

ITL PUBLIC SCHOOL
HOLIDAY HOMEWORK (2023-24)
CLASS – XII CHEMISTRY

SUMMER ENGAGEMENT PROGRAMME

1. INVESTIGATORY PROJECT

The project should have the following outline:

- **Cover page**
- **Certificate**
- **Acknowledgement**
- **Index**
- **Abstract-** Include the keywords
- **Statement of Problem-** A clear statement of the problem/need that has given rise to the project
- **Objectives-** General & specific objectives of topic
- **Introduction-** Purpose, scientific principle involved, reactions, advantages, disadvantages, current examples, case presentation and beneficiary satisfaction.
- **Problem question-** (specific, concrete questions to which concrete answers can be given) and/ or hypotheses
- **Materials/Resources required**
- **Procedure-** Describe the experiments proposed or the observations planned to make and the detailed process of analysis of data/observations. Methods proposed should be feasible and be able to adequately answer problem question.
- **Observations/Data gathered-** Using the procedures mentioned in introduction, experiments should be conducted and data should be recorded. Interesting things that happened during the conduct of experiments should also be recorded.
- **Testing & analysis-** Data should be interpreted in terms of proposed hypothesis. It should be tabulated and interpreted with the help of graphs if possible. The interpretation should be done in an honest manner even if it does not support proposed hypothesis.
- **Discussion of result**
- **Conclusion-** Reporting and writing up the report. Discussion of new learning from the study may be covered under conclusion. This may have possible suggestions for future studies.
- **Limitation of the study-** The limitations of the study are those features of design or procedure that might have affected the interpretation of the results of study. The limitations are alternatively interpreted as flaws or shortcomings due to flawed methodology, observations, small number of experiments or non-peer reviewed nature of study etc.
- **Summary**
- **Evidence-** Photos showcasing the student performing the experiment.
- **References**

Rubrics for Assessment of Project

<i>Parameters</i>	<i>Exemplary (3)</i>	<i>Developing (2)</i>	<i>Beginner (1)</i>
Presentation of Factual Information	<ul style="list-style-type: none"> Relevant to the topic. Well designed with good flow and appropriate use of pictures and graphs. Content covers the research well. 	<ul style="list-style-type: none"> Relevant to the topic. Well designed with appropriate use of pictures and graphs, but not organised. Content covered well but has few errors. 	<ul style="list-style-type: none"> Not relevant to the topic. Not so well designed. Inappropriate use of pictures and graphs. Content does not cover all the research.
Sources	<ul style="list-style-type: none"> Multiple sources used (books, different websites, journals, etc) 	<ul style="list-style-type: none"> Few sources used. 	<ul style="list-style-type: none"> Relied on only one source.
Project report & Data collection	<ul style="list-style-type: none"> Well defined problem with clear cut objectives and methodology. Key concepts clearly specified and explained technically. Work is well summarized and concluded. 	<ul style="list-style-type: none"> Well defined problem and methodology but objectives are not clear. Key concepts specified and explained technically. Work is well summarized and concluded. 	<ul style="list-style-type: none"> Poorly defined problem with un-clear objectives and not so appropriate methodology. Key concepts specified but not explained technically. Work is not summarized and concluded properly.
Depth of understanding	<ul style="list-style-type: none"> Good understanding of the relevance of the project. Extensive knowledge of not only the project but the related domain as well. 	<ul style="list-style-type: none"> Fair understanding of the relevance of the project. Extensive knowledge of the project but not of the related domain. 	<ul style="list-style-type: none"> Poor understanding of the relevance of the project. Little knowledge of the project and the domain around but not sufficient.
Interpretation and conclusion	<ul style="list-style-type: none"> In correlation with data and aim of project. Clear conclusions based on findings. 	<ul style="list-style-type: none"> In correlation with data and aim of project. Conclusions not based on findings. 	<ul style="list-style-type: none"> Not in correlation with data and aim of project. No conclusions.
Journal	<ul style="list-style-type: none"> Daily entries with details of discussions and brainstorming sessions with the teacher. 	<ul style="list-style-type: none"> Daily entries without details. 	<ul style="list-style-type: none"> Random entries.

