



CHEMISTRY

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CHEMISTRY (HINGLISH)

PROBLEMS BASED UPON STRUCTURES

AND REACTIONS OF ORGANIC

COMPOUNDS

Some Solved Problems

1. A white precipitate was formed slowly when silver nitrate was added to compound (A) with molecular formula $C_6H_{13}Cl$. Compound (A) on treatment with hot alcoholic potassium hydroxide gave a mixture of two isomeric alkenes (B) and (C), having the formula C_6H_{12} . The mixture of (B) and (C), on ozonolysis, furnished four compounds.

i. CH_3CHO , ii C_2H_5CHO

iii. CH_3COCH_3 , (iv) $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - CHO$

What are the structures of (A), (B) and (C) ?



2. A chloro compound (A) showed the following properties :

(i) decolourised bromine in CCl_4 ,

(ii) absorbed hydrogen catalytically ,

(iii) gave a precipitate with ammoniacal Cu_2CI_2 ,

(iv) when vapourised 1.49g of (A) gave 448mL of vapour at STP.

Identify (A) and write down the equation of reaction at step (iii).



3. From analysis and molecular weight determination the molecular formula of a compound (A) is C_3H_7NO . The compound gives the following information.

(i) On hydrolysis it gives an amine (B) and a carboxylic acid (C).

(ii) Amine (B) reacts with benzene sulphonyl chloride and gives a product which is insoluble in aqueous sodium hydroxide solution.

(iii) Acid (C) on reaction with Tollens's reagent

gives a silver mirror.

What are (A) , (B) and (C) ? Explain the reactions with the help of equations.



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4. Alkene (A) and (B) yield the same alcohol (C) on hydration. On vigorous oxidation with $KMnO_4$, (A) gives a carbonyl compound (D) and an acid (E) each containing four carbon atoms. On the other hand (B) gives an acid (F) and a carbonyl compound (G), In (G), no two

identical groups are attached to the same carbon atom. Give structures of (A) to (G) with proper reasoning.



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5. An acidic compound (A), $C_4H_8O_3$, loses its optical activity on strong heating yielding (B), $C_4H_6O_2$, which reacts readily with $KMnO_4$. (B) forms a derivative (C) with $SOCl_2$, which on reaction with $(CH_3)_2NH$ gives (D). The compound (A) on oxidation with dilute

chromic acid gives an unstable compound (E) which decarboxylates readily to give (F), C_3H_6O . The compound (F) gives a hydrocarbon (G) on treatment with amalgamated Zn and HCl. Give structures of (A) to (G) with proper reasoning.



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6. A hydrocarbon A, of C_8H_{10} , on ozonolysis gives compound (B), $C_4H_6O_2$ only. The compound (B) can also be obtained from alkyl

bromide (C), C_3H_5Br , upon treatment with magnesium in dry ether, followed by CO_2 and acidification. Identify (A), (B) and (C) and also give equations for the reactions.



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7. 1,4-pentadiene reacts with excess of HCl in the presence of benzoyl peroxide to give compound X which upon reaction with excess of Mg in dry ether forms Y. Compound Y on treatment with ethyl acetate followed by

dilute acid yields Z. Identify the structures of compound X,Y and Z.



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8. A mixture of an acid anhydride (A) and a mono basic acid (B) on heating produces another mono basic acid (C) of equivalent weight 74 and m an anhydride (D). The acids and anhydrides remain in equilibrium. The anhydride (D) contains two identical fluoro alkyl groups. The acid (B) contains a trifluoro

methyl group and has an equivalent weight of 128. Give structures of (A) to (D) with proper reasoning (Atomic weight of fluorine =19).



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9. Hydrocarbon (A), C_6H_{10} on treatment with $H_2 / Ni, H_2 / Lindler$ catalyst and $Na / Liquid$ ammonia forms three different reduction products (B), (C) and (C) respectively. (A) does not form any salt with ammoniacal $AgNO_3$ solution, but forms a salt(E) on heating with

NaNH_2 in an inert solvent. Compound (E) reacts with CH_3I to give (F). Compound (D) on oxidative ozonolysis gives n-butanoic acid along with other product. Give structures of (A) to (F) with proper reasoning .



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10. An ester (A) ($\text{C}_4\text{H}_8\text{O}_2$) , on treatment with excess methyl magnesium chloride followed by acidification, gives an alcohol (B) as the sole organic product. Alcohol (B), on oxidation with

NaOCl followed by acidification gives acetic acid. Deduce the structures of (A) and (B). show the reactions involved.



