IB Chemistry HL Notes
Core and Further Organic Chemistry

Alkenes

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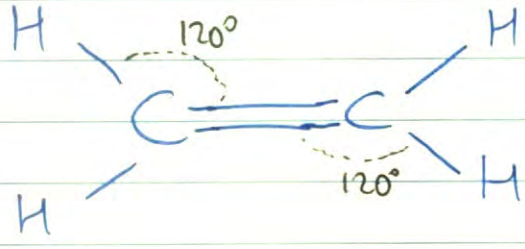
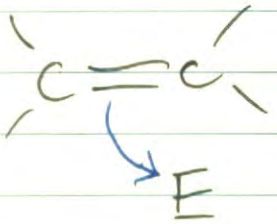
ALKENES

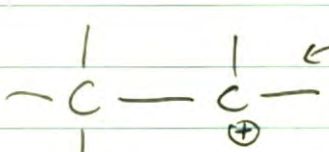


ethylene C_2H_4

- Planar molecule, sp^2 hybridised (C)
- π bond exists above and below, normal to plane.
- B/C of exposed areas of electron density of π bond, react with electrophiles (electron acceptors).



- E represents an electrophile
- curly arrow from π bond to electrophile.
- this is the movement of the e^- pair

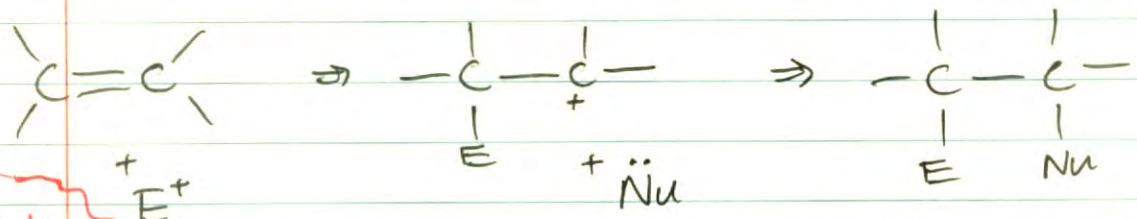


electron deficient.

Carbocation intermediate

Reaction intermediate

- In the reaction of an alkene with an electrophile, the C=C π bond is broken, and C–E bond is made. This results in a C atom being +vely charged.
- If C–E is neutral, E initially must be E^+.
- If E is initially neutral, C–E is +vely C–E^-.
- C^+ is electrophilic carbon site, hence to stabalise, react with nucleophile.
- Carbocation is extremely reactive, ∴ alkenes are a lot more reactive than alkanes, can be performed at R.T.P.



Electrophilic Addition

$\Delta H = -ve$ energetically favourable.

Energetics of Alkenes and Alkanes

(1) $CH_{4(g)} + Br_{2(g)} \xrightarrow{\Delta H} CH_3Br_{(g)} + HBr_{(g)}$

$\Delta S \approx 0$

$\Delta G \ll 0$

$\Delta H_1 = [4(C-H) + \cancel{(C=C)} + (Br-Br)] - [3(C-H) + (C-Br) + (H-Br)]$

$= [4(412) + \cancel{612} + 193] - [3(412) + 276 + 366]$

$= -37\ kJmol^{-1}$

(2) $C_2H_{4(g)} + Br_{2(g)} \xrightarrow{\Delta H} C_2H_4Br_{2(g)}$

$\Delta S < 0$

$\Delta G < 0$

T has no effect

$\Delta H_2 = [4(C-H) + (C=C) + (Br-Br)] - [(C\overline{\ }C) + 4(C-H) + 2(C-Br)]$

$= [4(412) + 612 + 193] - [348 + 4(412) + 2(276)]$

$= -95\ kJmol^{-1}$

$|\Delta H_2| - |\Delta H_1| = 58\ kJmol^{-1}$