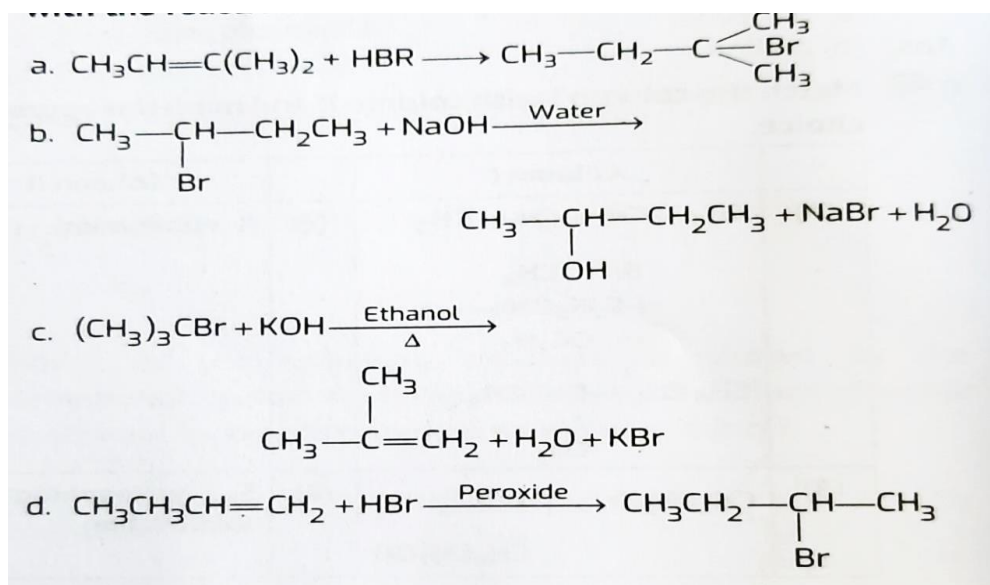
2. **PRACTICAL**: All the experiments performed so far to be completed in the file.

3. **ASSIGNMENT:** All the following assignment questions of chapters 6 (haloalkanes and haloarenes), chapter 7 (alcohol, phenol, ethers), chapter 8 (aldehydes, ketones, carboxylic acids) & chapter 9 (amines) to be solved in the chemistry register itself along with all solved and unsolved NCERT questions.

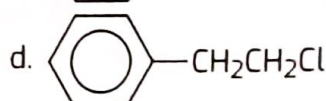
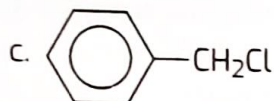
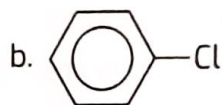
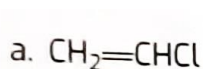
ASSIGNMENT QUESTIONS

MULTIPLE CHOICE QUESTIONS

1. The ease of dehydrohalogenation of alkyl halides with alcoholic KOH is
(a) $3^\circ < 2^\circ < 1^\circ$ (b) $3^\circ > 2^\circ > 1^\circ$ (c) $3^\circ < 2^\circ > 1^\circ$ (d) $3^\circ > 2^\circ < 1^\circ$
2. Which of the following products does not match correctly with the reaction?



3. A mixture of 1-chloropropane and 2-chloropropane when treated with alc. KOH gives:
(a) Prop-1-ene (b) Prop-2-ene (c) both a and b (d) Propanol
4. Which one of the following hydrocarbons readily undergoes solvolysis?



5. Which of the following statements regarding the $\text{S}_{\text{N}}1$ reaction shown by alkyl halide is not correct?
- (a) The added nucleophile plays no kinetic role in $\text{S}_{\text{N}}1$ reaction.
(b) The $\text{S}_{\text{N}}1$ reaction involves the inversion of configuration of the optically active substrate.
(c) The $\text{S}_{\text{N}}1$ reaction on the chiral starting material ends up with racemisation of the product. faster
(d) The more stable the carbocation intermediate the the $\text{S}_{\text{N}}1$ reaction.

6. Match the column I with column II and mark the appropriate choice

COLUMN I	COLUMN II
A. Hydrolysis of Benzene diazonium chloride	(i) p-Cresol
B. Phenol + methyl chloride in presence of anhy. AlCl_3	(ii) Salicylic acid
C. reaction of sodium phenoxide with CO_2	(iii) picric acid
D. phenol + conc HNO_3	(iv) phenol

- (a) (A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (ii), (D) \rightarrow (iv)
(b) (A) \rightarrow (ii), (B) \rightarrow (iii), (C) \rightarrow (iv), (D) \rightarrow (i)
(c) (A) \rightarrow (iii), (B) \rightarrow (iv), (C) \rightarrow (i), (D) \rightarrow (ii)
(d) (A) \rightarrow (iv), (B) \rightarrow (i), (C) \rightarrow (ii), (D) \rightarrow (iii)

7. Methyl alcohol is industrially prepared by the action of:

- (a) CH_3COCH_3 (b) $\text{CO} + \text{H}_2$ (c) CH_3COOH (d) $\text{C}_2\text{H}_5\text{OH}$

8. Which of the following statement is not correct about methanol?

- (a) It is used for drinking purposes.
(b) It is highly poisonous compound.
(c) It can be prepared by reduction of formaldehyde with LiAlH_4 .
(d) It is miscible with water in all proportions.

