CHAPTER 8

Aldehydes, Ketones and Carboxylic Acids

1. NOMENCLATURE & PREPARATION OF ALDEHYDES & KETONES

Very Short & Short Qs [1-3 marks]

1. What happens when Benzene is treated with acetyl chloride in the presence of anhydrous $AlCl_3$?
   [CBSE 2020]
2. What happens when benzene is treated with CH_3COCl in presence of anhydrous $AlCl_3$?
   [CBSE 2020]
3. How can you convert the following: Benzene to acetophenone?
   [CBSE 2020]
4. Write the major product(s) in the following:

   (A) $CH_3 - CH = CH - CH_2 - CN \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) DIBAL-H}}$

   (B) $CH_3 - CH_2 - OH \xrightarrow{CrO_3}$

   [CBSE 2020]
5. Write chemical equations for the following reaction:
   [CBSE 2019, 18]
6. Complete the following reaction:
   $(C_6H_5CH_2)_2Cd + 2CH_3COCl \rightarrow$

   [CBSE 2019]

7. Write the product in the given reaction:

   $CH_3 - CH = CH - CN \xrightarrow[\text{(ii) } H_2O]{\text{(i) (DIBAL) - H}} ?$

   [CBSE 2017]
8. Write the structure of 2-methylbutanal.
   [CBSE 2015]

9. Draw the structure of 3-methylpentanal.
   [CBSE 2015]

10. Write the IUPAC name of the following: CH_3CH_2CHO
    [CBSE 2015]

11. How do you convert the following:
    Ethyne to ethanal

    [CBSE 2015]

12. Draw the structures of the following:
    (A) p - Methylbenzaldehyde

    (B) 4 - Methylpent- 3-en-2-one

    [CBSE 2015]

13. Write the equations involved in the following reactions:
    (A) Stephen reaction

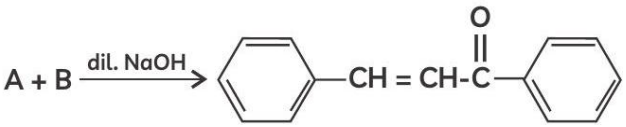
    (B) Etard reaction

    [CBSE 2015]

2. PHYSICAL AND CHEMICAL PROPERTIES OF ALDEHYDES AND KETONES

Objective Qs [1 - 3 marks]

14.



Identify A and B.

(a) A = 1-phenylethanal, B = Acetophenone

(b) A = Benzophenone, B = Formaldehyde

(c) A = Benzaldehyde, B = Acetophenone

(d) A = Benzophenone, B = Acetophenone

[CBSE SQP 2023]

15. What is IUPAC name of the ketone A, which undergoes iodoform reaction to give $CH_3CH = C(CH_3)COONa$ and yellow precipitate of CH_3 ?

(a) 3-Methylpent-3-en-2-one

(b) 3-Methylbut-2-en-one

(c) 2,3-Dimethylethanone

(d) 3-Methylpent-4-one

[CBSE SQP 2023]

16. Which of the following tests/reactions is given by aldehydes as well as ketones?

(a) Fehling's test

(b) Tollen's test

(c) 2,4 DNP test

(d) Cannizzaro reaction

[CBSE SQP 2022]

17. lodoform test is not given by:
(a) 2-pentanone
(b) ethanol
(c) ethanal
(d) 3-pentanone

[CBSE 2020]

In the following question, a statement of assertion (A) followed by a statement of reason (R) is given. Choose the correct answer out of the following choices.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

18. Assertion (A): Strong oxidising agents oxidise toluene and its derivatives to benzoic acids.

Reason (R): It is possible to stop the oxidation of toluene at the aldehyde stage with suitable reagents. [CBSE SQP 2023]

Very Short & Short Qs [1-3 marks]

19. Arrange the following in the increasing order of their property indicated:

    (A) Benzoic acid, Phenol, Picric acid, Salicylic acid (pk_a values).

    (B) Acetaldehyde, Acetone, Methyl tert butyl ketone (reactivity towards NH_2OH).

    (C) Ethanol, Ethanoic acid, Benzoic acid (boiling point)

    [CBSE SQP Term-2 2022]

20. Give reasons to support the answer:

    (A) Presence of Alpha hydrogen in aldehydes and ketones is essential for aldol condensation.

    (B) 3 -Hydroxy pentan-2-one shows positive Tollen's test.

