InkChemistry

QUESTION WORKBOOK

Halogenoalkanes: nucleophilic substitution and rates of hydrolysis

Alkanes and halogenoalkanes · Unit C17

AQA 3.3.3.1 · OCR A 4.2.1 (e); 4.2.2 (a), 4.2.2 (b); 6.2.1; 6.2.4

17 questions · 53 marks

PRINT EDITION

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SECTION A · Short, 1 to 2 marks

A1 HN-Q16 Explain why 1-fluorobutane gives no precipitate in the silver nitrate hydrolysis test. [2]

A2 HN-Q17 Suggest why the reaction of a halogenoalkane with cyanide ions is useful when making a compound with a longer carbon chain. [2]

A3 HN-Q21 Give an equation for the conversion of ethanol into chloroethane with thionyl chloride, and give one advantage of this reagent. [2]

SECTION B · Standard, 3 to 5 marks

B1 HN-Q4 Outline the mechanism for the reaction of 1-bromopropane with an excess of ammonia. [5]

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B2 HN-Q1 Explain why the carbon atom bonded to bromine in 1-bromopropane is attacked by nucleophiles, and identify the nucleophile in its reactions with aqueous sodium hydroxide, with potassium cyanide in ethanol and with ammonia. [4]

B3 HN-Q6 Give the reagent and conditions for converting bromoethane into propanenitrile and into ethylamine, and explain how the name propanenitrile follows from the reaction. [4]

B4 HN-Q9 Describe how the rates of hydrolysis of 1-chlorobutane, 1-bromobutane and 1-iodobutane can be compared using silver nitrate solution. [4]

B5 HN-Q3 Draw the mechanism for the reaction of bromoethane with hydroxide ions. [3]

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B6 HN-Q5 Outline the mechanism for the reaction of 1-chlorobutane with cyanide ions, and name the organic product. [3]

B7 HN-Q8 Explain why 1-iodobutane is hydrolysed faster than 1-chlorobutane, even though the C–Cl bond is more polar. [3]

B8 HN-Q10 Explain why ethanol is added to the mixture in the silver nitrate hydrolysis test, and why water rather than hydroxide ions is used as the nucleophile. [3]

B9 HN-Q13 Suggest the structure and name of the product formed when 2-bromopropane is heated with potassium cyanide in ethanol and water, and say how many carbon atoms it contains. [3]

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B10 HN-Q14 Suggest why an excess of ammonia is used to make ethylamine from bromoethane, and what forms if it is not. [3]

B11 HN-Q15 Compare the reaction of bromoethane with hydroxide ions with its reaction with ammonia. [3]

B12 HN-Q18 Explain why hydrolysis of a single enantiomer of a chiral tertiary halogenoalkane gives a product that does not rotate plane-polarised light. [3]

B13 HN-Q19 Suggest why 2-bromo-2-methylpropane gives a precipitate with aqueous silver nitrate and ethanol much sooner than 1-bromobutane, and why these two compounds make a fair comparison. [3]

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B14
HN-Q20

Suggest a two-step route from bromoethane to propanoic acid, giving the reagent and conditions for each step and the intermediate. [3]

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