9. The enzyme which can catalyse the conversion of glucose to ethanol is:

- (a) Invertase (b) zymase (c) maltase (d) diastase

10. A organic compound A containing C, H and O has a pleasant odour with boiling point of 78°C . On boiling A with concentrated H_2SO_4 , a colourless gas is produced which decolourises bromine water and alkaline KMnO_4 . The organic liquid A is:

- (a) $\text{C}_2\text{H}_5\text{Cl}$ (b) $\text{C}_2\text{H}_5\text{COOCH}_3$ (c) $\text{C}_2\text{H}_5\text{OH}$ (d) C_2H_6

11. Why BaSO_4 is used with Pd in Rosenmund reduction reaction?

- (a) It reduces the activity of Pd.
(b) It increases the activity of Pd.
(c) It has no significant role in the reaction.
(d) None of the above.

12. Which of the following substances is the least water-soluble?

- (a) Methanal (b) Pentanal (c) Propanone (d) Ethanal

13. When benzaldehyde and formaldehyde are heated in an aqueous NaOH solution, they produce

- (a) sodium formate + benzyl alcohol (c) Methanol + benzyl alcohol
(b) methanol + sodium benzoate (d) sodium formate + sodium benzoate

14. The conversions that can be made under Wolff-Kishner reduction circumstances include

- (a) cyclohexanone to cyclohexane conversion
(b) benzaldehyde to benzyl alcohol transformation
(c) cyclohexanone to cyclohexanol conversion

(d) biphenyl to diphenylmethane conversion

15. One example of this is the production of cyanohydrin from a ketone

- (a) addition of electrophile (c) Replacement of nucleophiles
(b) inclusion of nucleophiles (d) Replacement of electrophiles

16. Match the column I with column II and mark the appropriate choice

Column-I

(A) Ammolysis

(B) Gabriel phthalimide

(C) Hoffmann bromide amide degradation

(D) Carbylamine reaction

Column-II

(p) Amine with lesser no. of carbon atom

(q) Detection of primary amine

(r) Reaction of phthalimide with KOH and R—X

(s) Reaction of alkyl halides with NH_3

- (a) A-s, B-r, C-p, D-q
(b) A-p, B-q, C-r, D-s
(c) A-r, B-s, C-p, D-q
(d) A-s, B-r, C-q, D-p.

17. Match the column I with column II and mark the appropriate choice

Column-I

(A) Benzene sulphonyl chloride

(B) Sulphanilic acid

(C) Alkyl diazonium salts

(D) Aryl diazonion salts

Column-II

(p) zwitter ion

(q) Hinsberg reagent

(r) Dyes

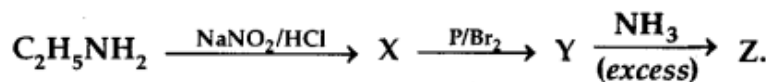
(s) Conversion to alcohols

- (a) A-p, B-q, C-s, D-r
(b) A-q, B-p, C-s, D-r
(c) A-q, B-p, C-r, D-s
(d) A-s, B-r, C-q, D-p.

18. The shape of $(\text{CH}_3)_3\text{N}$ molecule is-

- (a) Tetrahedral (b) square planar (c) pyramidal (d) trigonal bipyramidal

19. In the given sequence of reaction Z is-



- (a) Cyanoethane (b) Ethanamide (c) Methanamine (d) Ethanamine

20. Which of the following amines can exhibit enantiomerism?

- (a) Benzenamine (b) 2-Butanamine (c) 2-Propanamine (d) 2-Methyl-propanamine

REASONING QUESTIONS

CHAPTER 6 - HALOALKANES AND HALOARENES

1. Ethyl iodide undergoes S_N2 reaction faster than ethyl bromide. Why?
2. Why is (\pm)-butan-2-ol optically inactive?
3. C-X bond length in halobenzene is smaller than C-X bond length in CH_3-X .
4. Out of chlorobenzene and benzyl chloride, which one gets easily hydrolysed by aqueous NaOH and why?
5. Out of Chlorobenzene and Cyclohexyl chloride which one is more reactive towards nucleophilic substitution reaction and why?
6. Why is t- butyl bromide more reactive towards S_N1 reaction as compared to n- butyl bromide?
7. p-dichlorobenzene has higher melting point than those of o- and m- isomers. Why?
8. Thionyl chloride method is preferred for preparing alkyl chlorides from alcohols. Why?
9. The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride. Why?
10. S_N1 reactions are accompanied by racemization in optically active alkyl halides. Why?
11. Why 2-Bromobutane is optically active but 1-Bromobutane is optically inactive?
12. Why electrophilic reactions in haloarenes occur slowly?
13. Butan-1-ol optically inactive but butane-2-ol is optically active. Why?
14. Why chloroform is kept in dark coloured bottles?
15. Why grignard reagent should be prepared under anhydrous conditions?
16. Why is sulphuric acid not used during the reaction of alcohols with KI?
17. Why the boiling point of alkyl halides follows the order: $RI > RBr > RCl > RF$?
18. Why the boiling point decreases with branching for haloalkanes?
19. Why para isomer of dihaloarenes has higher melting point than ortho and meta isomers?
20. Why haloalkanes are insoluble in water?
21. Why aryl halides are less reactive towards nucleophilic substitution reaction?
22. Draw the resonating structures of chlorobenzene?
23. Although chlorine is an electron withdrawing group, yet it is ortho-, para- directing in electrophilic aromatic substitution reactions. Why?
24. The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohols but in the presence of alcoholic KOH, alkenes are major products. Explain.
25. What happens when
 - (i) n-butyl chloride is treated with alcoholic KOH,
 - (ii) bromobenzene is treated with Mg in the presence of dry ether,
 - (iii) chlorobenzene is subjected to hydrolysis,
 - (iv) ethyl chloride is treated with aqueous KOH,
 - (v) methyl bromide is treated with sodium in the presence of dry ether,
 - (vi) methyl chloride is treated with KCN?

