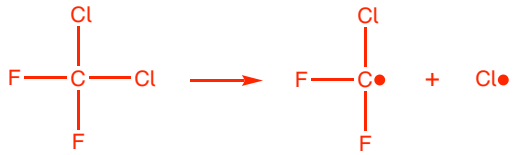
1 **a** Write an equation to show the formation of ozone destroying free radicals from CFC-11, $CFCl_3$

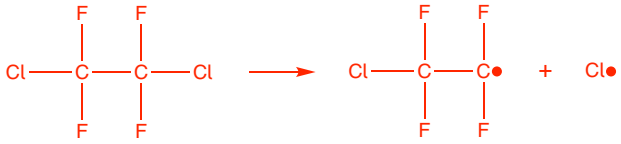


b Write a pair of equations to show how free radicals from part **a** destroy ozone molecules.

$Cl\bullet + O_3 \rightarrow ClO\bullet + O_2$

$ClO\bullet + O_3 \rightarrow Cl\bullet + 2O_2$

2 **a** Write an equation to show the formation of ozone destroying free radicals from CFC-114, CF_2ClCF_2Cl



b Write a pair of equations to show how free radicals from part **a** destroy ozone molecules.

$Cl\bullet + O_3 \rightarrow ClO\bullet + O_2$

$ClO\bullet + O_3 \rightarrow Cl\bullet + 2O_2$

c Explain why one free radical from part **a** can destroy very many ozone molecules.

Cl● acts as a catalyst – the Cl● is regenerated after it destroys O_3 and so can destroy more O_3

Cl● is removed by reaction with another radical but chances of collision with another radical is low as at any moment there are far more molecules present than radicals

3 **a** R-134a (CF_3CH_2F) is commonly used as a refrigerant in place of CFCs. Explain why this compound cannot destroy ozone.

does not contain any Cl atoms