

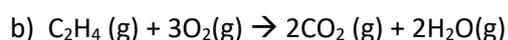
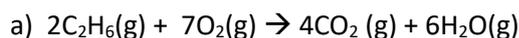
## Lesson 9 Chemical reactions with alkanes, haloalkanes and alkenes.

[Click](#) to revise reaction pathways

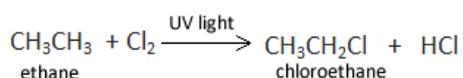
Saturated hydrocarbon = a compound that has single carbon to carbon bonds (C-C) and is composed of hydrogen and carbon atoms only.

Unsaturated hydrocarbon = a compound that has one or more double carbon to carbon bonds (C=C) or even a triple carbon to carbon bond and is composed of hydrogen and carbon atoms only.

All alkanes and alkenes undergo combustion with oxygen to produce carbon dioxide and water. In fact hydrocarbons will undergo combustion in oxygen to produce CO<sub>2</sub> and H<sub>2</sub>O.



Alkanes undergo reactions known as **substitution reactions** where a hydrogen is substituted for a chlorine or some other halogen. This usually occurs in the presence of UV light.

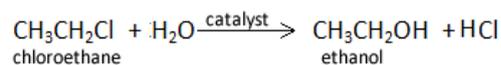


Haloalkanes can be used in further substitution reactions to produce other beneficial compounds.

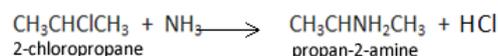
Chloroethane, for example, can undergo a substitution reaction with NaOH to produce ethanol



Ethanol can also be produced via a substitution reaction between chloroethane and water in the presence of a catalyst.

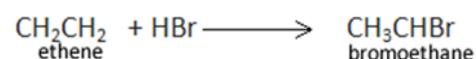
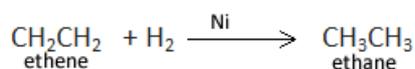


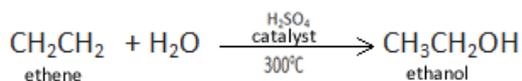
Not only alcohols can be produced via substitution reactions with haloalkanes but amines as well via reactions with ammonia.



Addition reactions.

As the name implies addition reactions involve the addition of a small molecule across the double bond of an alkene.

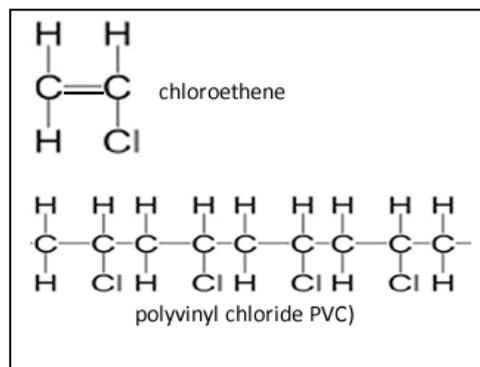




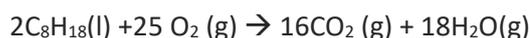
The reaction above, where water is used as a reactant is sometimes referred to as a **hydration** reaction.

Alkenes can also undergo addition reactions to form long chain polymers. This type of reaction is known as **addition polymerisation**. Alkenes can attach to each other across the double bond.

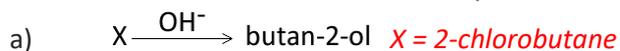
Eg Polyvinyl chloride (PVC) is a durable and versatile plastic. It is made from chloroethene monomers. Monomers are the small molecules that join to form long molecules, generally known as polymers.



- 1) Write a balanced chemical equation for the combustion reaction of octane.



- 2) For each of the reactions below identify X



- 2) trans-pent-2-ene reacts with  $\text{Cl}_2$  in an addition reaction.

Name all the possible isomers that are possible and give write their structural formulae.

*2,3-dichloropentane*

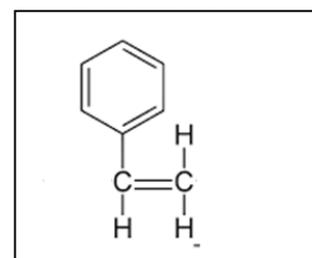
- 3) Styrene is a plastic commonly used for plastic and plastic cutlery.

The repeating unit in the polymer chain is shown on the right.

Draw the monomer of this polymer.

What type of reaction forms this plastic?

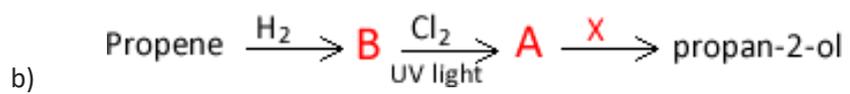
*Addition polymerisation*



- 4) Identify each species involved in the reaction pathways shown below. Identify the type of reaction that takes place at each step.



*A = 2-chloropropane, formation of A is an addition reaction, B = propene*



*A = 2-chloropropane, formation A is a substitution reaction, B = propane, formation of B is an addition reaction*