organic compound has molecular formula CH,,(A). A on heating with soda lime yields a hydrocarbon BCH) Bonblorination yields a single isomeric alkyl chloride C(CH.CI). Deduce the structures of A, B and C

Solution. We will proceed from two cases, because it is not entirely clear what is meant by the expression "the only isomeric alkyl chloride".

1) We understand this expression in such a way that one alkyl chloride is formed during chlorination. Then B is methane (CH_4). When chlorination is the reaction: $CH_4 + Cl_2 = CH_3Cl +$ +HCl. Then substance C is chloromethane (CH_3Cl). Since substance A initially reacts with soda lime, then A is acetic acid (CH_3COOH), and reaction: $CH_3COOH + NaOH = NaHCO_3 + CH_4$.

2) We understand this expression as the formation of two isomeric chlorinated alkanes, that is, one chlorinated alkane has one single isomer. Then B is 2-methylpropane. Then the chlorination reaction will go in two ways:

$H_3C\text{-}CH(CH_3)\text{-}CH_3 + Cl_2 = H_3C\text{-}C(Cl)(CH_3)\text{-}CH_3$ (2-chloro-2-methylpropane) + HCl;

$H_3C\text{-}CH(CH_3)\text{-}CH_3 + Cl_2 = H_3C\text{-}CH(CH_3)\text{-}CH_2Cl$ (1-chloro-2-methylpropane) + HCl. Then substance C can be either chloralkane from the first reaction or chloralkan from the second reaction. Substance A will then have the formula: $H_3C\text{-}CH(CH_3)\text{-}CH_2\text{-}COOH$ (3-methylbutanoic acid), and reaction with soda lime: $H_3C\text{-}CH(CH_3)\text{-}CH_2\text{-}COOH + NaOH = NaHCO_3 + H_3C\text{-}CH(CH_3)\text{-}CH_3$.

Answer: 1) A – acetic acid (CH_3COOH), B – methane (CH_4), C – chloromethane (CH_3Cl);

2)A – 3-methylbutanoic acid ($H_3C\text{-}CH(CH_3)\text{-}CH_2\text{-}COOH$), B – 2-methylpropane ($H_3C\text{-}CH(CH_3)\text{-}CH_3$), C - $H_3C\text{-}C(Cl)(CH_3)\text{-}CH_3$ (2-chloro-2-methylpropane) or $H_3C\text{-}CH(CH_3)\text{-}CH_2Cl$ (1-chloro-2-methylpropane).