    [CBSE SQP Term-2 2022]

21. Write the product formed when benzaldehyde reacts with the following reagents:

    (A) CH_3CHO in presence of dilute $NaOH$

    (B) Tollen's reagent

    [CBSE SQP Term-2 2022]

22. Write the equations involved in the following reactions:

    (A) Clemmensen reduction

    (B) Cannizzaro reaction

    [CBSE Term-2 2022]

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

    [CBSE SQP Term-2 2022]

24. Write the products formed when $(CH_3)_3C\ CHO$ reacts with the following reagents:

    (A) CH_3COCH_3 in the presence of dilute $NaOH$.

    (B) HCN.

(C) Conc. $NaOH$

[CBSE 2020]

25. What happens when, propanone is treated with methyl magnesium iodide and then hydrolysed?
[CBSE 2020]

26. How can you convert the following: Acetone to propene?
[CBSE 2020]

27. Write chemical equations for the following reactions:
(A) Propanone is treated with dilute $BaOH_2$.

(B) Acetophenone is treated with $Zn(Hg)/$ conc. HCl

[CBSE 2019]

28. How do you convert the following:
Ethanal to Propanone

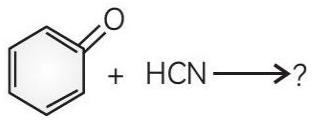
[CBSE 2018]

29. (X), (Y) and (Z) are three non-cyclic functional isomers of a carbonyl compound with molecular formula C_4H_8O. Isomers (X) and (Z) give positive Tollens' test whereas isomer (Y) does not give Tollens' test but gives positive lodoform test. Isomers (X) and (Y) on reduction with $Zn(Hg)/$ conc. HCl give the same product (W).
(A) Write the structures of $(X), (Y), (Z)$ and (W).

(B) Out of $(X), (Y)$ and (Z) isomers, which one is least reactive towards addition of HCN ?

[CBSE 2018]

30. Write the products in the following reaction:



[CBSE 2018]

31. (A) Write the chemical reaction involved in Wolff - Kishner reduction.
(B) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction. $C_6H_5COCH_3, CH_3-CHO, CH_3COCH_3$

(C) A and B are two functional isomers of compound C_3H_6O. On heating with NaOH and I_2, isomer B forms yellow precipitate of iodoform whereas isomer A does not form any precipitate. Write the formulae of A and B.

[CBSE 2016]

32. (A) Write the chemical equation for the reaction involved in Cannizzaro reaction.

(B) Draw the structure of the semicarbazone of ethanal.

(C) How can you distinguish between propanal and propanone?

[CBSE 2016]

33. A compound 'A' of molecular formula C_2H_3OCl undergoes a series of reactions as shown below. Write the structures of A, B, C and D in the following reactions:

$$(C_2H_3OCl)A \xrightarrow{H_2/Pd-BaSO_4} B \xrightarrow{\text{dit. NaOH}} C \xrightarrow{\text{Heat}} D$$

[CBSE 2015]

34. Describe the following reactions:

(A) Acetylation

(B) Aldol condensation

[CBSE 2015]

35. Draw the structures of the following derivatives:

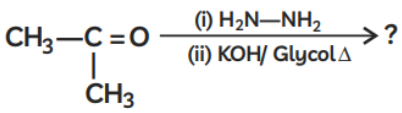
(A) Propanone oxime,

(B) Semicarbazone of CH_3CHO.

[CBSE 2015]

36. Predict the products of the following reactions:

(A)



(B) $C_6H_5 - CO - CH_3 \xrightarrow{NaOH/I_2} ? + ?$

[CBSE 2015]

37. Write the structures of the main products when acetone ($CH_3 - CO - CH_3$) reacts with the following reagents:

(A) $Zn - Hg/$ conc. HCl

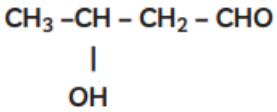
(B) H_2 $N - NHCONHN_2/H^+$

(C) CH_3MgBr and then H_2O^+

[CBSE 2015]

38. How will you convert ethanal into the following compounds? Give the chemical equations involved.
(A) $CH_3 - CH_3$

(B)



(C) CH_3CH_2OH

[CBSE 2015]

39. Give simple chemical tests to distinguish between the following pair of compounds:

Propanal and butan-2- one

[CBSE 2014]

40. Give simple chemical tests to distinguish between the following pairs of compounds:

(A) Benzaldehyde and benzoic acid

(B) Propanal and propanone

[CBSE 2014]

41. Write the products formed when ethanal reacts with the following reagents:

(A) CH_3MgBr and then H_3O^+

(B) $Zn - Hg/$ conc. HCl

(C) C_6H_5CHO in the presence of dilute NaOH

[CBSE 2014]

