CHEMISTRY

BOOKS - KALYANI CHEMISTRY (ENGLISH)

PROLEMS BASED ON CHEMICAL STRUCTURES AND REACTIONS

Questions

1. Name the gas evolved when $KClO_3$ undergoes thermal decomposition

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2. Name the gas evolved when: Ammonium carbonate undergoes thermal decomposition

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3. Name the gas evolved when: Calcium nitrate undergoes thermal decomposition

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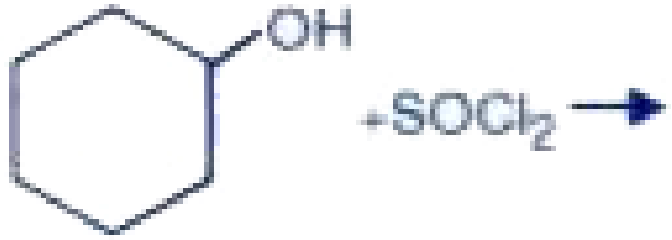
4. Draw the structures of major monohalo products in each of the following reactions



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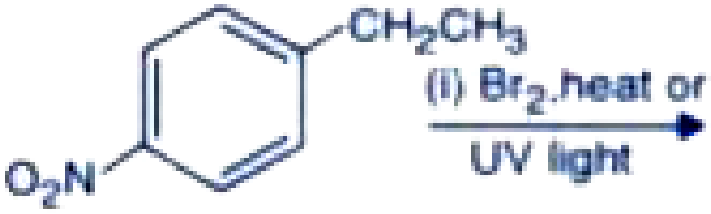

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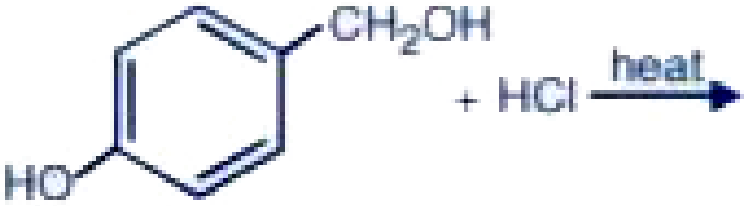

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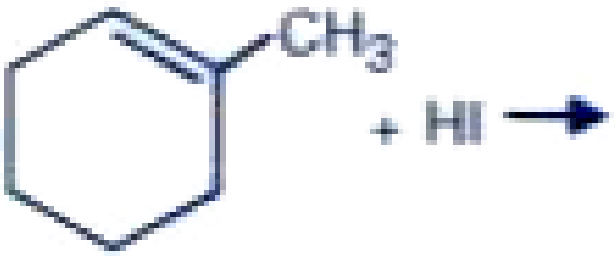

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8. Draw the structures of major monohalo products in each of the following reactions

$CH_3CH_2Br + NaI \rightarrow$

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9. Draw the structures of major monohalo products in each of the following reactions

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10. Primary alkyl halide C_4H_9Br :

(a) reacted with alcoholic KOH to give compound

(b) is reacted with HBr to give : (c) which is an

isomer of (a). When (a) is reacted with Na metal, it gives a compound (d), C_8H_{18} hich is different from the compound formed when n-butyl bromide is reacted with Na metal. Give the structural formula of (a) and write the equations for all the reactions.

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11. An alkyl halide $(X)$of the folmula $C_6H_{13}Cl$ on treatment with potassium tertiary butoxide gives two isomeric alkenes (Y) and $(Z)(C_6H_{12})$. Both the alkenes on hydrogenation give $2,3-$

dimethyl butane. Perdict the structures of $(X), (Y)$, and (Z)

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12. What would be the major products in the following reactions:

$$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_2Br \xrightarrow[\Delta]{C_2H_5OH}$$

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13. What happens when: Sulfuric acid reacts with phosphorus pentachloride.

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14. Dehydrobromination of compounds (A) and (B) yield the same alkene (C). Alkene (C) can regenerate (A) and (B) by the addition of HBr in the presence and absence of peroxide respectively. Hydrolysis of (A) and (B) give isomeric products (D) and (E) respectively. 1, 1-Diphenylethane is obtained on reaction of (C) with

benzene in presence of H+. Give structures of (A) to (E) with reasons.

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15. An alkyl halide with molecular formula $C_6H_{13}Cl$ when treated with alcoholic KOH gave two isomeric alkenes, A and B. Reductive ozonolysis of the mixture gave the following compounds:

(i) CH_3COCH_3 (ii) CH_3CHO

(iii) CH_3CH_2CHO and $(CH_3)_2CHCHO$.

Write the structural formula of alkyl halide.

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16. (i) How many monochloro products would you expect when 2-methylbutane is chlorinated? Write their structures and IUPAC names. One of them may have stereoisomer. Indicate it.

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17. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of the

compound 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

Write down the structural formula of both compounds 'A' and 'B'.

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18. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the the concentration of

the compounds 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

(i) Write down the structural formula of both compounds 'A' and 'B'.

(ii) Out of these two compounds, which one will be converted to the product with inverted configuration.

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19. Write the structures and names of the compounds formed when compound 'A' with molecular formula C_7H_8 is treated with Cl_2 in the presence of $FeCl_3$

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20. A hydrocarbon of molecular mass 72 g mol^{-1} gives a single monochloro derivative and two dichloro derivatives on photo chlorination. Give the structure of the hydrocarbon.

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21. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen. Write down the formula of three possible isomers of the compound which are similar and react with sodium.

22. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

What will be the product formed if it reacts with an organic acid ?

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23. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

Write an equation for the reaction between any of the isomers and acetic acid.

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24. An organic compound has the formula C4H100. It reacts with metallic sodium liberating hydrogen. Indicate by an equation, the product formed when any one of the isomers is oxidised.

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25. 0.36 g of a bromoderivative of a hydrocarbon (A) when vaporized occupied 65.2 mL at NTP. (A) on reaction with aqueous NaOH gave (B). (B) when passed over alumina at $250^{\circ}C$, gives a neutral compound (C) while at $350^{\circ}C$, it gives a

hydrocarbon (D). (D) when treated with HBr gave an isomer of(A). When (D) is treated with conc. H_2SO_4 and the product is diluted with water and distilled, (E) is obtained. Identify from (A) to (E) and explain the reactions involved.

