forms sodium salt. Which statement is correct about its sodium salt ? A. (F) has an acidic H atom and its conjugate base is delocalised to

(C = O) group.

B. (F) has an acidic H atom and its conjugate base is delocalised to (SO_2) group.

C. Both statements (a) and (b) are correct.

D. (F) does not have an acidic H atom.

Answer: C

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25.

Compound (B) is :

A. $CH_2 = O$

 $\mathsf{B}.\,HCOOMe$

C.HCOOEt

D. Both (a) and (c)

Answer: D

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26.

In the formation of (C) from (A) and (B), which statements (s)is/are correct ?

A. (A) acts as a source of carbanion and (B) acts as an acceptor.

- B. (A) acts as an acceptor and (B) acts as a source of carbanion.
- C. It is a Claisen ester type condensation
- D. it is a Michael addition reaction.

Answer: A::C

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27.

Which statement (s)is/are correct about the formation of (D) ?

A. It is a Claisen-Schmidt reaction

B. It is a Michael addition reaction.

C. The (CHO) group is introduced in (C) to increase the acidity of

lpha-H atom.

D. The (CHO) group is lost as (CO) in the formation of (D).

Answer: B::C

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28.

Which statements is / are correct about the formation of (E) from (D) ?

A. It undersoes intermolecular aldol condensation to give an alcohol

followed by the elimination of H_2O .

B. It undergoes intramolecular aldol condensation to give an alsohol

followed by the elimination of H_2O .

C. It undergoes intramolecular Claisen ester condensation.

D. The product is a β, γ -unsaturated ketone.

Answer: A

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29.

Product (E) is :









Answer: B



30. Three isomeric tetracarboxylic acids (I), (II), and (III) are given.



They can be distinguised by anhydride formation by treating with one equivalent and two equivalents of $SOCl_2$.

Which tetracarboxylic acid on reaction with one equivalent of $SOCl_2$ gives two isomeric monoanhydrides ?

A. (I)

B.(II)

 $\mathsf{C.}\left(III\right)$

D. All

Answer: A



COOH

 $\begin{array}{c} COOH\\ +++COOH\\ HOOC\\ COOH\\ (III) \end{array}$ They can be distinguised by anhydride formation by treating with one

(II)

HOOC

equivalent and two equivalents of SOCl₂.

COOH

ĊOOH

(I)

Which tetracarboxylic acid on reaction with one equivalent of $SOCl_2$ gives only one monoaanhydride ?

A. (I)

B. (*II*)

C. (*III*)

D. Both (II) and (III)

Answer: D

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32. Calculate the uncertainty in the velocity of a wagon of mass 4000kg

whose position is known accurately of ± 10 m.

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33. How many spherical nodal surfaces are there in 4s - sub-shell?





34. What is the mass (m) of an electron?



Exercises (Multiple Correct)

1. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition, n = 4 to n = 2 of He+ spectrum?

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2. Calculate the uncertainty in the momentum of an electron if it is confined to a linear region of length $1x 10^{-8}$

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3. Which of the following reactions is/are correct ?



Answer: B::C



4. Write the electronic configuration of (i) Mn4+, (ii) Fe3+ (iii) Cr2+

Mention the number of unpaired electrons in each case.



5. Which of the following statements are correct about nucleophilic acyl

substitution ?

A. RCOCl is more reactive than $RCON_3$ (acid azide).

B. $RCON_3$ is more reactive then enhydride.

C. $RCON_3$ is less reactive than anhydride.

D. Esters are less reactive than anhydrides but more reactive tham

amides.

Answer: A::B::D

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6. Which of the following statements is/are correct about the preparation

of t-butyl ethanoate.



A. Path (I) is feasible

B. Path (II) is feasble.

C. Both paths are feasible

D. None is feasible.

Answer: B

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7. Give the mathematical expression of uncertainty principle.

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8. What designations are given to the orbitals having (i) n = 2, l = 1 (ii) n = 1

2, l = 0 (iii) n = 4, l = 3 (iv) n = 4, l = 2 (v) n = 4, l = 1?

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9. Spectral lines are regarded as the finger prints of the elements. Why?



10. Which of the following statements are wrong?

A. Benzoic acid is a stronger acid than o-toluic acid.

B. m-Toluic acid is a stronger acid than p- touic acid.

C. Salicylic acid is a stronger acid than benzoic acid.

D. p- Hydroxy benzoic acid is a stronger acid than m-hydroxy benzoic

acid.

Answer: A::D

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11. 1L of a gas at STP weighs 1.97g. What is molecular mass?

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12. How is volume measured in laboratory? Convent 0.5L into ml and 30cm3 to dm3

- A. In the gaseous phase, propanoic acid is stronger acid than acetic acid.
- B. In the gaseous phase, t-bu an ol is stronger acid than

n-bu an ol

C. Propanoic acid is stronger acid than $CH_2 = CHCH_2COOH$.

D. $(HC \equiv C - CH_2COOH)$ is stronger acid than

 $CH_2 = CHCH_2COOH.$

Answer: A::B::D



13. Which of the following statements are correct?

A. Oximes are stronger acid than hydroxylamine.

B. pK_a of maleic acid is less than pK_a of fumaric acid.

C. Me_3SiCH_2COOh is a stronger acid than $Me_3C - CH_2COOH$.

D. o-Nitrobenzoic acid is a weaker acid than 3,5-dinitrobenzoic acid.

Answer: A::B

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14. Which of the following statements are correct about the following reaction :

 $R - \overset{ec{U}}{C} - OH + R'OH \stackrel{H^{\oplus}}{\Longleftrightarrow} RCOOR' + H_2O$

(a)Rate $= K[RCOOH][R'OH][H^+]$. First order in acid, alcohol, and H^{\oplus} , third order overall.

