# AS EQUATIONS - Unit 1

**Alkanes – with $O_2$**

**Complete combustion** $CH_4 + 2\,O_2 \rightarrow CO_2 + 2H_2O$

**Incomplete combustion** $CH_4 + 1.5O_2 \rightarrow CO + 2H_2O$

**Alkanes – with $Cl_2$, UV**

$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$

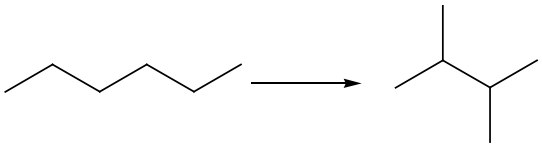
Mechanism = Photochemical free radical substitution.

**Alkanes – improving the quality of fuels**

Catalytic Cracking $C_{10}H_{22} \rightarrow C_5H_{12} + C_5H_{10}$

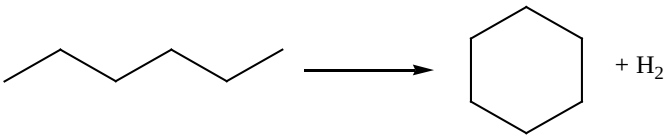
Conditions – Heat (600$^o$C), $Al_2O_3$

Isomerisation



Conditions - Heat, Pt

Reformation




Conditions - Heat, Pt

**Alkenes – with $H_2$** $H_2C{=}CH_2 + H_2 \rightarrow CH_3CH_3$

Conditions - Heat, **Ni**

**Alkenes – with $Br_2$ / hexane** $CH_3CH{=}CH_2 + Br_2 \rightarrow CH_3CHBrCH_2Br$

Colour change (orange to colourless)

Mechanism = Electrophilic Addition

**Alkenes – with Bromine water** $CH_3CH{=}CH_2 + Br_2 / H_2O \rightarrow CH_3CHOHCH_2Br$

Colour change (orange to colourless)

Mechanism = Electrophilic Addition

**Alkenes – with HBr/dry/gas** $CH_3CH{=}CH_2 + HBr \rightarrow CH_3CH_2BrCH_3$

Major product

Mechanism = Electrophilic Addition

Explanation for major product = Secondary carbocationic intermediate is more stable than primary.

**Alkenes – with $KMnO_4$ / $H_2SO_4$**

$CH_3CH{=}CH_2 + [O] \rightarrow CH_3CHOHCH_2OH$

Colour change (purple to colourless – H2SO4)

**Alkenes – Polymerisation**