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26. 0.037 g of an alcohol, ROH was added to CH_3MgI and the gas evolved measured $11.2cm^3$ at S.T.P. What is the molecular weight of ROH? On dehydration, ROH gives an alkene which on ozonolysis gives acetone as one of the products.

ROH on oxidation easily gives an acid containing the same number of carbon atoms. Give structures of ROH and the acid with proper reasoning.

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27. Write the structures of all isomeric alcohols of molecular formula $C_4H_{10}O$.

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28. Anorganic compound A (molecular formula $C_4H_{10}O$) reacts vigorously with acetyl chloride and responds to iodoform test. When passed over hot alumina, A is converted to another compound B (C_4H_8) which on ozonolysis gives only one aldehyde. Identify A and B with reasons.

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29. Two isomers A and B having molecular formula C_3H_8O when passed separately over heated alumina produce compound C with molecular

formula C_3H_6. C on ozonolysis produces D and E. Between them, D undergoes iodoform reaction but not E. Identify A, B, C, D and E. Write the equations of the reactions concerned.

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30. (i) An organic compound (P), $C_5H_{10}O$ reacts with dil. H_2SO_4 to give (Q) and (R). Both (Q) and (R) give positive iodoform test. The reactivity of organic compound (P) is 10^{15} times more than ethylene with respect to dil. H_2SO_4

(i) Identify the compounds (P), (Q) and (R).

(ii) Give reason for the extraordinary reactivity of compound (P).

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31. Anorganic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.

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32. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.

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33. An organic compound contains 69.77% carbon. 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce

Tollens' reagent but forms an addition compound with sodium hydrogensulfite and gives positive iodoform test. On vigorous oxidation, it gives ethanoic acid and propanoic acid. Write the structure of the compound.

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34. Compound 'A' was prepared by oxidation of oxidation of compound 'B' with alkaline $KMnO_4$ Compound 'A' on reduction with lithium aluminium hydride gets converted B in the presence of H_2SO_4 it produces fruity smell of

compound C to which family the compounds 'A', 'B' and 'C' belong to ?

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

ozonolysis and formation of iodoform from B and C.

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36. An aromatic compound 'A' (molecular formula C_8H_8O) gives positive 2, 4-DNP test. It gives a yellow precipitate of compound 'B' on treatment with iodine and sodium hydroxide solution. Compound 'A' does not give Tollen's or Fehling's test. On drastic oxidation with potassium permaganate it forms a carboxylic acid 'C' (molecular formula $C_7H_6O_2$), which is also

formed alongwith the yellow compound in the above reaction. Identify A, B and C and write all the reactions involved.

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37. When liquid 'A' is treated with a freshly prepared ammoniacal silver nitrate solution it gives bright silver mirror. The liquid forms a white crystalline solid on treatment with sodium hydrogen sulphate. Liquid 'B' also forms a white crystalline solid with sodium hydrogen sulphate. but it does not give test with ammoniacal silver

nitrate. Which of the two liquids is aldehyde? Write the chemical equations of these reactions also.

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38. An organic compound 'A'on treatment with ammoniacal silver nitrate gives metallic silver and produces a yellow crystalline precipitate of molecular formula $C_9H_{10}N_4O_4$, on treatment with Brady's reagent. Give the structure of the organic compound 'A'.

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39. 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:

40. An organic compound liberates CO_2 on reaction with sodium bicarbonate. When its sodium salt is heated with soda-lime, the first member of alkane series is produced. When its calcium salt is dry distilled, the first member of ketone series is produced. Identify the compound and write down the reactions. How can you

convert its sodium salt into an alcohol in one step?

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41. $CH_3 - \overset{\overset{O}{||}}{C} - OH \xrightarrow{2RLi} A, A \xrightarrow{H_3O^+} B$

Identify A and B.

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42. Anorganic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens'

reagent and undergoes Cannizzaro's reaction. On vigorous oxidation it gives a dicarboxylic acid which is used in the preparation of terylene. Identify the organic compound.

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43. Compound A ($C_6H_{12}O_2$) on reduction with $LiAlH_4$, yielded two compounds B and C. The compound B on oxidation gave D which upon treatment with aqueous alkali and subsequent heating furnished E. The latter on catalytic hydrogenation gave C. The compound D was

oxidised further to give F which was found to be a monobasic acid (molecular) formula weight = 60. Deduce the structures of A, B, C, D and E.

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44. 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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45. Anorganic compound (A) having molecular formula $C_9H_{10}O$ forms an orange red precipitate (B) with 2,4-DNP reagent. Compound (A) gives a yellow precipitate (C) When heated in the presence of iodine and NaOH alongwith a colourless compound (D). (A) does not reduce Tollens' reagent or Fehling solution nor does it

decolourise bromine water. On drastic oxidation of (A) with chromic acid, a carboxylic acid (E) of molecular formula $C_7H_6O_2$ is formed. Deduce the structures of the organic compounds (A) to (E).

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46. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula C_6H_7N. Write the structures and IUPAC names of compounds A,B and C.

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47. A solution contains 1g mol. Each of p-toluene diazonium chloride and p-nitrophenyl diazonium cholride. To this 1g mol.of alkaline solution of phenol is added. Predict the major product. Explain your answer.

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48. A hydrocarbon 'A' (C_4H_8) on reaction HCl gives a compound 'B', (C_4H_9Cl) which on

reaction with 1 mol of NH_3 gives compounds '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' given 2mols of acetyldehyde. Identify compound 'A' to 'D'. Explain the reaction involved.

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49. A colours substance 'A' (C_6H_7N) is sparingly soluble in water and gives a water soluble compound 'B' on treating with mineral acid. On reaction wih $CHCl_3$ and alcoholic potash 'A'

produces an obnoxious smell due to the formation of compound 'C'. Reaction of 'A' with benzensulphonyl chloride gives compound 'D' which is soluble in alkali. WIth $NaNO_2$ and HCl, 'A' forms compound 'E' which reacts with phenol in alkaline medium to give an orange dye 'F'. Identify compounds 'A' to'F'.