(b)Rate : K[RCOOH][R'OH]. First order in acid and alcohol , second order overall.

(c)Slow and rate-determining step (R. D. S) is the addition of alcohol to the protonated acid.

(d)Slow and rate-determining step (R. D. S) is the addition of acid to the protonated alcohol.

- A. Rate $= K[RCOOH][R'OH][H^+]$. First order in acid, alcohol, and H^{\oplus} , third order overall.
- B. Rate : K[RCOOH][R'OH]. First order in acid and alcohol , second order overall.
- C. Slow and rate-determining step (R. D. S) is the addition of alcohol to the protonated acid.
- D. Slow and rate-determining step (R. D. S) is the addition of acid to

the protonated alcohol.

Answer: A::C



15. Give the decreasing order of ease of decarboxylation of the following

acids when reacted with soda lime.

(I) $Cl_3C - COOH$

(II) $Br_3C - COOH$

(III) CH_3COOH

(IV) PhCOOH.

$$\begin{array}{l} \mathsf{A.} (I) > (II) > (III) > (IV) \\ \mathsf{B.} (I) > (II) > (IV) > (III) \\ \mathsf{C.} (IV) > (III) > (II) > (II) > (I) \\ \mathsf{D.} (III) > (IV) > (II) > (I) \\ \end{array}$$

Answer: B

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16. Calculate the number of moles in the following masses - (i) 7.85g of Fe

(ii) 7.9mg of Ca

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17. How much potassium chlorate should be heated to produce 2.24L of

oxygen at NTP?

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18. Calculate the weight of lime (CaO) obtained by heating 2000kg of 95%

pure lime stone (CaCO3

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19. The pka of acetic acid and pkb of ammonium hydroxide are 4.76 and

4.75 respectively. Calculate the pH of ammonium acetate solution.



20. The following acids can be differentiated by :



Answer: C

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21. Which of the following statements is/are correct about transacylation

?

A. Amides can be prepared by *RCOCl* and anhydrides.

B. Anhydrides can be prepared by esters.

C. Esters can be prepared by anhydrides.

D. *RCOCl* can be prepared by anhydrides an esters.

Answer: A::C

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22. Which of the following statements are correct about the following reaction :

 $RCOOH + LiAlH_4 \rightarrow$.

A. First step in the above reaction is :

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

B. Second step is the tranfer of H^{Θ} ion from AIH_3 to (C = O) of

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

 $RCOO^{\Theta}$.



acidification gives RCH_2OH .

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



23. Which of the following statement (s) is //are correct about the preparation of an amide ?



A. Path (I) is feasible

B. Path (II) is feasible.

C. Bothe the paths are feasible

D. None of feasible.

Answer: A

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24. 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. $B_2 H_6 \,/\, H_2 O_2, \, OH$ 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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25.4 litres of water are added to 2L of 6 molar HCl solutions.What is the

molarity of resulting solution?

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26. Find the product C(major)



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

A. The compounds (B) and (C), respectively, are Me - N = C = O

and *MeNHCOOMe*.

 $(iii) \Theta_{OH}$
B. The compounds (B) and (C), respectively, are Et - N = C = O

and $MeNH_2$.

- C. The reaction proceeds via the formation of acyl nitrene $\left(MeCO\ddot{N}:\right)$ as the intermediate species.
- D. The reaction proceeds via the formation of acyl nitrene $\left(EtCO\ddot{N}:\right)$ as the intermediate species.

Answer: A::C

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28.
$$PhCOOH \xrightarrow{(i) N_2H, H^{\oplus}} (B) \xrightarrow{H_2O/OH} (C)$$

Which of the following statement is /are correct about the reaction ?

A. The compounds (B) and (C), respectively, are Ph - N = C = O

and $PhNH_2$.

B. The compounds (B) and (C), respectively, are $Ph\overset{\scriptscriptstyle \oplus}{N}\equiv \overset{\scriptscriptstyle oldsymbol{ omega}}{C}$ and

PhNHMe.

C. The reaction is known as Curtius rearrangement reaction.

D. The reaction is known as Schmidt rearrangement reaction.

Answer: A::D

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29.
$$Et_{(A)}^{COCl} \xrightarrow[(i) H_2N.OH]{\Theta} (B) \xrightarrow[(i) OH]{\Theta} (C)$$

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

A. The compouds (B) and (C), respectively, are $Et - C \equiv N$ and

 $EtNH_2$.

B. The compounds (B) and (C), respectively, are EtN = C = O and

```
EtNHCOOEt.
```

C. The reaction is known as Lossen rearrangement reaction.

D. The reaction proceeds via the formation of acyl carbene

 $\left(EtCO\ddot{C}H
ight)$ as the intermediate species.