CHAPTER 7 - ALCOHOLS, PHENOLS, ETHERS

26. p-nitrophenol is more acidic than o-nitrophenol. Why?
27. p-nitrophenol is more acidic than p-methyl phenol. Why?
28. Why phenol is more acidic than ethanol?
29. Ethanol has a higher boiling point than methoxymethane. Why?

30. Why C-O-C bond angle in ethers is slightly greater than tetrahedral angle?
31. Butan-1-ol has higher boiling point than diethyl ether. Why?
32. ortho nitrophenol is more acidic than ortho methoxyphenol. Why?
33. o-nitrophenol is more volatile and has less melting point than p-nitrophenol. Why?
34. Why bond length of C-O bond in phenol is shorter than that in CH_3OH ?
35. C-O-H bond angle in alcohols is slightly less than the tetrahedral angle. Why?
36. Convert cumene into phenol.
37. Why the boiling point decreases with increase in branching of alcohols?
38. Why the solubility of alcohols decreases with increase in number of carbon atoms?
39. Explain the acidity order of - Primary, secondary and tertiary alcohols.
40. Why phenols are more acidic than alcohols?
41. Why we use pyridine during the reaction of alcohol and acyl chloride?
42. How will you convert salicylic acid into aspirin? Give reaction?
43. How will you obtain picric acid from phenol?
44. How to distinguish between primary, secondary, tertiary alcohols?
45. What is the limitation of Williamson's synthesis?
46. Why ethers are soluble in water like alcohols?
47. $(\text{CH}_3)_3\text{C}-\text{Br}$ on reaction with sodium methoxide (NaOCH_3) gives alkenes as the main product and not an ether. Why?

CHAPTER 8- ALDEHYDES, KETONES, CARBOXYLIC ACIDS

48. Why $\text{Cl}-\text{CH}_2\text{COOH}$ is a stronger acid than CH_3COOH ?
49. Why carboxylic acid does not give reactions of carbonyl group?
50. Aldehydes are more reactive toward nucleophilic addition reactions than ketones. Why?
51. Why benzaldehyde does not undergo aldol condensation?
52. Why benzoic acid does not undergo Friedel-Crafts reaction?
53. Why oxidation of propanal is easier than propanone?
54. Why CH_3CHO is more reactive than CH_3COCH_3 towards reaction with HCN ?
55. Carboxylic acid is a stronger acid than phenol. Comment.
56. Why carboxylic acids have higher boiling points than alcohols?
57. Methanal is more reactive than ethanal towards Nucleophilic addition reaction. Explain.
58. Why formaldehyde does not take part in aldol condensation?
59. Why alpha hydrogen of aldehydes and ketones is acidic in nature?
60. Electrophilic substitution in benzoic acid takes place at meta position. Why?
61. Which will be more reactive towards nucleophilic substitution reaction and why- propanal or benzaldehyde?
62. How will you distinguish between aldehydes and ketones?
63. How will you distinguish between aliphatic and aromatic aldehydes?
64. What is Rochelle's salt? What is the use of it?
65. Why carboxylic acids are water soluble?
66. Why electron withdrawing groups increases the acidity while electron donating groups decreases the acidity of acids?
67. Arrange the following compounds in increasing order of acid strength
 - (i) $\text{CH}_3\text{CH}_2\text{OH}$, CH_3COOH , ClCH_2COOH , FCH_2COOH , $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$
 - (ii) $\text{C}_6\text{H}_5\text{COOH}$, FCH_2COOH , $\text{NO}_2\text{CH}_2\text{COOH}$

(iii) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$, $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$, $(\text{CH}_3)_2\text{CHCOOH}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$

(iv) Benzoic acid, 4-Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid

68. Arrange the following compounds in increasing order of their reactivity in nucleophilic addition
Reactions with reasons-

(i) Ethanal, Propanal, Propanone, Butanone.