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50. Predict the reagent or the product in the following reaction sequence.

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51. An organic compound (A) contains C = 32%, H=6.66% and N = 18.67%. On reduction, it gives primary amine, (B) which gives ethyl alcohol with nitrous acid. (B) gives an offensive odour on warming with CHCI, and KOH and gives compound (C) which on reduction forms ethyl methylamine. Assign structures to A, B and C and explain the reaction.

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52. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields

(i) A single monochloride.

(ii) Three isomeric monochlorides.

(iii) Four isomeric monochlorides.

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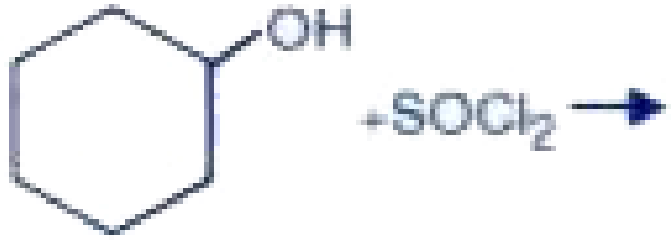

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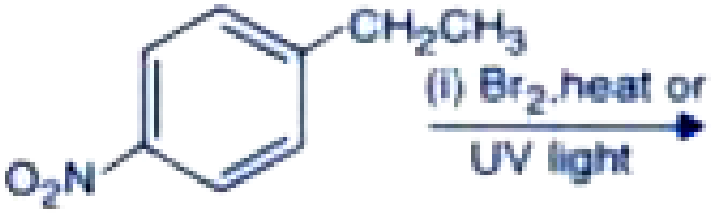

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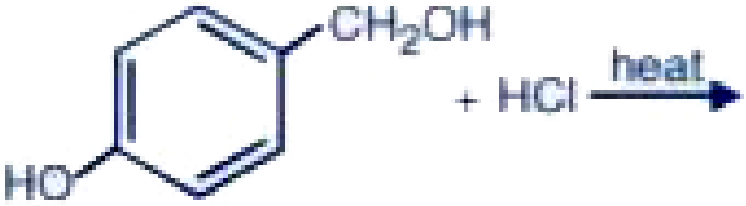

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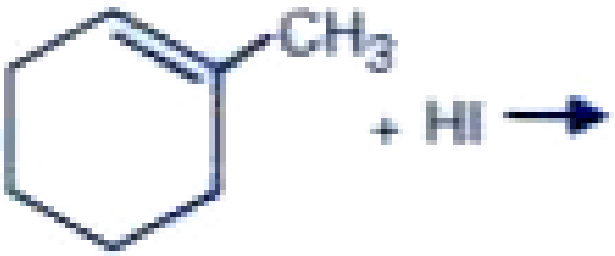

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$CH_3CH_2Br + NaI \rightarrow$

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61. Primary alkyl halide C_4H_9Br :

(a) reacted with alcoholic KOH to give compound

(b) is reacted with HBr to give : (c) which is an

isomer of (a). When (a) is reacted with Na metal, it gives a compound (d), C_8H_{18} hich is different from the compound formed when n-butyl bromide is reacted with Na metal. Give the structural formula of (a) and write the equations for all the reactions.

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62. An alkyl halide $(X)$of the folmula $C_6H_{13}Cl$ on treatment with potassium tertiary butoxide gives two isomeric alkenes (Y) and $(Z)(C_6H_{12})$. Both the alkenes on hydrogenation give $2,3-$

dimethyl butane. Perdict the structures of $(X), (Y)$, and (Z)

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63. What would be the major products in the following reactions:

$$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_2Br \xrightarrow[\Delta]{C_2H_5OH}$$

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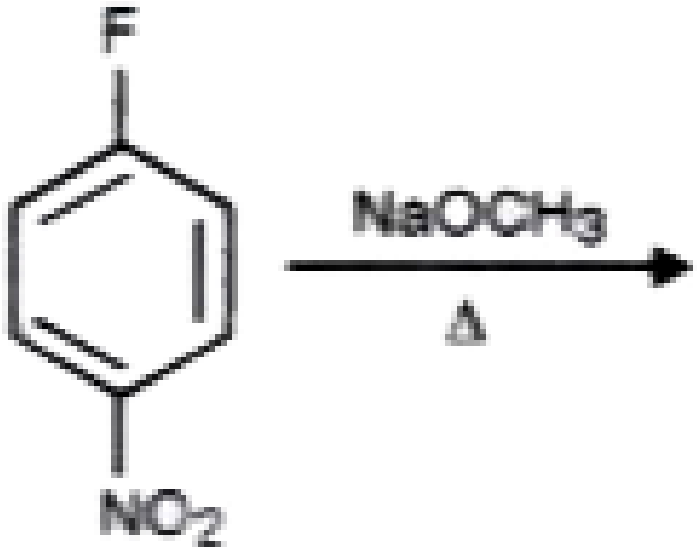

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65. Dehydrobromination of compounds (A) and (B) yield the same alkene (C). Alkene (C) can

regenerate (A) and (B) by the addition of HBr in the presence and absence of peroxide respectively. Hydrolysis of (A) and (B) give isomeric products (D) and (E) respectively. 1, 1-Diphenylethane is obtained on reaction of (C) with benzene in presence of H+. Give structures of (A) to (E) with reasons.

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66. An alkyl halide with molecular formula $C_6H_{13}Cl$ when treated with alcoholic KOH gave two isomeric alkenes, A and B. Reductive

ozonolysis of the mixture gave the following compounds:

(i) CH_3COCH_3 (ii) CH_3CHO

(iii) CH_3CH_2CHO and $(CH_3)_2CHCHO$.

Write the structural formula of alkyl halide.

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67. (i) How many monochloro products would you expect when 2-methylbutane is chlorinated? Write their structures and IUPAC names. One of them may have stereoisomer. Indicate it.

