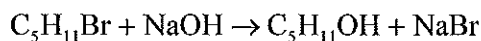


8. There are several structural isomers with the molecular formula $C_5H_{11}Br$.
- (a) Deduce the name of **one** of the isomers which can exist as enantiomers and draw three-dimensional representations of its **two** enantiomers. [3]

.....

- (b) All the isomers react when warmed with a dilute aqueous solution of sodium hydroxide according to the equation below.



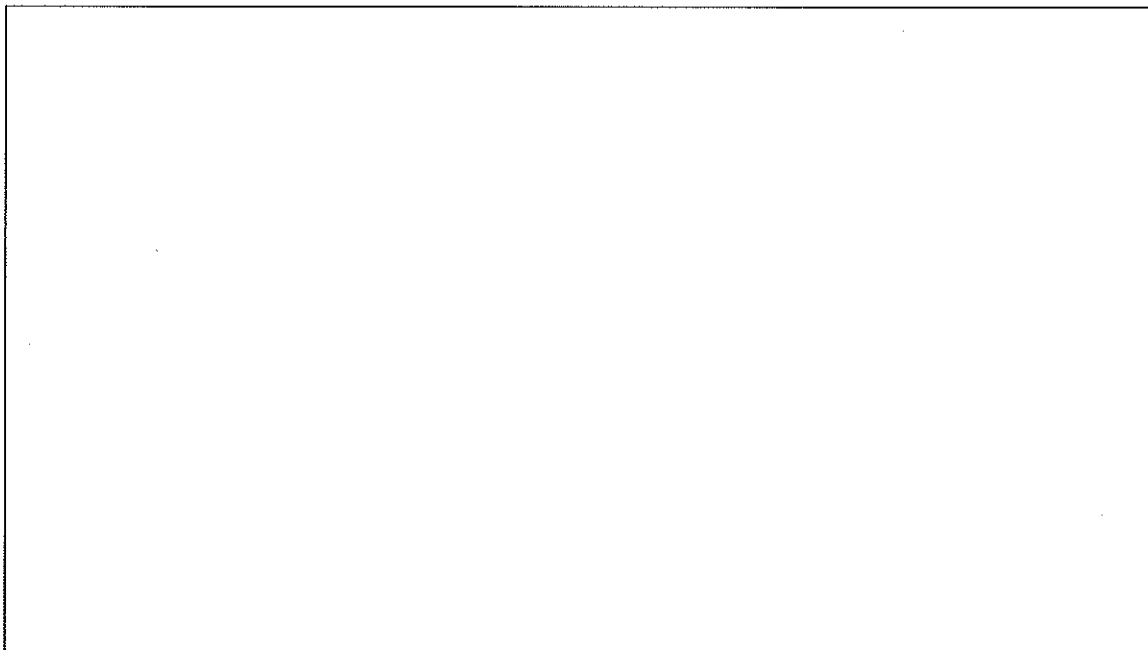
- (i) The reaction with 1-bromopentane proceeds by an S_N2 mechanism. Describe this mechanism using structural formulas and curly arrows to represent the movement of electron pairs. [3]

(This question continues on the following page)

