Halogenoalkanes – AS 2022 Chemistry P2

1. June/2022/Paper_7404/2/No.6

0 6 Trichlorofluoromethane (CCl_3F) was developed as a refrigerant. The production and use of CCl_3F is now restricted.

0 6 . 1 The equation for a process used to manufacture CCl_3F is

$$SbF_3Br_2 + CCl_4 \rightarrow CCl_3F + SbF_2Br_2Cl$$

Calculate the percentage atom economy for the production of CCl_3F in this reaction. Give your answer to 3 significant figures.

[2 marks]

Percentage atom economy _____

An alternative synthesis of CCl_3F is the free-radical substitution reaction between fluoromethane (CH_3F) and chlorine.

0 6 . 2 An intermediate in this alternative synthesis is dichlorofluoromethane ($CHCl_2F$)

Give equations to represent the two propagation steps in the conversion of $CHCl_2F$ into CCl_3F

[2 marks]

Propagation step 1

_____

Propagation step 2

_____

0 6 . 3 Analysis of the products of this reaction shows the formation of a compound with the empirical formula CCl_2F

Give an equation to represent a termination step forming this compound.
Show the structural formula of the product in the equation.

[1 mark]