(ii) Benzaldehyde, *p*-Tolualdehyde, *p*-Nitrobenzaldehyde, Acetophenone.

(iii) Acetaldehyde, Acetone, Di-*tert*-butyl ketone, Methyl *tert*-butyl ketone

69. There are two $-\text{NH}_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazones. Why?

70. During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester should be removed as soon as it is formed. Why?

71. Why acetic acid is stronger acid than phenol whereas formic acid is stronger than acetic acid?

CHAPTER 9- AMINES

72. Why primary amines have higher boiling points than the tertiary amines?

73. Aniline does not undergo Friedel-Crafts reaction. Why?

74. $(\text{CH}_3)_2\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution. Why?

75. Acetylation of aniline reduces its activation effect. How?

76. CH_3NH_2 is more basic than $\text{C}_6\text{H}_5\text{NH}_2$. Why?

77. Although $-\text{NH}_2$ is o/p directing group, yet aniline on nitration gives a significant amount of m-nitroaniline. Explain.

78. Why aromatic diazonium salts are more stable than aliphatic diazonium salts?

79. Why Aromatic primary amines can not be prepared by Gabriel phthalimide synthesis?

80. Aliphatic amines are stronger bases than ammonia. Explain.

81. Ethylamine is soluble in water whereas aniline is not. Why?

82. *p*-methylaniline is more basic than *p*-nitroaniline. Why?

83. Why pyridine is used during acylation of amines?

84. Why we do not usually use ammonolysis method to prepare amines from alkyl halides?

85. Why higher amines are water insoluble?

86. What is the order of basicity of primary, secondary and tertiary amines in gaseous phase? Explain the order.

87. Explain the basic strength order in aqueous phase-

(a) $(\text{C}_2\text{H}_5)_2\text{NH} > (\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$

(b) $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$

88. Draw the resonating structure of aniline?

89. How will you distinguish between aliphatic and aromatic amines?

90. How will you distinguish between primary, secondary and tertiary amines ?

91. Aniline on bromination gives 2,4,6-tribromoaniline. How we will get only para bromoaniline?

92. Diazonium salts of aromatic amines are more stable than those of aliphatic amines. Explain.

93. Why cannot aromatic primary amines be prepared by Gabriel phthalimide synthesis?

94. Why are amines less acidic than alcohols of comparable molecular masses?

95. Why do amines react as nucleophile?

96. A primary amine, RNH_2 can be reacted with $\text{CH}_3\text{-X}$ to get secondary amine, R-NHCH_3 but the only disadvantage is that 3° amine and quaternary ammonium salts are also obtained as side products. Can you suggest a method where RNH_2 forms only 2° amine?

REACTION MECHANISMS

1. Give the mechanism for preparation of alkene from alcohols and vice-versa.
2. Give the mechanism for aldol condensation.
3. Give the sequence of steps for Gabriel Phthalimide synthesis of ethanamine.
4. Give the sequence of steps for the addition of phenyl magnesium bromide on propan-2-one.
5. Give the mechanism for preparation of ethoxy ethane from ethane.
6. Give the mechanism for preparation of alkyl halides from unsymmetrical ethers.
7. Give the mechanism of esterification of carboxylic acids.
8. Give the sequence of steps for the conversion of phthalic acid into phthalimide.

WORD PROBLEMS

1. Primary alkyl halide $\text{C}_4\text{H}_9\text{Br}$ (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.
2. An organic compound 'A' having molecular formula C_4H_8 , on treatment with dil. H_2SO_4 gives 'B'. 'B' on treatment with conc. HCl and anhydrous ZnCl_2 gives 'C' and on treatment with sodium ethoxide gives back 'A'. Identify the compounds 'A', 'B' and 'C' and write the equations involved.
3. An organic compound A, having the formula, $\text{C}_3\text{H}_8\text{O}$, on treatment with copper at 573 K, gives B. B does not reduce Fehling's solution but gives a yellow precipitate of the compound C with I_2/NaOH . Deduce the structures of A, B and C.
4. An unknown aldehyde [A] on reacting with alkali gives β -hydroxyaldehyde which loses water to form an unsaturated aldehyde but-2-enal. Another aldehyde [B] undergoes disproportionation reaction in the presence of conc. alkali to form products [C] and [D]. The compound [C] is an aryl alcohol with formula $\text{C}_7\text{H}_8\text{O}$.
 - (i) Identify [A] and [B]
 - (ii) Write the sequence of reactions involved.
 - (iii) Name the products when [B] reacts with zinc amalgam and hydrochloric acid.
5. An organic compound [A] with molecular formula $\text{C}_5\text{H}_8\text{O}_2$ is reduced to n-pentane on treatment with Zn-Hg/HCl . The compound [A] forms dioxime with two moles of hydroxyl amine and gives a positive iodoform test and Tollen's test. Identify the compound [A] and deduce its structure. (**hint-** there are 2 different functional groups in A)
6. An organic compound 'A' (molecular formula $\text{C}_4\text{H}_{10}\text{O}$) reacts vigorously with acetyl chloride and responds to iodoform test. When passed over heated alumina, 'A' is converted into another compound 'B' (C_4H_8) which upon ozonolysis gives two moles of an aldehyde. Identify 'A' and 'B' with reactions.