Long Qs [4 - 5 marks]

42. Convert the following:

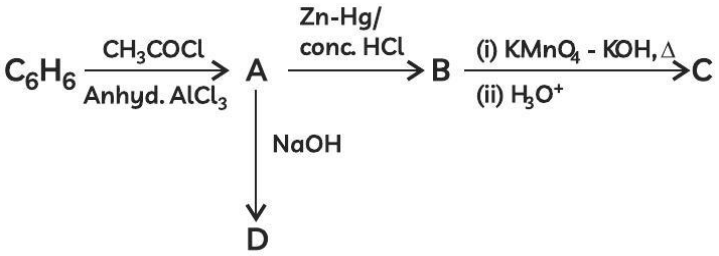
(A) Bromomethane to ethanoic acid.

(B) Benzene to p-nitrobenzoic acid.

(C) Benzoic acid to benzaldehyde.

[Delhi Gov. SQP Term-2 2022]

43. Complete the reaction sequence by writing structures of A-D. Also name the reaction involved in the conversion of A to B.



[Delhi Gov. SQP Term-2 2022]

44. An organic compound $A(C_8H_6)$ on treatment with dilute sulphuric acid containing mercuric sulpharte gives a compound B, which can also be obtained from a reaction of benzene with an acid chloride in the presence of anhydrous aluminium chloride. The compound B, when treated with iodine in aqueous KOH, yields C and a yellow compound D. Identify A, B, C and D with justification. Show how B is formed from A ?

[CBSE 2020]

3. NOMENCLATURE & PREPARATION METHODS OF CARBOXYLIC ACIDS

Very Short Type Qs [1 mark]

45. Convert the following:

(A) Benzoic acid to Benzaldehyde

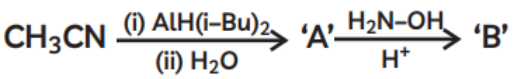
(B) Propan-1-ol to 2-Bromopropanoic acid

(C) Acetaldehyde to But-2-enal

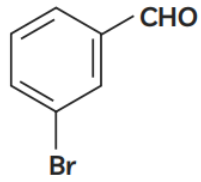
[CBSE Term-2 2022]

46. Complete the following:

(A)



(B) Write IUPAC name of the following compound:



(C) Write chemical test to distinguish between the following compounds: Phenol and Benzoic acid.

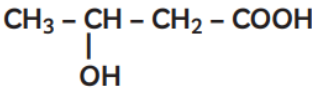
[CBSE Term-2 2022]

47. How do you convert the following:

Toluene to benzoic acid?

[CBSE 2018]

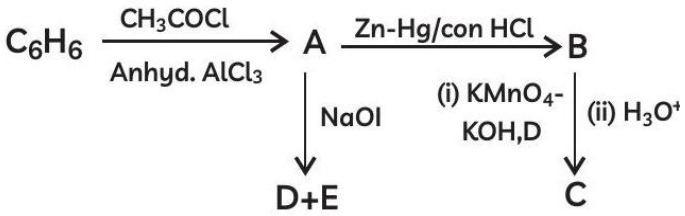
48. Write the IUPAC name of the compound:



[CBSE 2014]

Long Qs [4 - 5 marks]

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



[CBSE 2016]

4. PHYSICAL AND CHEMICAL PROPERTIES OF CARBOXYLIC ACIDS

Objective Qs [1 mark]

In the following question, a statement of assertion (A) followed by a statement of reason (R) is given. Choose the correct answer out of the following choices.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

50. Assertion (A): Carboxylic acids are more acidic than phenols.

    Reason (R): Phenols are ortho and para directing.

    [CBSE 2020]

Very Short & Short Qs [1 - 3 mark]

51. You are given four organic compounds " A ", " B ", " C " and " D ". The compounds " A ", " B " and " C " form an orange-red precipitate with 2,4 DNP reagent. Compounds " A " and " B " reduce Tollen's reagent while compounds " C " and " D " do not. Both " B " and " C " give a yellow precipitate when heated with iodine in the presence of NaOH. Compound "D" gives brisk effervescence with sodium bicarbonate solution. Identify " A ", " B ", " C " and " D " given the number of carbon atoms in three of these carbon compounds is three while one has two carbon atoms. Give an explanation for your answer.