Answer: B::C



30.
$$MeCH_2COOH \xrightarrow{(i) SOCI}_{(ii) CH_2N_2} (B) \xrightarrow{H_2O} (C)$$

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

A. The product (B) and (C), respectively, are MeCH = C = O and

 $MeCH_2COOMe.$

B. The products (B) and (C), respectively, are :

 $MeCH_2CH = C = O$ and $MeCH_2CH_2COOH$.

C. The reaction is known as Wolff rearrangement reaction.

D. The reaction is known as rearrangement reaction.

Answer: B::D



Which of the following statements are correct about AZT ?

A. It shows acidic property.

B. It undergoes tautomerisation.

C. It gives white precipitate with $(ZnCl_2 + HCl)$ (Lucas reagent).

D. Azide ion $\left(N_{3}^{\;\Theta}
ight)$ cannot replace $Br^{\,\Theta} \left(
ight)$ by SN^{2} reaction.

Answer: A::B::D

D Watch Video Solution

33.



AZT structure is given above find which of the following functional groups are present in AZT.

A. Oxolane

B. Keto group

C. Lactam

D. Alcoholic group

Answer: A::C::D

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34. Calculate molecular mass of - C2H6, C12H22O11, H2SO4, H3PO4

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Exercises (Singlecorrect)

1. The decreasing order of ester formation with benzoic acid in presence of H^{\oplus} is :



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

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

Answer: B



2. The decreasing order of ester formation with acetic acid in presence of

 $H^{\,\oplus}$ is :



$$\mathsf{C.}\left(IV\right)>(II)>(III)>(I)$$

$$\mathsf{D}.\left(IV\right)>\left(III\right)>\left(II\right)>\left(I\right)$$

Answer: A

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

A. MeCOOH

 $\mathsf{B.}\, CH_3 NH_2$



Answer: A

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4. Which of the following is the strongest acid ?

A. Benzoic acid

B. 4-Nitrobenzoic acid

C. 4-Methoxy benzoic acid

D. 4-Methyl benzoic acid

Answer: B

5. What is the effect of reducing the volume on the system described

below? 2C(s) + O2(g)= 2CO(g)

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6. Which reagent can distinguish between pentanoic acid and pentanamide ?

A. Cold dil. NaOH

B. Cold $dil. NaHCO_3$

C. Cold $conc. H_2SO_4$

D. All

Answer: D

$$\mathbb{R} \xrightarrow[(A)]{} \mathbb{O} \xrightarrow[(A)]{} \mathbb{N} \xrightarrow[(A]]{} \mathbb{N} \xrightarrow[(A]]{}$$

The compound (D) is :

A. RCOOH

7.

B. RCH_2OH

 $\mathsf{C}.\,R-C\equiv N$

D. RCHO

Answer: D

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8. the standard heat of formation of Fe2O3 (s) is 824.2kJ mol-1 Calculate

heat change for the reaction. 4Fe(s) + 302 (g)= 2Fe2O3(s)

9. Which H atom in the following ester is most acidic ?

$$C\overset{O}{H_{3}}-\overset{O}{CH_{2}}-\overset{O}{C}-\overset{O}{H_{2}}-\overset{O}{C}-O-\overset{O}{H_{2}}\overset{O}{H_{3}}$$

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

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10. Product (B) in the reaction is :

Me
$$(i)$$
 NaOEt (i) NaOEt (i) (B)
(ii) $H^{(j)}$ (B)
(A)



Answer: C



11. The reactant (A) is the reaction is :



 $\mathsf{B}. \textit{EtCOOEt} + \textit{EtOOC} - \textit{COOEt}$

$$\mathsf{C}.\left(EtOOC - CH - COOEt + HCOOEt \\ | \\ Me \\ \end{pmatrix} \right)$$

 $\mathsf{D.} \textit{EtCOOEt} + \textit{HCOOEt}.$

Answer: B

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Product (C) is :





Β.





Answer: B

D.





Product (C) is :





- Β.
- C. Bothe (a) and (b)

D. None

Answer: B

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14. Give two examples of reactions which are driven by enthalpy change.



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

(I) MeCOOPh



A. (II) > (I) > (IV) > (III)B. (I) > (II) > (III) > (IV)C. (III) > (IV) > (I) > (II)

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

Answer: A

16. The boiling points of ethyl acetate and CH_3OH , respectively, are $77^{\circ}C$ and $65^{\circ}C$. Which of the following reactions can be shifted to the right by the distillation of the reaction mixture at about $66^{\circ}C$.

(I) MeCOOEt + MeOH
ightarrow

(II) MeCOOMe + EtOH
ightarrow

(III) MeCOOMe + PhOH
ightarrow

(IV) MeCOOPh + MeOH
ightarrow .

A.(I),(II)

B. (II), (III)

 $\mathsf{C}.\,(I),\,(III)$

 $\mathsf{D}.\,(II),\,(IV)$

Answer: D

17. Carboxylic acid, although unreactive to alcohols, reacts in the presence of small amount of *conc*. H_2SO_4 or with 2 - 3% of HCl? $RCOOH + R'OH \stackrel{H^{\oplus}}{\iff} RCOOR' + H_2O$

Which of the following statements is//are 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



18. The major product (C) in the reaction is :



Answer: A

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

A. $Me_{3}C-COCl+MeOH
ightarrow$

B. $Me_{3}C - COOH + MeOH \rightarrow$

 $\mathsf{C.}\,Me_3C-COOH+CH_2N_2\rightarrow$

D. $Me_{3}C-COCl+MeONa
ightarrow$

Answer: C

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20. Which of the following is the best method for the synthesis of lpha –

hydroxy butyric acid (I) ?