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11. Two isomeric forms of an organic compound (A), $\text{C}_{11}\text{H}_{13}\text{OCl}$ readily decolourise bromine water and give same compound (B) on catalytic hydrogenation. Both the isomeric forms on vigorous oxidation give (C) which on treatment with soda lime

gives 2-chloro ethoxy benzene. However, (C) treatment with Ni/Al alloy in alkaline medium gives 3-ethoxy benzoic acid. Only one of the isomers of (A) gives geometrical isomers (D) and (E). Identify (A) to (E) with proper reasoning.



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12. One mole of the compound (A), C_8H_{12} incapable of showing stereoisomerism, reacts with only one mole of H_2 hydrogenation over

Pd. (A) undergoes ozonolysis to give a symmetrical diketone (B), $C_8H_{12}O_2$. What are the structures of (A) and (B) ?



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13. A hydrocarbon (A) of the formula , C_7H_{12} on ozonolysis gives a compound (B) which undergoes aldol condensation giving 1-acetylcyclopentene. Identify (A) and (B).



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14. An organic compound (A), $C_{18}H_{20}O$ on ozonolysis gives (B), $C_{10}H_{12}O$ and (C) $C_8H_8O_2$. Compound (B) gives iodoform reaction and products an oxime (D), $C_{10}H_{13}ON$ on treatment with NH_2OH . Compound (D) reacts with PCl_5 in dry ether to give (E) which on hydrolysis (F), $C_8H_{11}N$ and acetic gives acid. (F) on treatment with HNO_2 followed by oxidation gives phthalic acid. Compound (C) on mild oxidation gives (G) which gives effervescence with $NaHCO_3$. (G) on treatment with HI produces p-hydroxy

benzoic acid and CH_3I . Give structures of (A) to (G) with proper reasoning.



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15. An aldehyde (A) ($C_{11}H_8O$), which does not undergo self aldol condensation, gives benzaldehyde and two moles of (B) on ozonolysis. Compound (B), on oxidation with silver ion, gives oxalic acid. Identify the compounds (A) and (B).



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16. Catalytic dehydrogenation of methyl cyclohexane, obtained from petroleum gives a liquid which on treatment with chloro sulphonic acid at $370K$ yields a mixture to two isomers (A) and (B) , $C_7H_7SO_2Cl$. The major isomer (A) reacts with ammonia to form (C), which on oxidation with permanganate gives compound (D). On heating. compound (D) gives a well known sweetening agent (E), The minor isomer (B) also with ammonia to give a compound (F) which on treatment with

$NaCl \xrightarrow{N} aOH$ gives an antiseptic (G). Identify (A) to (G) with proper reasoning .



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17. Compound (A) (C_8H_8O) on treatment with NH_2OH . HCl gives (B) and (C) rearrange to give (D) and (E), respectively, on treatment with acid. (B), (C), (D) and (E) are all isomers of molecular formula (C_8H_9NO) . When (D) is boiled with alcoholic KOH, an oil (F) (C_6H_7N) separates out. (F) reacts with CH_3COCl to

give back (D). On the other hand, (E) on boiling with alkali followed by acidification gives a white solid (G) ($C_7H_6O_2$). Identify (A) to (G).



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18. A Grignard reagent (A) and a haloalkene (B) react together to give (C). Compound (C) on heating with KOH yields a mixture of two geometrical isomers, (D) and (E), of which (D) predominates. (C) and (E) have the same molecular formula and (C) gives 1-bromo-3-

phenyl propane on reaction with HBr in the presence of a peroxide. Give structures of (A), (B) and (C) and configuration of (D) and (E) with reasons.



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19. An organic compound [A] C_8H_6 on reacting with dilute sulphuric acid containing mercuric sulphate gives a compound [B] which can also be obtained from a reaction of benzene with acid chloride in the presence of

anhydrous $AlCl_3$. The compound [B] when treated with iodine and aqueous NaOH yields [C] and a yellow compound [D]. Identify [A],[B], [C] and [D] with justification. Show how [B] is formed from [A].



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20. Compound A of molecular formula $C_9H_7O_2Cl$ exists in keto form and predominantly in enolic form B. On oxidation

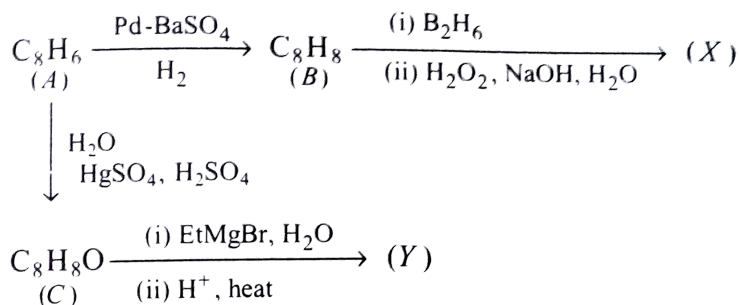
with $KMnO_4$, A give m-chlorobenzoic acid.

Identify A and B



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21. In the following reactions identify (A), (B), (C), (X) and (Y).



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