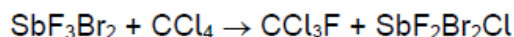


**Halogenoalkanes – AS 2022 Chemistry P2****1. June/2022/Paper\_7404/2/No.6****0 6**

Trichlorofluoromethane ( $\text{CCl}_3\text{F}$ ) was developed as a refrigerant. The production and use of  $\text{CCl}_3\text{F}$  is now restricted.

**0 6 . 1**

The equation for a process used to manufacture  $\text{CCl}_3\text{F}$  is



Calculate the percentage atom economy for the production of  $\text{CCl}_3\text{F}$  in this reaction. Give your answer to 3 significant figures.

**[2 marks]**

Percentage atom economy \_\_\_\_\_

An alternative synthesis of  $\text{CCl}_3\text{F}$  is the free-radical substitution reaction between fluoromethane ( $\text{CH}_3\text{F}$ ) and chlorine.

**0 6 . 2**

An intermediate in this alternative synthesis is dichlorofluoromethane ( $\text{CHCl}_2\text{F}$ )

Give equations to represent the two propagation steps in the conversion of  $\text{CHCl}_2\text{F}$  into  $\text{CCl}_3\text{F}$

**[2 marks]**

Propagation step 1

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Propagation step 2

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Analysis of the products of this reaction shows the formation of a compound with the empirical formula  $\text{CCl}_2\text{F}$

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

[1 mark]

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