Answer: C



21. Which of the following statements is wrong about the transesterification reaction, catalysed by $H_3O^{\oplus}(H_2SO_4 \text{ or } dryHCl)$ or $RO^{\oplus}(EtONa)$? $Me - \overset{O}{\underset{Ester}{}}^{H} - Et + \underset{Alcohol}{}^{H} \overset{H_3O^{\oplus}}{\underset{Bster}{}} \overset{H_3O^{\oplus}}{\underset{H}{}} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{}} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{}} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{}} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{}} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} } \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} } \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} } \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{} } \overset{H_3O^{\oplus}}{\underset{RO^{\oplus}}{}$ A. Alcohol (PrOH) is taken in excess to shift the equilibrium to

R. H. S.

B. It involves tetrahedral inermediate in which the hybridisation of C

of the (C = O) group changes from sp^2 to sp^3 .

- C. Isotopic oxygen is present in the new alcohol $\left(Et \overset{*}{O}H
 ight)$ formed.
- D. Rate of transesterification is dependent on the concentration of ester only.

Answer: D

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22. The molecular weight of benzoic acid in benzene as determined by depression in the freezing point method corresponds to

A. Ionisation of benzoic acid

B. Dimerisation of benzoic acid

C. Trimerisation of benzoic acid

D. Solution of benzoic acid

Answer: B

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23. Which of the following reaction is expected to readily give a hydrocarbon product in good yields?

A.
$$RCOOK \xrightarrow{\text{Electrolytic}} oxidation$$

B. $RCOOAg \xrightarrow{I_2}$
C. $CH_3CH_3 \xrightarrow{Cl_2/hv}$
D. $Me_3C - Cl \xrightarrow{C_2H_5OH}$

Answer: A

24. Which of the following reactions is not possible ?



 $\mathsf{C.}\left(I
ight)CH_{3}OH+C_{2}H_{5}Ona(II)$

 $D.(I)ClCH_2COOH + CH_3COONa(II)$

Answer: B

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25.
$$PhCONH_2 \xrightarrow[(A)]{KOBr} (B) \xrightarrow[MeOH]{MeOH} (C)$$

Product is (C) is :

A. $PhNH_2$

B. PhNHCOOMe

C. PhNHCOOPh

D. None

Answer: B

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26. It has been found that 221.4J is needed to heat 30g of ethanol from 150C to 180C. calculate (a) specific heat capacity, and (b) molar heat capacity of ethanol.

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27.
$$PhCOOH \xrightarrow{(i) SOCI_2} (B)$$

 $(A) \xrightarrow{(ii) CH_2N_2} (B)$

Product (B) is :

A. $PhCONH_2$

B. $PhCH_2COOH$

C. $PhCH_2COOMe$

 $\mathsf{D.}\, PhCONHMe$

Answer: C

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28. Calculate energy of 2mole of photons of radiation whose frequency is

5x10^14 Hz

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29.
$$EtCOOMe \xrightarrow[(A)]{\Theta} \xrightarrow[(ii)NH_2NH_2(ii)HNO_2]{\Theta} (B)$$

The product (B) is :

A. $MeNH_2$

 $\mathsf{B.} EtNH_2$

 $\mathsf{C}.\, MeCONH_2$

D. EtCONHMe

Answer: B



30. PhCOOMe
$$\xrightarrow[(A)]{\Theta}$$
 $\xrightarrow[(i)OH(iii)EtOH]{\Theta}$ (B)

Product (B) is :

A. $PhNH_2$

 $\mathsf{B}.\, MeNH_2$

C. PhNHCOOEt

 ${\tt D.} \ PhNHCOOMe$

Answer: C





Product (B) is :



32. 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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33. Which of the following does not contain (-COOH) group ?

A. Aspirin

B. Benzoic acid

C. Picric acid

D. All have (-COOH) group

Answer: C



34. Acids do not give the characteristic reaction of (C = O) group because of :

A. Dimerisation

B. Resonance

C. Cyclic structures

D. Attached alkyl radical

Answer: B

35. The addition of Hbr to $CH_2 = CHCOOH$ results in the formation

of.

A. α – Bromopropanoic acid

B. eta – Bromopropanoic acid as the major product

C. None of the above

D. Both (a) and (b) in equal proportion.

Answer: B

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36. Mark the correct order of increasing reactivity.

A. $CH_3CONH_2 < CH_2COOC_2H_5 < CH_3COCl$

 $\mathsf{B.} \ CH_3 COOC_2H_5 < CH_3 COCl < CH_3 CONH_2$

 $\mathsf{C.}\,CH_3COCl < CH_3CONH_2 < CH_3COOC_2H_5$

 $\mathsf{D.} \ CH_3 COOC_2H_5 < CH_3 CONH_2 < CH_3 COCl.$

Answer: A



37.
$$CH_3COOH \xrightarrow{Br_2/P} (Y) \xrightarrow{(i) KCN} (X)$$

Here, (X) is :

A. Glycollic acid

B. α -Hydroxypropionic acid

C. Succinic acid

D. Malonic acid

Answer: D



38. Find out atomic number, mass number, number of electron and neutron in an element? X(Atomic no 20, Mass no. 40)



39. Electrolytic reduction of oxalic acid produces :

A. Succinic acid

B. Glycollic acid

C. Glycol

D. Glutaric acid

Answer: B

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40. When glycolic acid is subjected to reduction with HI, the product

formed is :

A. Acetic acid

B. Formic acid

C. Iodoacetic acid

D. None of the above

Answer: B

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41. 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: A
42. How will you convert ethyne to benzene?



