11.0: INTRODUCTION

OBJECTIVE

After completing this section, you should be able to identify substitution and elimination as being the two most important reactions of alkyl halides.

STUDY NOTES

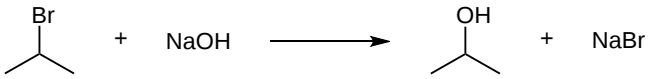
Alkyl halides are electrophiles, which means they can undergo nucleophilic substitution and base-induced elimination reactions. These reaction types offer a large and useful range of reactions for organic synthesis in the laboratory.

THE REACTIONS

Two reactions are shown her with both involving heating a halogenoalkane under reflux with sodium or potassium hydroxide solution. Two different reactions can occur.

NUCLEOPHILIC SUBSTITUTION

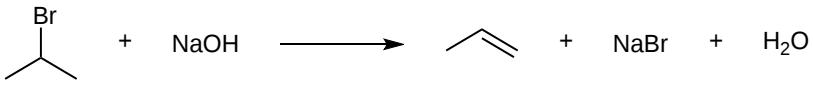
The hydroxide ions present are good nucleophiles, and one possibility is a replacement of the halogen atom by an -OH group to give an alcohol via a nucleophilic substitution reaction.



In the example, 2-bromopropane is converted into propan-2-ol.

ELIMINATION

Hydroxide ions are also strong bases, therefore halogenoalkanes also undergo elimination reactions in the presence of sodium or potassium hydroxide.



In this reaction, the 2-bromopropane has reacted to form an alkene - propene.

Notice that a hydrogen atom has been removed from one of the end carbon atoms together with the bromine from the centre one. In all simple elimination reactions the things being removed are on adjacent carbon atoms, and a double bond is set up between those carbons.

WHAT DECIDES WHETHER YOU GET SUBSTITUTION OR ELIMINATION?

The reagents you are using are the same for both substitution or elimination - the halogenoalkane and either sodium or potassium hydroxide solution. In all cases, you will get a mixture of both reactions happening - some substitution and some elimination. What you get most of depends on a number of factors.