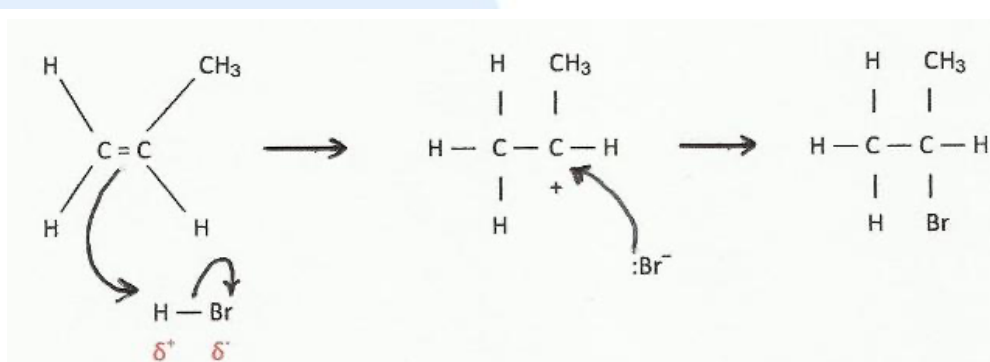


HL Answers to Electrophilic addition questions

1. i. Bromine is non-polar as the bonding electron pair is shared equally between the two bromine atoms. As the bromine molecule approaches the electron rich C=C double bond the electrons in the double bond repel the bromine electrons on the nearest bromine atom inducing a dipole in the molecule so that one of the Br atoms becomes δ^+ (and can act as an electrophile) and the other becomes δ^- .
- ii. 1,2-dibromoethane
- iii. The intermediate carbocation formed is $\text{CH}_2\text{Br}-\text{CH}_2^+$. In the presence of water the OH^- from the water adds to the carbocation in place of Br^- as it is a better nucleophile. (Alternatively water adds to give $\text{CH}_2\text{Br}-\text{CH}_2\text{OH}_2^+$ and then the Br^- removes H^+ to form the organic product and HBr .)

2.



The IB will usually award four marks for the answers involving this type of mechanism.

One mark each for:

curly arrow going from C=C to H of HBr **and** curly arrow showing Br^- leaving;

correct representation of carbocation;

curly arrow going from lone pair/negative charge on $:\text{Br}^-$ to C^+ ;

formation of 2-bromopropane, $\text{CH}_3\text{CHBr}(\text{CH}_3)$;

(Note that in the past they have not awarded a mark for showing the δ^+ and the δ^- on the H—Br but I think that it is good practice to include this and it is now specifically mentioned on the syllabus under 'Guidance').

3. $\text{H}_2\text{IC}-\text{CHCl}-\text{CH}_2-\text{CH}_3$ 2-chloro-1-iodobutane (1-iodo-2-chlorbutane would also be accepted).

4.