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44. A hydrocarbon C_6H_{12} decolourises bromine solution and yields n – hexane on hydrogenation. On oxidation with $KMnO_4$ it affords two different monobasic acids of the type R – COOH. The compound is :

A. Cyclohexene

B. 2-Hexene

C. 1-Hexene

D. 3-Hexene

Answer: D

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45. An organic liquid of the composition $C_4H_8O_2$ yields a sodium salt of an acid $C_3H_6O_2$ and methanol on boiling with NaOH solution. The gives liquid is :

A. $CH_3CH_2COOCH_3$

B. $CH_3COOC_2H_5$

C. $HCOOC_3H_7$

 $\mathsf{D.}\, CH_3 CH_2 CH_2 COOH$

Answer: B



46. On heating calcium acetate and calcium formate, the product formed

is :

A. CH_3COCH_3

B. CH_3CHO

 $\mathsf{C}. HCHO + CaCO_3$

D. $CH_3CHO + CaCO_3$

Answer: A

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

A. Alkaline $KMnO_4$

B. Selenium dioxide

C. Ammoniacal $AgNO_3$

D. All

Answer: D

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48. One mole of an organic compound is found to require only 0.5mol of oxygen to produce an acid. Which class of compounds does the starting material belong to ?

A. Alcohol

B. Aldehyde

C. Ether

D. Ketone

Answer: C



49. Identify Z in the following series

 $CH_2 = CH_2 \stackrel{HBr}{\longrightarrow} X \stackrel{Hydrolysis}{\longrightarrow} Y \stackrel{Na_2CO_3}{\underset{I_2excess}{\longrightarrow}} Z$

A. C_2H_5I

 $\mathsf{B.}\, C_2H_5OH$

 $\mathsf{C}. CHI_3$

D. CH_3CHO

Answer: B



50. Which one of the following has the maximum acid strength ?

A. o-Nitrobenzoic acid

B. m-Nitrobenzoic acid

C. p-Nitrobenzoic acid

D. p-Nitrophenol

Answer: C

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51. 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: A

52. The reaction of HCOOH with $conc. H_2SO_4$ gives :

A. CO_2

 $\mathsf{B}.\,CO$

C. Oxalic acid

D. Acetic acid

Answer: C

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53. The compound which react with Fehling solution is :

A. C_6H_5COOH

 $\mathsf{B}.\,HCOOH$

 $\mathsf{C.}\, C_6H_5CHO$

D. CH_2ClCH_3

Answer: B

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54.
$$CH_3CH_2COOH \xrightarrow{Cl_2/Fe} (X) \xrightarrow{Alc.}_{KOH} (Y)$$

Compound (Y) is :

A. CH_3CH_2OH

 $\mathsf{B.}\, CH_3 CH_2 CN$

 $\mathsf{C}.\,CH_2=CHCOOH$

D. $CH_3CHClCOOH$

Answer: C

55. Vinegar contains :

A. $10-20~\%\,$ acetic acid

B. 10~%~ acetic acid

C. $7-8\,\%\,$ acetic acid

D. $100~\%\,$ acetic acid

Answer: C

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56. What of the following is expected to be most highly ionised in water ?

A. $CH_2ClCH_2CH_2COOH$

 $\mathsf{B.}\, CH_3 CHClCH_2 COOH$

 $\mathsf{C.}\,CH_3CH_2CCl_2COOH$

 $\mathsf{D.}\, CH_3 CH_2 CHClCOOH$

Answer: C



57. Fifty-nine grams of amide is obtained from the carboxylic acid. RCOOH on heating with alkali gave 17gm of ammonia. The acid is :

A. Formic acid

B. Acetic acid

C. Propionic acid

D. Benzoic acid

Answer: B



58. What is formed when oxalic acid is dehydrated by $conc. H_2SO_4$?

A. $C + CO_2$

 $\mathsf{B.}\,CO$

 $\mathsf{C}.CO_2$

 $D.CO + CO_2$

Answer: D

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59. How will you convert the following compounds into benzene? (i) C2H4

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60. Draw the structure of the following compounds all showing C and H

atoms. (a) 2-methyl -3-iso propyl heptanes (b) Dicyclopropyl methane.

61. Name the reaction sequence.

$RCOOH \stackrel{SOCl_2}{\longrightarrow} RCOCl \stackrel{CH_2N_2}{\longrightarrow} RCOCHN_2 \stackrel{H_2O}{\xrightarrow{Ag}} RCH_2COOH.$

A. Arndt-Eistert synthesis

B. Wolff's reaction

C. Reppe's process

D. Wacker's process

Answer: A

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62. For the Hunsdiecker decarboxylation reaction, which of the following is false :

A. It involves reaction between silver salt of an acid and Br_2 .

B. It is used to prepare alkyl bromide.

C. It of the type :

 $RCH_2COOAg + Br_2
ightarrow RCH_2Br + CO_2 + AgBr$

D. It is of the type :

 $RCH_2COOAg \rightarrow RCH_3 + CO_2 + AgBr.$

Answer: D

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63. How will you prepare isobutane?