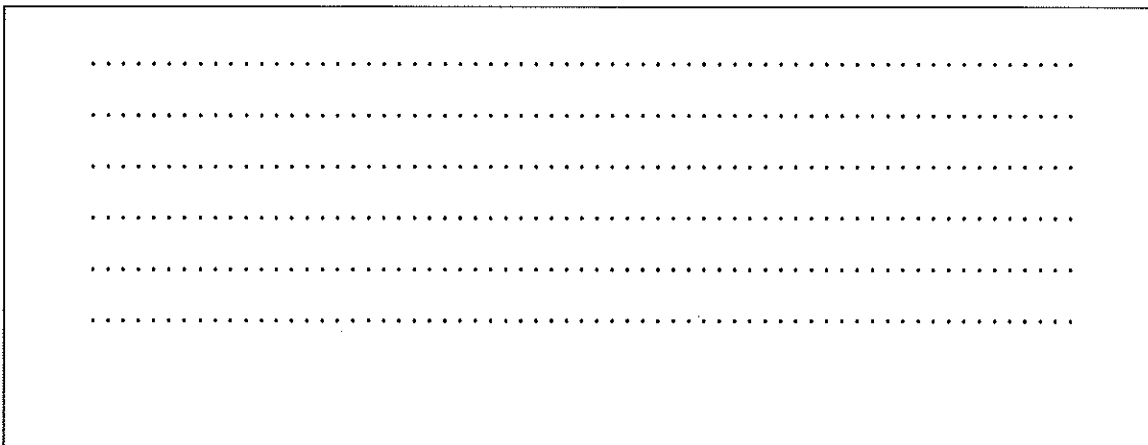


(Question 8 continued)

- (ii) The reaction with 2-bromo-2-methylbutane proceeds by an S_N1 mechanism. Describe this mechanism using structural formulas and curly arrows to represent the movement of electron pairs. [3]



- (iii) Explain why 1-bromopentane reacts by an S_N2 mechanism whereas 2-bromo-2-methylbutane reacts by an S_N1 mechanism. [3]



(This question continues on the following page)



(Question 8 continued)

- (iv) Explain whether the boiling point of 1-bromopentane will be higher, lower or the same as that of 2-bromo-2-methylbutane. [3]

.....
.....
.....
.....
.....
.....

- (v) The product $C_5H_{11}OH$ formed from the reaction with 1-bromopentane is warmed with ethanoic acid in the presence of a few drops of concentrated sulfuric acid. State the name of the type of reaction taking place and the structural formula of the organic product. [2]

.....
.....

(This question continues on the following page)



(Question 8 continued)

- (c) If the conditions of the reaction in (b) are changed so that a hot solution of sodium hydroxide in ethanol is used then a different reaction occurs. The reaction with 2-bromo-2-methylbutane gives **two** different organic products. State the type of reaction taking place and suggest the identity (name or structure) of these **two** products. Explain whether or not they can exist as geometrical isomers. [4]

.....
.....
.....
.....
.....
.....
.....

- (d) Dihalogenoalkanes can also react with warm dilute potassium hydroxide solution to form diols. These diols can react with dicarboxylic acids.
- (i) Deduce the equation for the reaction of benzene-1,4-dicarboxylic acid with the diol formed from 1,5-dibromopentane. [3]

.....
.....
.....
.....
.....
.....

- (ii) Outline the economic importance of the reaction of diols with dicarboxylic acids. [1]

.....
.....



9. (a) Alkenes are an economically and chemically important family of organic compounds.
- (i) The reaction of alkenes with bromine water provides a test for unsaturation in the laboratory. Describe the colour change when bromine water is added to chloroethene. [1]
 - (ii) Deduce the Lewis structure of chloroethene and identify the formula of the repeating unit of the polymer poly(chloroethene). [2]
 - (iii) Besides polymerization, state **two** commercial uses of the reactions of alkenes. [2]
- (b) Halogenoalkanes undergo two major types of reaction leading to the formation of different organic compounds.
- (i) 1-bromopropane can be converted to 1-butylamine (butan-1-amine) in **two** stages. Draw the structural formulas of 1-bromopropane and 1-butylamine (butan-1-amine). [1]
 - (ii) Deduce a reaction pathway for the **two**-stage conversion of 1-bromopropane to 1-butylamine (butan-1-amine). Your answer should include an equation for each stage of the reaction **and** the reaction conditions for the second stage. [4]
- (c) (i) Describe the elimination of HBr from bromoethane. Your answer should include the reagents, conditions and equation for the reaction. [3]
- (ii) Explain the mechanism for the elimination of HBr from bromoethane. [5]
- (d) But-2-ene can be converted to butan-2-one in **two** stages.
- (i) Draw the structural formulas of but-2-ene and butan-2-one. [2]
 - (ii) Deduce a reaction pathway for the **two** stages of the reaction. Your answer should include the fully balanced equation for each stage of the reaction **and** the reagents and conditions for the two stages. [5]
-