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68. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of the compound 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

Write down the structural formula of both compounds 'A' and 'B'.

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69. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of the compound 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

Write down the structural formula of both compounds 'A' and 'B'.

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70. Write the structures and names of the compounds formed when compound 'A' with molecular formula C_7H_8 is treated with Cl_2 in the presence of $FeCl_3$

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71. A hydrocarbon of molecular mass 72 g mol^{-1} gives a single monochloro derivative and two dichloro derivatives on photo chlorination. Give the structure of the hydrocarbon.

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72. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

Write down the formula of three possible isomers of the compound which are similar and react with sodium.

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73. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

What will be the product formed if it reacts with an organic acid ?

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74. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

Write an equation for the reaction between any of the isomers and acetic acid.

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75. An organic compound has the formula C4H100. It reacts with metallic sodium liberating hydrogen. Indicate by an equation, the product formed when any one of the isomers is oxidised.

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76. 0.36 g of a bromoderivative of a hydrocarbon (A) when vaporized occupied 65.2 mL at NTP. (A) on reaction with aqueous NaOH gave (B). (B) when passed over alumina at $250^{\circ}C$, gives a neutral compound (C) while at $350^{\circ}C$, it gives a

hydrocarbon (D). (D) when treated with HBr gave an isomer of(A). When (D) is treated with conc. H_2SO_4 and the product is diluted with water and distilled, (E) is obtained. Identify from (A) to (E) and explain the reactions involved.

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77. 0.037 g of an alcohol, ROH was added to CH_3MgI and the gas evolved measured $11.2cm^3$ at S.T.P. What is the molecular weight of ROH? On dehydration, ROH gives an alkene which on ozonolysis gives acetone as one of the products.

ROH on oxidation easily gives an acid containing the same number of carbon atoms. Give structures of ROH and the acid with proper reasoning.

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78. Write the structures of all isomeric alcohols of molecular formula $C_4H_{10}O$. How many pi-diastereoisomers are possible in each case after dehydration ?

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79. Anorganic compound A (molecular formula $C_4H_{10}O$) reacts vigorously with acetyl chloride and responds to iodoform test. When passed over hot alumina, A is converted to another compound B (C_4H_8) which on ozonolysis gives only one aldehyde. Identify A and B with reasons.

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80. Two isomers A and B having molecular formula C_3H_8O when passed separately over heated alumina produce compound C with molecular

formula C_3H_6. C on ozonolysis produces D and E. Between them, D undergoes iodoform reaction but not E. Identify A, B, C, D and E. Write the equations of the reactions concerned.

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81. (i) An organic compound (P), $C_5H_{10}O$ reacts with dil. H_2SO_4 to give (Q) and (R). Both (Q) and (R) give positive iodoform test. The reactivity of organic compound (P) is 10^{15} times more than ethylene with respect to dil. H_2SO_4

(i) Identify the compounds (P), (Q) and (R).

(ii) Give reason for the extraordinary reactivity of compound (P).

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82. Anorganic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.

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83. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.

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84. (a) Give chemical tests to distinguish between compounds in the following pairs of substances ,

(i) Ethanal and Propanal

(ii) Benzoic acid and Ethyl benzoate

(b) An organic compound contains 69.77% carbon , 11.63% hydrogen and rest oxygen . The molecular mass of the compound is 86. It does not reduce Tollen 's reagent but forms an addition compound with sodium hydrogen sulphite and gives positive iodoform test. On vigorous oxidation, it gives ethanoic and propanoic acids . Derive the structure of the compound.

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

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86. An alkene 'A' (molecular formula C_5H_{10}) on ozonolysis gives a mixture of two compounds 'B'

and 'C'. Compound 'B' gives positive Fehling's test and also forms iodoform on treatement with I_2 and $NaOH$. Compound 'C' does not give Fehling's test but forms iodoform. Identify the compounds A, B and C. Write the reaction for ozonolysis and formation of iodoform from B and C.

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87. An aromatic compound 'A' (molecular formula C_8H_8O) gives positive 2, 4-DNP test. It gives a yellow precipitate of compound 'B' on treatment

with iodine and sodium hydroxide solution. Compound 'A' does not give Tollen's or Fehling's test. On drastic oxidation with potassium permaganate it forms a carboxylic acid 'C' (molecular formula $C_7H_6O_2$), which is also formed alongwith the yellow compound in the above reaction. Identify A, B and C and write all the reactions involved.

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88. When liquid 'A' is treated with a freshly prepared ammoniacal silver nitrate solution it

gives bright silver mirror. The liquid forms a white crystalline solid on treatment with sodium hydrogen sulphate. Liquid 'B' also forms a white crystalline solid with sodium hydrogen sulphate. but it does not give test with ammoniacal silver nitrate. Which of the two liquids is aldehyde? Write the chemical equations of these reactions also.

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89. An organic compound 'A'on treatment with ammoniacal silver nitrate gives metallic silver and

produces a yellow crystalline precipitate of molecular formula $C_9H_{10}N_4O_4$, on treatment with Brady's reagent. Give the structure of the organic compound 'A'.

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90. 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:

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91. An organic compound liberates CO_2 on reaction with sodium bicarbonate. When its

sodium salt is heated with soda-lime, the first member of alkane series is produced. When its calcium salt is dry distilled, the first member of ketone series is produced. Identify the compound and write down the reactions. How can you convert its sodium salt into an alcohol in one step?

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92. $CH_3 - \overset{\overset{O}{||}}{C} - OH \xrightarrow{2RLi} A, A \xrightarrow{H_3O^+} B$

Identify A and B.

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93. Anorganic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro's reaction. On vigorous oxidation it gives a dicarboxylic acid which is used in the preparation of terylene. Identify the organic compound.

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94. Compound A ($C_6H_{12}O_2$) on reduction with $LiAlH_4$, yielded two compounds B and C. The

compound B on oxidation gave D which upon treatment with aqueous alkali and subsequent heating furnished E. The latter on catalytic hydrogenation gave C. The compound D was oxidised further to give F which was found to be a monobasic acid (molecular) formula weight = 60. Deduce the structures of A, B, C, D and E.