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64. Which of the following substances is likely of be effective as detergents in water ?

A.
$${CH_3(CH_2)}_{15}{CH_2OSO_3^{m \Theta}}\stackrel{\oplus}{Na}$$

B. $CH_3(CH_2)_{16}COOH$

$$\operatorname{\mathsf{C.}} CH_3(CH_2)_{16}COONa^\oplus$$

$$\mathsf{D.}\left[CH_3(CH_2)_{16}COO^{-}\right]_2Ca.$$

Answer: A

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Exercises (Assertion-Reasoning)

1. The following reaction occurs.



Acylium ion is resonance stabilised.

- A. If both (A) are (R) are true and (R) is the correct explanation of (A).
- B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: A

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2. AZT (azidothymine) is used to treat AIDS patients. If flights AIDS

infection but not cure it.



It shows acidic property.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: A



3. (KOOC - CH = CH - COOK) undergoes Kolbe's reaction to form a product which reacts with ammoniacal $AgNO_3$ solution to form a precipitate.

The product is a saturated hydrocarbon that forms salt with $AgNO_3$.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

- B. If both (A) and (R) are true but (R) is not the correct explanation of (A).
- C. If (A) is true but (R) is false.
- D. If (A) is false but (R) is true.

Answer: C

4. 3 - Phenol propanic acid (B) can be prepared by both nitrile and

carbonation method as shown.



Path I gives a good yield of (B).

 $\Theta \\ CN$ initiates elimination reaction.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: A



5.

(I) is more

acidic than

The negative charge of the conjugate base of (II) cannot be delocalised

through the benzene ring.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: D

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6. Succinic acid (B) can be prepared by both nitrile and carbonation method as shown.



Both paths give good yields of (B).

(A) with Mg would lead to the loss of vicinal Br atoms to give alkene and $MgBr_2$.

- A. If both (A) are (R) are true and (R) is the correct explanation of (A).
- B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: D

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7. $\beta-$ Hydroxy propanoic acid on heating gives acrylic acid.

Acrylic acid exists in two diastereomers.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

- C. If (A) is true but (R) is false.
- D. If (A) is false but (R) is true.

Answer: C

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8. Assertion: Both HCOOH(I) and $CH_3COOH(II)$ give precipitate

with aqueous $AgNO_3$ solution soluble in HNO_3 .

Reason: HCOOH gives positive Tollens test.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: B

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9. Acetic acid on reaction with hydrazoic acid (N_3H) in the presence of H_2SO_4 followed by heating and hydrolysis in basic medium gives acetamide.

Methyl isocyanate (Me - N = C = O) is formed is an intermediate compound.

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

C. If (A) is true but (R) is false.

D. If (A) is false but (R) is true.

Answer: D

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10. Oxides

more acidic than hydroxylamine (NH_2OH) .

Conjugate base of oxime is resonance stabilised.

are

A. If both (A) are (R) are true and (R) is the correct explanation of

(A).

B. If both (A) and (R) are true but (R) is not the correct explanation

of (A).

- C. If (A) is true but (R) is false.
- D. If (A) is false but (R) is true.

Answer: A

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Exercises Archives (Single Correct)

1. Which of the following is basic?

A. CH_3CH_2OH

 $\mathsf{B}.\,H-O-O-H$

$$\mathsf{C}.\,HO-CH_2-CH_2-OH$$

D.
$$H_3C - \underset{\substack{||\\O}}{C} - OH$$

Answer: A

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2. Acetamide is treated with the following reagents separately. Which one

of these would yield methyl amine ?

A. PCl_5

B. $NaOH + Br_2$

C. Soda lime

D. Hot conc. H_2SO_4

Answer: B

3. Hydrogenation of benzoyl chloride in the presence of Pd on $BaSO_4$

gives:

A. Benzyl alcohol

B. Benzaldehyde

C. Benzoic acid

D. Phenol

Answer: B

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4. 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



5. 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



6. Identify the correct order of boiling points of the following compound

 $CH_3CH_2CH_2CH_2OH(1)$

 $CH_3CH_2CH_2CHO(2)$

 $CH_3CH_2CH_2COOH(3)$

:

 $\mathsf{A}_{\cdot}(A) > (B) > (C)$

 ${\sf B.}\,(C)>(A)>(B)$

$$\mathsf{C}.\,(A)>(C)>(B)$$

D.(C) > (B) > (A)

Answer: B











D.

C.

Answer: A



8. An enantiomerically pure is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be :

A. Optically active mixture

- B. Pure enantiomer
- C. Mesi-compound
- D. Racemic mixture

Answer: A

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9. Benzamide on treatment with $POCl_3$ gives

A. Aniline

B. Benzonitrile

C. Chlorbenzene

D. Benzyl amine

Answer: B

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10. Which benzene sulphonic acid and $p-{\sf nitrophenol}$ are treated with

 $NaHCO_3$, the gases released, respectively are :

A. SO_2, NO_2

 $B.SO_2, NO$

 $\mathsf{C}.SO_2, CO_2$

 $\mathsf{D}.\,CO_2,\,CO_2$

Answer: D

1. Statement-1: Acetic acid does not undergo haloform test.

and

Statement-2: Acetic acid does not contain any α - hydrogen.

