
SL Paper 3

Alkenes can undergo electrophilic addition reactions with bromine and with hydrogen bromide.

Name the product formed when but-2-ene reacts with

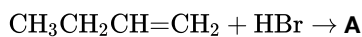
- a. Explain how a bromine molecule is able to act as an electrophile. [1]
- b. (i) bromine. [2]
- (ii) hydrogen bromide.
- c. When but-1-ene reacts with hydrogen bromide, two possible organic products could be formed but in practice only one organic product is [4]
obtained in high yield. Explain the mechanism for this reaction using curly arrows to represent the movement of electron pairs and explain clearly why only one organic product is formed.

- a. Deduce a two-step reaction pathway which can be used to convert 1-bromopropane into butanoic acid. Draw the structural formula of the [4]
organic product formed for each step and identify the reagents involved.
- b. Deduce a two-step reaction pathway which can be used to convert propan-2-ol into 1,2-dibromopropane. Draw the structural formula of the [4]
organic product formed for each step and identify the reagents involved.

Addition of hydrogen halides to unsymmetrical alkenes produces a mixture of halogenoalkanes. The latter can be converted into Grignard reagents by reaction with magnesium metal and then used for the preparation of various organic molecules with an increased number of carbon atoms.

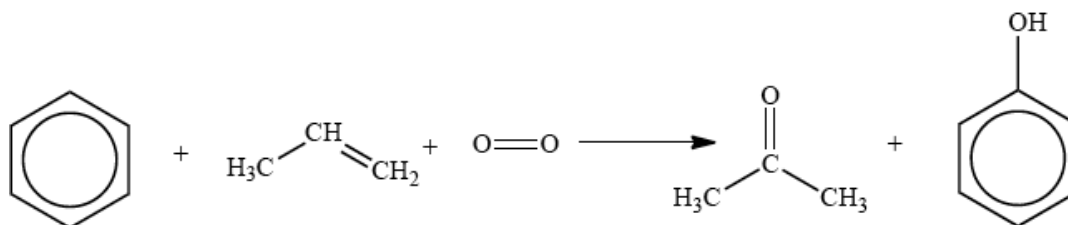
Describe, using equations and curly arrows to represent the movement of electron pairs, the mechanism of the reaction between propene and hydrogen bromide. Compare the relative stabilities of the two intermediate carbocations which lead to the formation of the major and minor products.

Draw the structural formula of the **major** organic products, **A** and **B**, formed in the following reactions.



A:

The cumene process is used for the production of both propanone and phenol. The overall reaction is shown in the equation below.



This process is important in the polymer industry. Propanone can be converted into methyl methacrylate, the monomer used to make Perspex[®], and phenol is used in phenol-methanal resins, which are important thermosetting plastics.

a.ii.State and explain how the presence of a halogen substituent might affect the acidity of carboxylic acids. [3]

d. Propanone could also be formed from propene by reaction with steam over an acidic catalyst, followed by oxidation of the product. [3]

The reaction of propene with water can yield two possible products. Explain, in terms of the stability of the intermediate carbocations, why one is formed in much greater quantities than the other.