7. A hydrocarbon 'A', (C_4H_8) on reaction with HCl gives a compound 'B', (C_4H_9Cl), which on reaction with 1 mol of NH_3 gives compound 'C', ($C_4H_{11}N$). On reacting with $NaNO_2$ and HCl followed by treatment with water, compound 'C' yields an optically active alcohol, 'D'. Ozonolysis of 'A' gives 2 moles of acetaldehyde. Identify compounds 'A' to 'D'. Explain the reactions involved.
8. A colourless substance 'A' (C_6H_7N) is sparingly soluble in water and gives a water-soluble compound 'B' on treatment with mineral acid. On reacting with $CHCl_3$ and alcoholic potash, 'A' produces an obnoxious smell due to compound 'C' formation. The reaction of 'A' with benzene sulphonyl chloride gives compound 'D', which is soluble in alkali. With $NaNO_2$ and HCl, 'A' forms compound 'E', which reacts with phenol in an alkaline medium to give 'F' orange dye. Identify compounds 'A' to 'F'.

CONVERSIONS

(Practice all NCERT conversions apart from the mentioned below)

Do the following conversions-

- | | |
|--|--|
| 1. Prop-1-ene to 1-fluoropropane | 19. Propanone to propene |
| 2. Chlorobenzene to 2-chlorotoluene | 20. Propanoic acid to propenoic acid |
| 3. Ethanol to propane nitrile | 21. Benzoyl chloride to benzonitrile |
| 4. Phenol to picric acid | 22. Acetophenone to 2-phenyl-2-butanol |
| 5. 2-methylpropanol to 2-methylpropene | 23. Propene to acetone |
| 6. Propene to 1-propanol | 24. Ethyl cyanide to ethanoic acid |
| 7. Phenol to salicylic acid | 25. Ethanal to butan-2-one |
| 8. Propan-2-ol to 2-methylpropan-2-ol | 26. Ethanal to butan-1-ol |
| 9. Phenol to anisole | 27. Ethanal to butanoic acid |
| 10. Aniline to phenol | 28. Nitrobenzene to m-nitroaniline |
| 11. Ethanol to 2-propanol | 29. Benzoic acid to aniline |
| 12. Phenol to acetophenone | 30. Aniline to chlorobenzene |
| 13. Anisole to 2-methoxy toluene | 31. Ethanamine to ethanoic acid |
| 14. Ethyl chloride to methoxy ethane | 32. Aniline to benzonitrile |
| 15. Propanal to butanone | 33. Toluene to 2-bromo-4-methylaniline |
| 16. Ethanol to 3-hydroxy butanal | 34. Nitrobenzene to acetanilide |
| 17. Propanoyl chloride to dipropylamine | 35. 3-Nitrobromobenzene to 3-nitrobenzoic acid |
| 18. Benzoic acid to m-nitro benzyl alcohol | |

DISTINGUISHING TESTS

How will you distinguish the following compounds-

- | | |
|-------------------------------------|-------------------------------------|
| 1. Ethyl bromide & Bromobenzene | 8. Propanal and Propanone |
| 2. Chlorobenzene & n-hexyl chloride | 9. Acetophenone and Benzophenone |
| 3. Methanol and Ethanol | 10. Phenol and Benzoic acid |
| 4. Propanol and Propan-2-ol | 11. Benzoic acid and Ethyl benzoate |
| 5. Phenol and Cyclohexanol | 12. Pentan-2-one and Pentan-3-one |
| 6. 1^0 , 2^0 , & 3^0 Alcohols | 13. Benzaldehyde and Acetophenone |
| 7. Phenol and Benzoic acid | 14. Ethanal and Propanal |

- 15. Acetone and Acetaldehyde
- 16. Acetaldehyde and Benzaldehyde
- 17. Ethanoic acid and Ethanoyl chloride
- 18. Formic acid and Acetic acid

- 19. Methylamine and dimethylamine
- 20. Ethylamine and aniline
- 21. Aniline and benzylamine
- 22. Aniline and N-methylaniline