A. Statement I is true , Statement II is true , Statement II is the

correct explanation of Statement I.

B. Statement I is true , Statement II is true , Statement II is not the

correct explanation of Statement I.

C. Statement *I* is true , Statement *II* is false.

D. Statement *I* is false , Statement *II* is true.

Answer: C

2. Statement I : p -hydroxybenzoic acid has a lower boiling point than ohydroxybenzoic acid.

Statement II : o-hydroxybenzoic acid has intramolecular hydrogene bonding.

A. Statement I is true , Statement II is true , Statement II is the

correct explanation of Statement I.

B. Statement I is true , Statement II is true , Statement II is not the

correct explanation of Statement I.

C. Statement *I* is true , Statement *II* is false.

D. Statement I is false , Statement II is true.

Answer: D



Exercises Archives (Linked Comprehension)

1. $RCONH_2$ is converted into RNH_2 by means of Hofmann bromamide degradation.



In this RCONHBr is formed form which this reaction has derived its name. Electron-donating group at phenyl activities the reaction. Hofmann degradation reaction is an intramolecular reaction.

Hoe can the conversation of (i)
ightarrow (ii) be brought about ?

A. KBr

 $\mathsf{B.} \mathit{KBr} + \mathit{CH}_3\mathit{ONa}$

 $\mathsf{C.}\,KBr+KOH$

$\mathsf{D.}\,Br_2 + KOH$

Answer: D



2. $RCONH_2$ is converted into RNH_2 by means of Hofmann bromamide degradation.



In this RCONHBr is formed form which this reaction has derived its name. Electron-donating group at phenyl activities the reaction. Hofmann
degradation reaction is an intramolecular reaction.

Which is the rate-determining step in Hofmann bromamide degradation ?

A. Formation of (i)

B. Formation of (*ii*)

C. Formation of (iii)

D. Formation of (iv)

Answer: D

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3. What are the constituent amines formed when the mixture of (1) and

(2) undergoes Hofmann bromamide degradation ?





Answer: B

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Exercises Archives (Multiple Correct)

1. The reaction of $RCONH_2$ with a mixture of Br_2 and aqueous KOH gives RNH_2 as the main product The intermediate (s) involved in this reation is (are).

A.
$$R-\overset{O}{\overset{||}{C}}-NHBr$$

 $\mathsf{B.}\,R-NHBr$

C.
$$R - N = C = O$$

 $A \cdot R - C - N - Br$
Br

Answer: A::C



2. Amongest the following, the total number of compound soluble in aqueous NaOH is :



A. (V)

B. (VI)

C. (VII)

D. (VIII)

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Exercises Archives (Fill In The Blanks)

1. Formic acid when heated with $conc. \ H_2SO_4$ produces



Exercises Archives (True/False)

1. Hydrolysis of an ester in the presence of a dilute acid is known as saponification.

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2. The boiling point of propionic acid is less than that of n-butyl alcohol, an alcohol of comparable molecular weight.

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Exercises Archives (Analytical And Descriptive)

1. Write the chemical eqution to show what happens when 'Ethyl acetate is treated with sodium ethoxide in ethanol and the reaction mixture is acidified'.

2. State with balanced equation what happens when 'Acetic anhydride

reacts with phenol in the presence of a base'.

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3. Give reasons for the following in one or two sentences.

'Acetic acid can be halogenated in the presence of P and Cl_2 , but formic

acid cannot be halogenated in the same way'.

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4. Write down the reactions involved in the preparation of the following

using the reagents indicated against in parenthesis.

'Propionic anhydride from propionaldehyde'.

 $[AgNO_3, NH_4OH, P_2O_5].$

5. A certain hydrocarbon (A) was found to contain 85.7% carbon and 14.3% hydrogen. This compound consumes 1 molar equivalent of hydrogen to give a saturated hydrocarbon. What is the empirical formula of compound?

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6. Give reason in one or two sentences for the following : 'Formic acid is a

stronger acid than acetic acid'.

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7. Arrange the following in order of their increasing ease of hydrolysis :

 $CH_3COOC_2H_5, CH_3COCl, (CH_3CO)_2O, CH_3CONH_2.$

8. Complete the following with appropriate structures :

 $(CH_3CO)_2O \xrightarrow{C_2H_4OH} CH_3COOH + ?.$

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9. A liquid (X) having a molecular formula $C_6H_{12}O_2$ is hydrolysed with water in the presence of an acid to give a carboxylic acid (Y) and an alcohol (Z). Oxidation of (Z) with chrome acid gives (Y). What are the structures of (X), (Y), and (Z)?

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10. Write the balanced equations for the following reaction :

'Acetamide is reacted with bromine in the presence of potassium hydroxide'.

11. An organic compound (A) on treatment with acetic acid in the presence of sulphuric acid produces an ester (B). (A) on mild oxidation gives (C), (C) with 50 % potassium hydroxide followed by acidification with dilute hydroxide acid generates (A) and (D), (D) with phosphorus pentachloride followed by reaction with ammonia gives (E), (E) on dehydration produces hydrocyanic acid. Identify the compounds (A), (B), (C), (D), and (E).