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95. 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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96. Anorganic compound (A) having molecular formula $C_9H_{10}O$ forms an orange red precipitate (B) with 2,4-DNP reagent. Compound (A) gives a

yellow precipitate (C) When heated in the presence of iodine and NaOH alongwith a colourless compound (D). (A) does not reduce Tollens' reagent or Fehling solution nor does it decolourise bromine water. On drastic oxidation of (A) with chromic acid, a carboxylic acid (E) of molecular formula $C_7H_6O_2$ is formed. Deduce the structures of the organic compounds (A) to (E).

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97. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound

'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula C_6H_7N. Write the structures and IUPAC names of compounds A,B and C.

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98. A solution contains 1g mol. Each of p-toluene diazonium chloride and p-nitrophenyl diazonium cholride. To this 1g mol.of alkaline solution of phenol is added. Predict the major product. Explain your answer.

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99. A hydrocarbon 'A' (C_4H_8) on reaction HCl gives a compound 'B', (C_4H_9Cl) which on reaction with 1 mol of NH_3 gives compounds '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' given 2mols of acetyldehyde. Identify compound 'A' to 'D'. Explain the reaction involved.

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100. A colours substance 'A' (C_6H_7N) is sparingly soluble in water and gives a water soluble compound 'B' on treating with mineral acid. On reaction wih $CHCl_3$ and alcoholic potash 'A' produces an obnoxious smell due to the formation of compound 'C'. Reaction of 'A' with benzensulphonyl chloride gives compound 'D' which is soluble in alkali. WIth $NaNO_2$ and HCl, 'A' forms compound 'E' which reacts with phenol in alkaline medium to give an orange dye 'F'. Identify compounds 'A' to'F'.

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101. Predict the reagent or the product in the following reaction sequence.

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102. An organic compound (A) contains C = 32%, H=6.66% and N = 18.67%. On reduction, it gives primary amine, (B) which gives ethyl alcohol with nitrous acid. (B) gives an offensive odour on warming with CHCI, and KOH and gives compound (C) which on reduction forms ethyl methylamine.

Assign structures to A, B and C and explain the reaction.

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103. A mixture of two aromatic compounds (A) and (B) was separated by dissolving in chloroform followed by extraction with aqueous KOH solution. The organic layer containing compound (A) when heated with alcoholic solution of KOH produced a compound $C, (C_7H_5N)$ associated with an unpleasant odour. The alkaline aqueous layer, on the other hand, when heated with chloroform and

then acidified gave a mixture of two isomeric compounds (D) and (E) of molecular formula $C_7H_6O_2$. Identify the compounds A, B, C, D and E and write their structures.

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104. A basic volatile compound gave a foul smelling gas when treated with chloroform and alcoholic potash. A 0.295g sample of the substance dissolved in aq. HCl and treated with Na NO_2 solution at $0^\circ C$, liberated a colourless, odourless gas whose volume corresponded to 112

mL at S.T.P. After the evolution of gas was complete, the aqueous solution gave an organic liquid which did not contain nitrogen and which on warming with alkali and iodine gave a yellow precipitate. Identify the original substance. Assume that it contains one N-atom per molecule.

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105. One mole of each of a bromo derivative (A) and NH_3, react to give one mole of an organic compound (B). (B) reacts with CH_3I to give (C). Both (B) and (C) react with HNO_2 to give

compounds (D) and (E) respectively. (D) on oxidation and subsequent decarboxylation gives 2-methoxy-2-methylpropane. Give structures of (A) to (E) with proper reasoning.

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106. Identify A, B and C in the following reactions.

$$C_6H_5COOH \xrightarrow{PCl_5} A \xrightarrow{NH_3} B \xrightarrow{P_2O_5} C_6H_5CN \xrightarrow{H_2, Ni} C$$

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107. Identify A, B and C in the following reactions.

$$C_6H_5NH_2 \xrightarrow{NaNO_2, HCl} A \xrightarrow[\text{pyridine}]{CuCN} B \xrightarrow{Sn/HCl} C$$

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108. Identify A, B and C in the following reactions.

$$C_6H_5NH_2 \xrightarrow{Br_2, H_2O} A \xrightarrow[HCl]{NaNO_2} B \xrightarrow{H_3PO_2} C$$

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109. Identify A, B and C in the following reactions.

$$CH_3CH(CH_3)CONH_2 \xrightarrow{Br_2, NaOH} A \xrightarrow[Br_2]{HONO} B \xrightarrow{O} C$$

View Text Solution

110. Identify A, B and C in the following reactions.

$$C_6H_5COOH \xrightarrow{PCl_5} A \xrightarrow{NH_3} B \xrightarrow{P_2O_5} C_6H_5CN \xrightarrow{H_2, Ni} C$$

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111. Give the structure of 'A' in the following reaction.

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112. A compound Z with molecular formula C_3H_9N reacts with $C_6H_5SO_2Cl$ to give a solid, insoluble in alkali. Identify Z.

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113. (a) How will you convert:

(i) Aniline into Fluorobenzene.

(ii) Benzamide into Benzylamine.

(iii) Ethanamine to N,N-Diethylethanamine.

(b) Write the structures of A and B in the following:

(i) $CH_3CH_2CN \xrightarrow[\text{Partial hydrolysis}]{OH^-} A \xrightarrow{NaOH + Br_2} B$

(ii) $CH_3CH_2Br \xrightarrow[(ii)\ LiAlH_4]{(i)\ KCN} A \xrightarrow[O^0C]{NHO_2} B$

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114. Give the structures of A, B and C in the following reactions:

$C_6H_5N_2Cl \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B \xrightarrow[\Delta]{NH_3} C$

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115. Give the structures of A, B and C in the following reactions:

$$CH_3CH_2Br \xrightarrow{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow[0^\circ C]{HNO_2} C$$

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116. Give the structures of A, B and C in the following reactions:

$$C_6H_5NO_2 \xrightarrow{Fe\,/\,HCl} A \xrightarrow[273K]{NaNO_2+HCl} B \xrightarrow{H_2O\,/\,H^+} C$$

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117. Give the structures of A, B and C in the following reactions:

$$CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{NaOBr} B \xrightarrow{NaNO_2\,/\,HCl} C$$

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118. Give the structures of A, B and C in the following reactions:

$$C_6H_5NO_2 \xrightarrow{Fe\,/\,HCl} A \xrightarrow[273K]{HNO_2} B \xrightarrow{C_6H_5OH} C.$$

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119. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields

(i) A single monochloride.