CASE BASED QUESTIONS

1. The order of reactivity towards S_N1 reaction depends upon the stability of carbocation in the first step. Greater the stability of the carbocation, greater will be its ease of formation from alkyl halide and hence faster will be the rate of the reaction. As we, know, 3° carbocation is most stable, therefore, the tert-alkyl halides will undergo S_N1 reaction very fast. For example, it has been observed that the reaction $(CH_3)_3CBr$ with OH^- ion to give 2-methyl-2-propanol is about 1 million times as fast as the corresponding reaction of the methyl bromide to give methanol.
- The primary alkyl halides always react predominantly by S_N2 mechanism. On the other hand, the tertiary alkyl halides react predominantly by S_N1 mechanism. Secondary alkyl halides may react by either mechanism or by both the mechanisms without much preference depending upon the nature of the nucleophile and solvent.

Assertion -Reason Type: A statement of assertion is followed by a statement of reason.

Mark the correct choice from the options given below:

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Assertion is false but reason is true.

- (i) Assertion : Low concentration of nucleophile favours S_N1 .
Reason : 2° alkyl halides are less reactive than 1° towards S_N1 reactions.
- (ii) Assertion : Polar solvent slows down S_N2 reactions.
Reason : CH_3Br is less reactive than CH_3Cl .
- (iii) Assertion : Benzyl bromide when kept in acetone-water it produces benzyl alcohol.
Reason : The reaction follows S_N2 mechanism.
- (iv) Assertion : Rate of hydrolysis of methyl chloride to methanol is higher in DMF than in water.
Reason: Hydrolysis of methyl chloride follows second order kinetics.
- (v) Assertion : S_N1 reaction is carried out in the presence of a polar protic solvent.
Reason : A polar protic solvent increases the stability of carbocation due to solvation.

2. An organic compound A having molecular formula C_6H_6O turn blue litmus solution into red but does not react with sodium bicarbonate, but when treated with bromine water then form a white ppt of compound B. when compound A react with chloroform in presence of aqueous caustic soda solution at $340K$ then form two compound C and D. When compound A treated with caustic soda then form compound E compound. E when treated with methyl halide then form compound F.

Answer the following questions :

- (i) The IUPAC name of compound B is:
(a) 2-methyl propene-2-ol (c) 2,4,6-tribromophenol
(b) 2-methyl phenol (d) Butane 1-ol
- (ii) Which are isomers of each other
(a) A and C (b) B and C (c) C and D (d) D and E
- (iii) The IUPAC name of compound F is
(a) Anisole (b) Methoxybenzene (c) Salicylaldehyde (d) 2-methyl propene-2-ol
- (iv) When compound E is treated with ethyl iodide then _____ is formed.
(a) Ethoxybenzene (b) Ethoxyhexane (c) Propoxypropane (d) Benzaldehyde
- (v) On oxidation with potassium dichromate and conc H_2SO_4 , phenol gives
(a) Benzaldehyde (b) p-Benzoquinone (c) o-Benzoquinone (d) m-benzoquinone

3. Carbonyl compounds undergo a number of reactions. They give nucleophilic substituted product. The aldehydes and ketones are distinguished on the basis of certain set of reactions which are given by aldehydes only and not by ketones.

An organic compound (A) with molecular formula $\text{C}_8\text{H}_8\text{O}$ forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent, nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula $\text{C}_7\text{H}_6\text{O}_2$.

Answer the following questions :

- (i) The compound A is –
(a) Acetophenone (b) Benzophenone (c) 2-Phenyl ethanol (d) None of these
- (ii) Reaction with Iodine in the presence of NaOH is given by-
(a) Propyl ketones (b) Ethyl ketones (c) Methyl ketones (d) All aldehydes
- (iii) Fehlings' solution test is used to distinguish between-
(a) Aliphatic and aromatic ketones
(b) Primary and secondary alcohols
(c) Primary and secondary amines
(d) Aliphatic and aromatic aldehydes
- (iv) In the Tollen's test we get –
(a) Red precipitate (c) Brown precipitate
(b) Silver mirror (d) A base
- (v) The carboxylic acid so formed in these set of reactions is
(a) Benzoic acid (c) Phenyl ethanoate
(b) Phenyl ethanoic acid (d) Heptanoic acid

4. Amines are alkyl or aryl derivatives of ammonia formed by replacement of one or more hydrogen atoms. Alkyl derivatives are called aliphatic amines and aryl derivatives are known as aromatic amines. The presence of aromatic amines can be identified by performing dye test. Aniline is the simplest example of aromatic amine. It undergoes electrophilic substitution reactions in which $-\text{NH}_2$ group strongly activates the aromatic ring through delocalisation of lone pair of electrons of N-atom. Aniline

undergoes electrophilic substitution reactions. Ortho and para positions to the $-\text{NH}_2$ group become centres of high electrons density. Thus, $-\text{NH}_2$ group is ortho and para-directing and powerful activating group.