12. Give reasons for the following :

'Carbon-oxygen bond lengths in formic acid aer $1.23 {
m \AA}$ and $1.36 {
m \AA}$ and

both carbon-oxygen bonds in sodium formate have the same value, i.e.,

1.27Å.



13. Conversion of Ethanoic acid to mixture of methanoic acid and diphenyl

ketone

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14. The sodium salt of a carboxylic acid, A, was produced by passing a gas, B, into an aqueous solution of caustic alkali at an elevated temperature and pressure. A on heating in presence of sodium hydroxide followed by treatment with sulphuric acid gave a dibasic acid C, A sameple of 0.4 g of C on combustion gave 0.08g of water and 0.39g of carbondioxide. The silver salt of acid weihin 1g on ignition yielded 0.71g of silver as residue. Identify A, B and C.

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15. In the following, identify the compounds/reaction conditions represented by the alphabets (A), (B), and (C).

$$H_{3}C-CH=CH-CHO \stackrel{NaBH_{4}}{\longrightarrow} (A) \stackrel{HCl}{\stackrel{}{\longrightarrow}} (B) \stackrel{KCN}{\stackrel{}{\longrightarrow}} (C)$$

16. 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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17. In the following identify the compounds/reaction conditions represented by the alphabets (A), (B), and (C):

$$C_6H_5COOH \stackrel{PCl_5}{\longrightarrow} (A)^{NH_3 \rightarrow \ (B)} \stackrel{P_2O_5}{\longrightarrow} C_6H_5CN \stackrel{H_2/Ni}{\longrightarrow} (C)$$
 .

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18. Complete the following sequence of the reactions with approprite structures.



20. In the following reactions, identify the compounds A, B, C and D.

- (i) $PCl_5 + SO_2
 ightarrow A + B$
- (ii) $A + MeCOOH \rightarrow C + SO_2 + HCl$
- (iii) $2C + Me_2Cd \rightarrow 2D + CdCl_2$.

21. Predict the major product in the following reaction :

 $C_6H_5-CH_2CO_2CH_3 \stackrel{(i\,)\,CH_3MgBr\,(\,Excess\,)}{(ii\,)\,H^{\,\oplus}} \;.$

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22. How will you bring about the following conversion ?

'Benzamide from nitrobenzene'.

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23. Give reason for the following :

'In acylium ion, the structure $R-C\equiv O^\oplus$ is more stable than $R-\overset{\oplus}{C}=O.$

24. Which of the following carboxylic acids undergoes decarboxylation easily ? Explain briefly.

(i) $C_6H_5 - CO - CH_2 - COOH$

(ii) $C_6H_5 - CO - COOH$

iii.
$$C_6H_5-CH-COOH$$
 (iv) $C_6H_5-CH-COOH.$

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25. Complete the following sequence of reactions with appropriate structures.

$$egin{aligned} CH_3 - CH_2 - COOH & rac{P ext{ and }}{ ext{Bromide}} & (A) \ & (A) & rac{(i) ext{ Alc. KOH}(excess)}{(ii) ext{ H}^{\oplus}} & (B). \end{aligned}$$

26. Complete the following giving the structures of the principal organic

products.

(i)
$$Me + (COOEt)_2 + EtONa \longrightarrow (A)$$

NO₂

(ii) $H_3CCOCOC_6H_5 + NaOH / H_3O^\oplus
ightarrow (B).$

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27. The following reaction gives two products. Write the structures of these products.

 $CH_3CONHC_6H_5 \stackrel{Br_2/Fe}{\longrightarrow}.$

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28. Explain briefly the formation of products giving the structures of the intermediates.





29. What would be the major product in the following reactions ?



30. Write the structures of products (A) and (B)

$$CH_3 - \stackrel{O}{\overset{||}{C}} - \stackrel{18}{OC_2}H_5 \stackrel{H_3O^+}{\longrightarrow} (A) + (B).$$

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31. Five isomeric p-subsituted aromatic compounds (A) to (E) with molecular formula $C_8H_8O_2$ are given for identifyication. Based on the following observation, give the structures of the compounds.

i. Both (A) and (B) form a silver mirror with Tollens reagent, (B) also gives a positive test with neutral $FeCl_3$ solution.

ii. (C) gives positive iodoform test.

iii. (D) is readily extracted in aqueous $NaHCO_3$ solution.

iv. (E) on acid hydrolysis gives 1,4-dihydroxy benzene.

Compound (A) is:

32. A racemic mixture of $(\pm)2 - pheynl$ propanoic acid on esterification with $(+)2 - bu \tan ol$ gives two esters. Mention the seterichemistry of the two ester produced.

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33. A biologically active compound bombykol $(C_{16}H_{30}O)$ is obtained from a natural source. The structure of the compound is determined by the following reactions :

(a) On hydrogenation, bombykol gives a compound (A), $C_{16}H_{34}O$, which reacts with acetic anhydride to give an ester.

(b) Bombykol also reacts with acetic anhydride to give another ester, which on oxidation ozonolysis (O_3/H_2O_2) gives a mixture of butanoic acid, oxalic acid, and $10 - hydr \otimes y$ decanoic acid.

Determone the number of double bonds in bombykol. Write the structures of compounds (A) and bombykol. How many geometrical isomers are possible for bombykol?

34. Convert the following (in not more than three steps):