(ii) Three isomeric monochlorides.

(iii) Four isomeric monochlorides.

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120. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields

(i) A single monochloride.

(ii) Three isomeric monochlorides.

(iii) Four isomeric monochlorides.

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121. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one that on photochemical chlorination yields

(i) A single monochloride.

(ii) Three isomeric monochlorides.

(iii) Four isomeric monochlorides.

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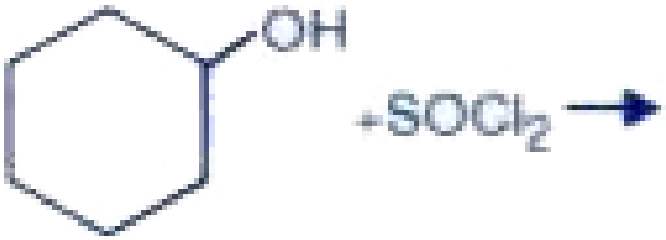
122. Draw the structures of major monohalo products in each of the following reactions



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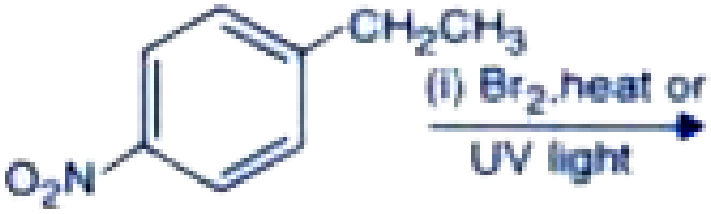
123. Draw the structures of major monohalo products in each of the following reactions



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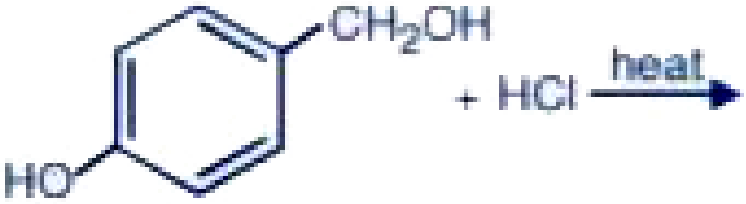
124. Draw the structures of major monohalo products in each of the following reactions



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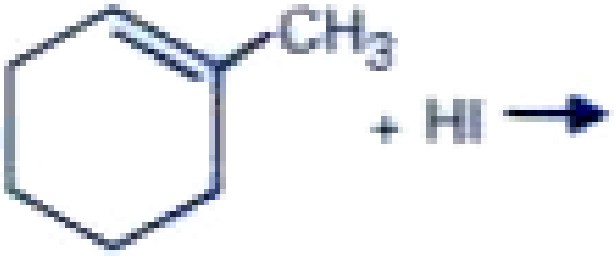
125. Draw the structures of major monohalo products in each of the following reactions



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126. Draw the structures of major monohalo products in each of the following reactions

$CH_3CH_2Br + NaI \rightarrow$

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127. Draw the structures of major monohalo products in each of the following reactions

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128. Primary alkyl halide C_4H_9Br :

(a) reacted with alcoholic KOH to give compound (b) is reacted with HBr to give : (c) which is an isomer of (a). When (a) is reacted with Na metal, it gives a compound (d), C_8H_{18} hich is different from the compound formed when n-butyl bromide is reacted with Na metal. Give the structural

formula of (a) and write the equations for all the reactions.

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129. An alkyl halide (X) of the folmula $C_6H_{13}Cl$ on treatment with potassium tertiary butoxide gives two isomeric alkenes (Y) and $(Z)(C_6H_{12})$. Both the alkenes on hydrogenation give $2,3-$ dimethyl butane. Perdict the structures of $(X),(Y)$, and (Z)

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130. What would be the major products in the following reactions:

$$CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_2Br \xrightarrow[\Delta]{C_2H_5OH}$$

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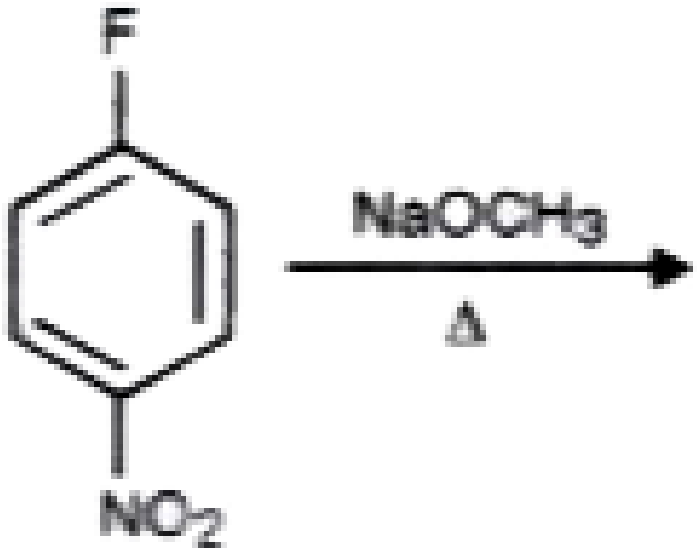
131. What would be the major products in the following reactions:



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132. Dehydrobromination of compounds (A) and (B) yield the same alkene (C). Alkene (C) can regenerate (A) and (B) by the addition of HBr in the presence and absence of peroxide respectively. Hydrolysis of (A) and (B) give isomeric

products (D) and (E) respectively. 1, 1-Diphenylethane is obtained on reaction of (C) with benzene in presence of H+. Give structures of (A) to (E) with reasons.