    [CBSE SQP 2023]

52. Arrange the following in the increasing order of their property indicated:

    (A) Ethanal, propanone, propanal, butanone (reactivity towards nucleophilic addition)

    (B) 4-Nitrobenzoic acid, benzoic acid, 3, 4-dinitrobenzoic acid. 4-methoxy benzoic acid (Acid strength)

    [CBSE Term-2 2022]

53. Write the equation for the following:

    (A) Salicylic acid is treated with acetic anhydride in the presence of conc. H_2SO_4

    (B) Tert butyl chloride is treated with sodium ethoxide.

    (C) Phenol is treated with chloroform in the presence of NaOH

    [CBSE SQP 2022]

54. A hydrocarbon (a) with molecular formula C_5H_{10} on ozonolysis gives two products (b) and (c). Both (b) and (c) give a yellow precipitate when heated with iodine in presence of NaOH while only (b) give a silver mirror on reaction with Tollen's reagent.

    (A) Identify (a), (b) and (c).

    (B) Write the reaction of (b) with Tollen's reagent

    (C) Write the equation for iodoform test for (c).

(D) Write down the equation for aldol condensation reaction of (b) and (c).

[CBSE SQP 2022]

55. An organic compound (a) with molecular formula $C_2Cl_3O_2H$ is obtained when (b) reacts with Red P and Cl_2. The organic compound (b) can be obtained on the reaction of methyl magnesium chloride with dry ice followed by acid hydrolysis.

(A) Identify (a) and (b)

(B) Write down the reaction for the formation of (a) from (b). What is this reaction called?

(C) Give any one method by which organic compound (b) can be prepared from its corresponding acid chloride.

(D) Which will be the more acidic compound (a) or (b)? Why?

(E) Write down the reaction to prepare methane from the compound (b).

[CBSE SQP 2022]

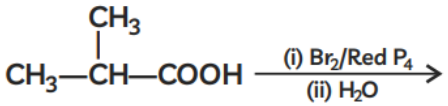
56. Write structure of the products formed:

(A) $CH_3CH_2COOH \xrightarrow[\Delta]{Cl_2,\ red\ P_4}$

(B) $C_6H_5COCl \xrightarrow[\Delta]{H_2, Pd-BaSO_4}$

[CBSE 2019]

57. Complete the following reaction:



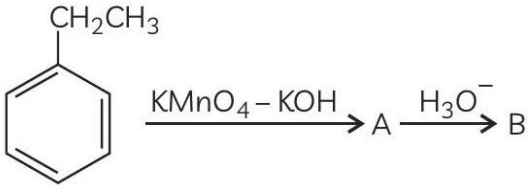
[CBSE 2019]

58. Carry out the following conversions:

Propanoic acid to Acetic acid

[CBSE 2019]

59. Write structures of compounds (A) and (B) in each of the following reactions:



[CBSE 2019]

60. Account for the following:

(A) Aromatic carboxylic acids do not undergo Friedel-Crafts reaction.

(B) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid.

[CBSE 2018]

61. Do the following conversion in not more than two steps:

Ethyl benzene to benzoic acid

[CBSE 2017]

62. Why carboxylic acid does not give reactions of carbonyl group?

[CBSE 2017, 16]

63. How will you convert the following in not more than two steps:

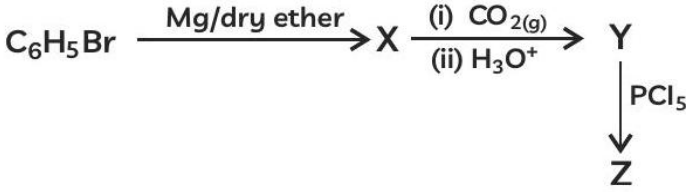
(A) Acetophenone to benzoic acid

(B) Ethanoic acid to 2-hydroxyethanoic acid

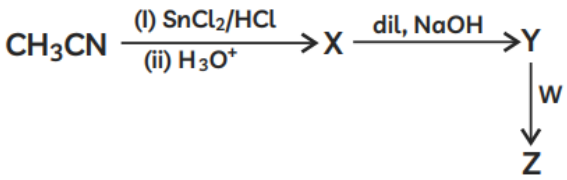
[CBSE 2017]

64. Write the structures of compounds X, Y and X in each of the following reactions:

(A)



(B)



[CBSE 2017]

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

$$CH_3CHO, CH_3COOH, CH_3CH_2OH.$$

[CBSE 2016, 15]

66. Describe the following giving chemical equation:

Decarboxylation

[CBSE 2015]

67. Give simple chemical test to distinguish between the following pair of compounds:

Benzoic acid and phenol.

[CBSE 2014]

68. Write the chemical equation to illustrate the following name reaction:

Hell-Volhard-Zelinsky reaction

[CBSE 2014]