Answer the following questions :

- (i) Cyclohexylamine and aniline can be distinguished by
 - (a) Hinsberg's test (b) carbylamine test (c) Lassaigne test (d) azo dye test
- (ii) Which of the following compounds gives-dye test?
 - (a) Aniline (b) Methyl amine (c) Diphenyl amine (d) Ethyl amine
- (iii) Which of the following statements concerning methylamine is correct?
 - (a) Methylamine is stronger base than NH_3
 - (b) Methylamine is less basic than NH_3
 - (c) Methylamine is slightly acidic
 - (d) Methylamine forms salts with alkali
- (iv) $\text{C}_3\text{H}_8\text{N}$ cannot represent-
 - (a) Primary amine (b) Secondary amine (c) Tertiary amine (d) Quaternary ammonium salt

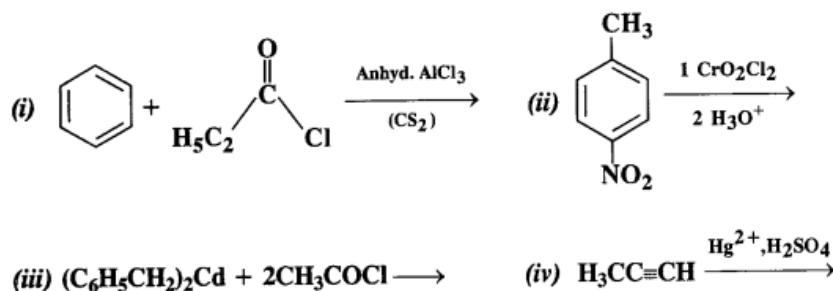
NAME REACTIONS

Write a short note on the following name reactions-

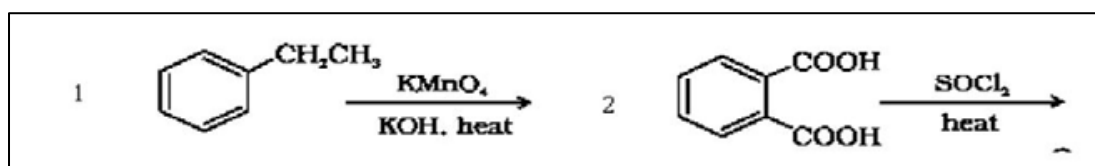
1. Finkelstein reaction
2. Swarts reaction
3. Kolbe's reaction
4. Reamer-Tiemann reaction
5. Williamson ether synthesis
6. Stephan reaction
7. Rosenmund reduction
8. Etard reaction
9. Gattermann Koch reaction
10. Aldol condensation
11. Cannizzaro's reaction
12. Haloform reaction
13. Hell-Volhard Zelinsky reaction
14. Sandmeyer reaction
15. Carbylamine reaction
16. Gabriel phthalimide synthesis
17. Hoffmann bromamide degradation reaction

COMPLETE THE ORGANIC REACTIONS

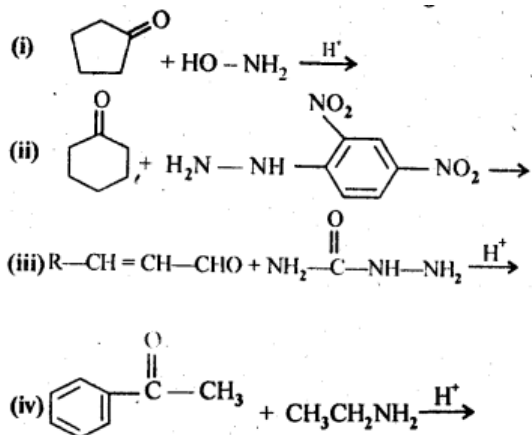
Ques 1. Complete the following reactions-



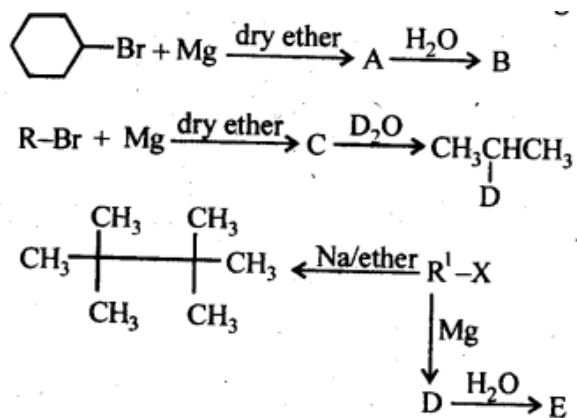
Ques 2. Complete the following reactions-



Ques 3. Complete the following reactions-



Ques 4. Complete the following reactions and identify A, B, C, R', D and E



Ques 5. Complete the following reactions-