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133. An alkyl halide with molecular formula $C_6H_{13}Cl$ when treated with alcoholic KOH gave two isomeric alkenes, A and B. Reductive ozonolysis of the mixture gave the following compounds:

(i) CH_3COCH_3 (ii) CH_3CHO

(iii) CH_3CH_2CHO and $(CH_3)_2CHCHO$.

Write the structural formula of alkyl halide.

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134. (i) How many monochloro products would you expect when 2-methylbutane is chlorinated? Write their structures and IUPAC names. One of them may have stereoisomer. Indicate it.

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135. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the the concentration of the compounds 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

(i) Write down the structural formula of both compounds 'A' and 'B'.

(ii) Out of these two compounds, which one will be converted to the product with inverted configuration.

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136. Compound 'A' with molecular formula C_4H_9Br is treated with aq. KOH solution. The rate of this reaction depends upon the the concentration of the compounds 'A' only. When another optically active isomer 'B' of this compound was treated with aq. KOH solution, the rate of reaction was found to be dependent on concentration of compound and KOH both.

(i) Write down the structural formula of both compounds 'A' and 'B'.

(ii) Out of these two compounds, which one will

be converted to the product with inverted configuration.

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137. Write the structures and names of the compounds formed when compound 'A' with molecular formula C_7H_8 is treated with Cl_2 in the presence of $FeCl_3$

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138. A hydrocarbon of molecular mass 72 g mol^{-1} gives a single monochloro derivative and two dichloro derivatives on photo chlorination. Give the structure of the hydrocarbon.

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139. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

Write down the formula of three possible isomers

of the compound which are similar and react with sodium.

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140. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

What will be the product formed if it reacts with an organic acid ?

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141. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

Write an equation for the reaction between any of the isomers and acetic acid.

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142. An organic compound has the formula C4H10O. It reacts with metallic sodium liberating hydrogen.

Indicate by an equation, the product formed when any one of the isomers is oxidised.

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143. 0.36 g of a bromoderivative of a hydrocarbon (A) when vaporized occupied 65.2 mL at NTP. (A) on reaction with aqueous NaOH gave (B). (B) when passed over alumina at $250^{\circ}C$, gives a neutral compound (C) while at $350^{\circ}C$, it gives a hydrocarbon (D). (D) when treated with HBr gave an isomer of(A). When (D) is treated with conc. H_2SO_4 and the product is diluted with water and

distilled, (E) is obtained. Identify from (A) to (E) and explain the reactions involved.

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144. 0.037 g of an alcohol, ROH was added to CH_3MgI and the gas evolved measured $11.2cm^3$ at S.T.P. What is the molecular weight of ROH? On dehydration, ROH gives an alkene which on ozonolysis gives acetone as one of the products. ROH on oxidation easily gives an acid containing the same number of carbon atoms. Give

structures of ROH and the acid with proper reasoning.

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145. Write the structures of all isomeric alcohols of molecular formula $C_4H_{10}O$. How many pi-diastereoisomers are possible in each case after dehydration ?

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146. Anorganic compound A (molecular formula $C_4H_{10}O$) reacts vigorously with acetyl chloride and responds to iodoform test. When passed over hot alumina, A is converted to another compound B (C_4H_8) which on ozonolysis gives only one aldehyde. Identify A and B with reasons.

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147. Two isomers A and B having molecular formula C_3H_8O when passed separately over heated alumina produce compound C with

molecular formula C_3H_6. C on ozonolysis produces D and E. Between them, D undergoes iodoform reaction but not E. Identify A, B, C, D and E. Write the equations of the reactions concerned.

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148. (i) An organic compound (P), $C_5H_{10}O$ reacts with dil. H_2SO_4 to give (Q) and (R). Both (Q) and (R) give positive iodoform test. The reactivity of organic compound (P) is 10^{15} times more than ethylene with respect to dil. H_2SO_4

(i) Identify the compounds (P), (Q) and (R).

(ii) Give reason for the extraordinary reactivity of compound (P).

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149. Anorganic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.

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150. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.

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151. An organic compound contains 69.77% carbon. 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not

reduce Tollens' reagent but forms an addition compound with sodium hydrogensulfite and gives positive iodoform test. On vigorous oxidation, it gives ethanoic acid and propanoic acid. Write the structure of the compound.

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152. Compound 'A' was prepared by oxidation of oxidation of compound 'B' with alkaline $KMnO_4$ Compound 'A' on reduction with lithium aluminium hydride gets converted B in the presence of H_2SO_4 it produces fruity smell of

compound C to which family the compounds 'A', 'B' and 'C' belong to ?

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

ozonolysis and formation of iodoform from B and C.

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154. An aromatic compound 'A' (molecular formula C_8H_8O) gives positive 2, 4-DNP test. It gives a yellow precipitate of compound 'B' on treatment with iodine and sodium hydroxide solution. Compound 'A' does not give Tollen's or Fehling's test. On drastic oxidation with potassium permaganate it forms a carboxylic acid 'C' (molecular formula $C_7H_6O_2$), which is also

formed alongwith the yellow compound in the above reaction. Identify A, B and C and write all the reactions involved.

155. When liquid 'A' is treated with a freshly prepared ammoniacal silver nitrate solution it gives bright silver mirror. The liquid forms a white crystalline solid on treatment with sodium hydrogen sulphate. Liquid 'B' also forms a white crystalline solid with sodium hydrogen sulphate. but it does not give test with ammoniacal silver

nitrate. Which of the two liquids is aldehyde? Write the chemical equations of these reactions also.

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156. KO_2 on reaction with dilute sulfuric acid gives

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157. 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:

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158. PbO_2 on reaction with dilute sulfuric acid gives

Watch Video Solution

159. SnO_2 on reaction with dilute sulfuric acid gives

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160. Anorganic compound with molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens'

reagent and undergoes Cannizzaro's reaction. On vigorous oxidation it gives a dicarboxylic acid which is used in the preparation of terylene. Identify the organic compound.

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161. MnO_2 on reaction with dilute sulfuric acid gives

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162. 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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163. Anorganic compound (A) having molecular formula $C_9H_{10}O$ forms an orange red precipitate (B) with 2,4-DNP reagent. Compound (A) gives a yellow precipitate (C) When heated in the presence of iodine and NaOH alongwith a colourless compound (D). (A) does not reduce Tollens' reagent or Fehling solution nor does it decolourise bromine water. On drastic oxidation of (A) with chromic acid, a carboxylic acid (E) of molecular formula $C_7H_6O_2$ is formed. Deduce the structures of the organic compounds (A) to (E).

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164. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula C_6H_7N. Write the structures and IUPAC names of compounds A,B and C.

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165. A solution contains 1g mol. Each of p-toluene diazonium chloride and p-nitrophenyl diazonium cholride. To this 1g mol.of alkaline solution of

phenol is added. Predict the major product. Explain your answer.

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166. A hydrocarbon 'A' (C_4H_8) on reaction HCl gives a compound 'B', (C_4H_9Cl) which on reaction with 1 mol of NH_3 gives compounds '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' given 2mols of acetyldehyde. Identify compound 'A' to 'D'. Explain the reaction involved.

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167. A colours substance 'A' (C_6H_7N) is sparingly soluble in water and gives a water soluble compound 'B' on treating with mineral acid. On reaction wih $CHCl_3$ and alcoholic potash 'A' produces an obnoxious smell due to the formation of compound 'C'. Reaction of 'A' with benzensulphonyl chloride gives compound 'D' which is soluble in alkali. WIth $NaNO_2$ and HCl, 'A' forms compound 'E' which reacts with phenol in alkaline medium to give an orange dye 'F'. Identify compounds 'A' to'F'.

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168. Predict the reagent or the product in the following reaction sequence.

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warming with CHCI, and KOH and gives compound (C) which on reduction forms ethyl methylamine. Assign structures to A, B and C and explain the reaction.

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170. A mixture of two aromatic compounds (A) and (B) was separated by dissolving in chloroform followed by extraction with aqueous KOH solution. The organic layer containing compound (A) when heated with alcoholic solution of KOH produced a compound $C, (C_7H_5N)$ associated with an

unpleasant odour. The alkaline aqueous layer, on the other hand, when heated with chloroform and then acidified gave a mixture of two isomeric compounds (D) and (E) of molecular formula $C_7H_6O_2$. Identify the compounds A, B, C, D and E and write their structures.

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171. A basic volatile compound gave a foul smelling gas when treated with chloroform and alcoholic potash. A 0.295g sample of the substance dissolved in aq. HCl and treated with

Na NO_2 solution at $0^\circ C$, liberated a colourless, odourless gas whose volume corresponded to 112 mL at S.T.P. After the evolution of gas was complete, the aqueous solution gave an organic liquid which did not contain nitrogen and which on warming with alkali and iodine gave a yellow precipitate. Identify the original substance. Assume that it contains one N-atom per molecule.

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172. One mole of each of a bromo derivative (A) and NH_3, react to give one mole of an organic

compound (B). (B) reacts with CH_3I to give (C). Both (B) and (C) react with HNO_2 to give compounds (D) and (E) respectively. (D) on oxidation and subsequent decarboxylation gives 2-methoxy-2-methylpropane. Give structures of (A) to (E) with proper reasoning.

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173. Identify A, B and C in the following reactions.

$$C_6H_5COOH \xrightarrow{PCl_5} A \xrightarrow{NH_3} B \xrightarrow{P_2O_5} C_6H_5CN \xrightarrow{H_2, Ni} C$$

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174. Identify A, B and C in the following reactions.

$$C_6H_5NH_2 \xrightarrow{NaNO_2, HCl} A \xrightarrow[\text{pyridine}]{CuCN} B \xrightarrow{Sn/HCl} C$$

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175. Identify A, B and C in the following reactions.

$$C_6H_5NH_2 \xrightarrow{Br_2, H_2O} A \xrightarrow[HCl]{NaNO_2} B \xrightarrow{H_3PO_2} C$$

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176. Identify the product in the following reactions.

CH_3COOH + NaOH →

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177. Identify A, B and C in the following reactions.

$C_6H_5COOH \xrightarrow{PCl_5} A \xrightarrow{NH_3} B \xrightarrow{P_2O_5} C_6H_5CN \xrightarrow{H_2, Ni} C$

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179. A compound Z with molecular formula C_3H_9N reacts with $C_6H_5SO_2Cl$ to give a solid, insoluble in alkali. Identify Z.

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180. (a) How will you convert:

(i) Aniline into Fluorobenzene.

(ii) Benzamide into Benzylamine.

(iii) Ethanamine to N,N-Diethylethanamine.

(b) Write the structures of A and B in the

following:

(i) $CH_3CH_2CN \xrightarrow[\text{Partial hydrolysis}]{OH^-} A \xrightarrow{NaOH + Br_2} B$

(ii) $CH_3CH_2Br \xrightarrow[(ii)\, LiAlH_4]{(i)\, KCN} A \xrightarrow[O^0C]{NHO_2} B$

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181. Give the structures of A, B and C in the following reactions:

$C_6H_5N_2Cl \xrightarrow{CuCN} A \xrightarrow{H_2O\,/\,H^+} B \xrightarrow[\Delta]{NH_3} C$

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182. Give the structures of A, B and C in the following reactions:

$$CH_3CH_2Br \xrightarrow{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow[0^\circ C]{HNO_2} C$$

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183. Give the structures of A, B and C in the following reactions:

$$C_6H_5NO_2 \xrightarrow{Fe\,/\,HCl} A \xrightarrow[273K]{NaNO_2+HCl} B \xrightarrow{H_2O\,/\,H^+} C$$

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184. Give the structures of A, B and C in the following reactions:

$$CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{NaOBr} B \xrightarrow{NaNO_2 / HCl} C$$

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185. Give the structures of A, B and C in the following reactions:

$$C_6H_5NO_2 \xrightarrow{Fe / HCl} A \xrightarrow[273K]{HNO_2} B \xrightarrow{C_6H_5OH} C.$$

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