MINISTRY OF EDUCATION

SECONDARY ENGAGEMENT PROGRAMME

GRADE 11

CHEMISTRY

WEEK 5 **LESSON 1**

Topic: Hydrocarbons

Sub-topic: Reactions of Alkenes

Objective: Given the information and with the use of examples, students will:

(i) correctly describe the reactions of alkenes.

(ii) Write the chemical equations and conditions for each reaction.

Content:

Alkenes are unsaturated hydrocarbons. They have a double bond between two carbon atoms. The presence of this carbon-carbon double bond makes alkenes compounds more reactive than alkanes.

Reactions of Alkenes

1. **Combustion**

Alkenes burn in the air (oxygen) producing a yellow smoky flame. The products are carbon dioxide and water (steam). Ethene is usually used as a typical example. A similar reaction will occur when burning any alkene.

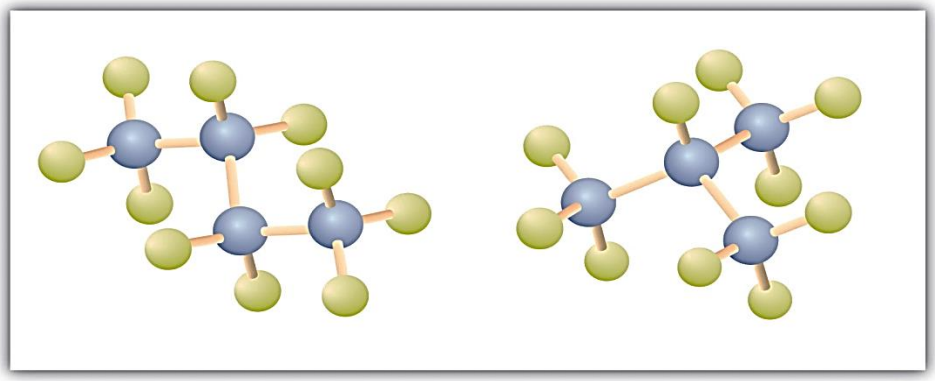
$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_20(g)$

Ethene oxygen → carbon dioxide water

2. Addition Reaction

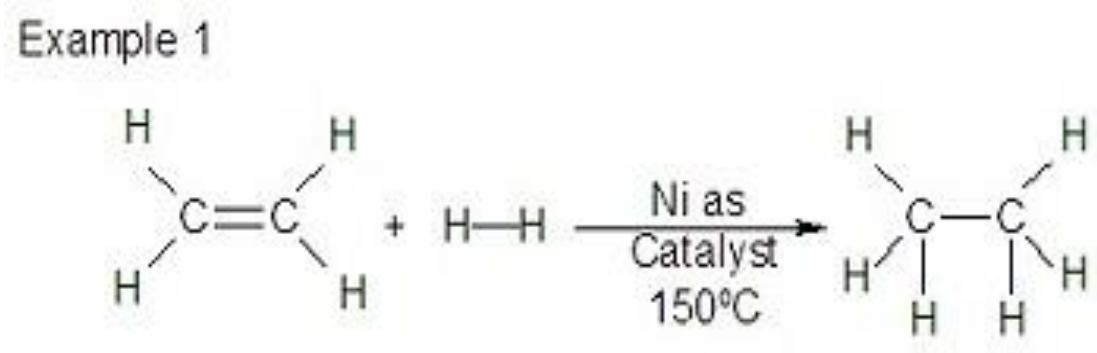
Most of the reactions of alkenes are classified as addition reactions. In, addition reactions, two or more reacting molecules combine to form a single molecule as the product.

During the addition reaction, a bond in the double bond of the alkene is broken and a saturated compound (no double bonds) is formed.



(a) Hydrogenation

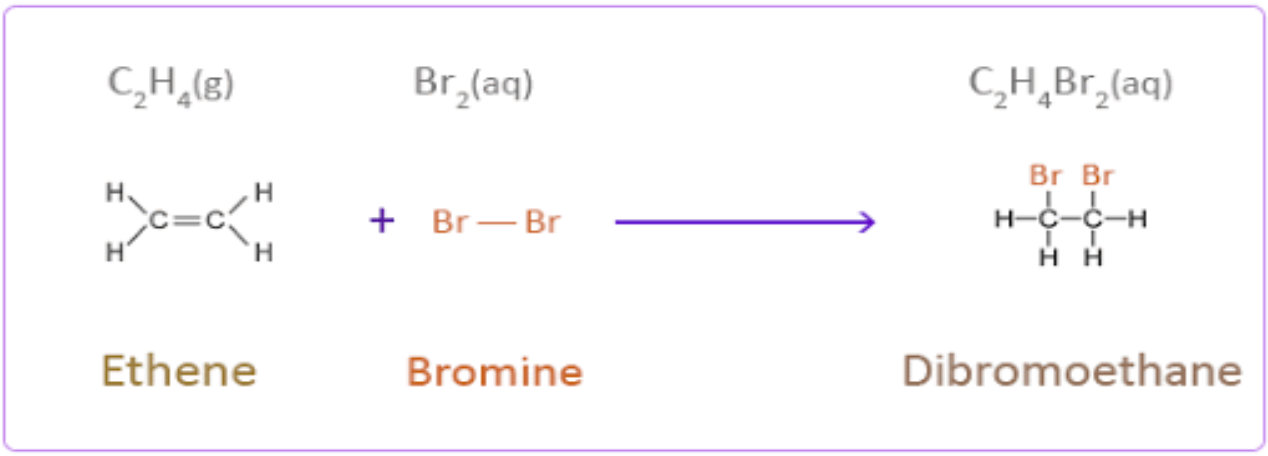
The **addition of hydrogen** to an alkene is an example of hydrogenation. During hydrogenation, the corresponding **alkane** is formed. Hydrogen is added under pressure (5 atm), in the presence of a nickel catalyst.



Ethene **Ethane**

(b) Halogenation

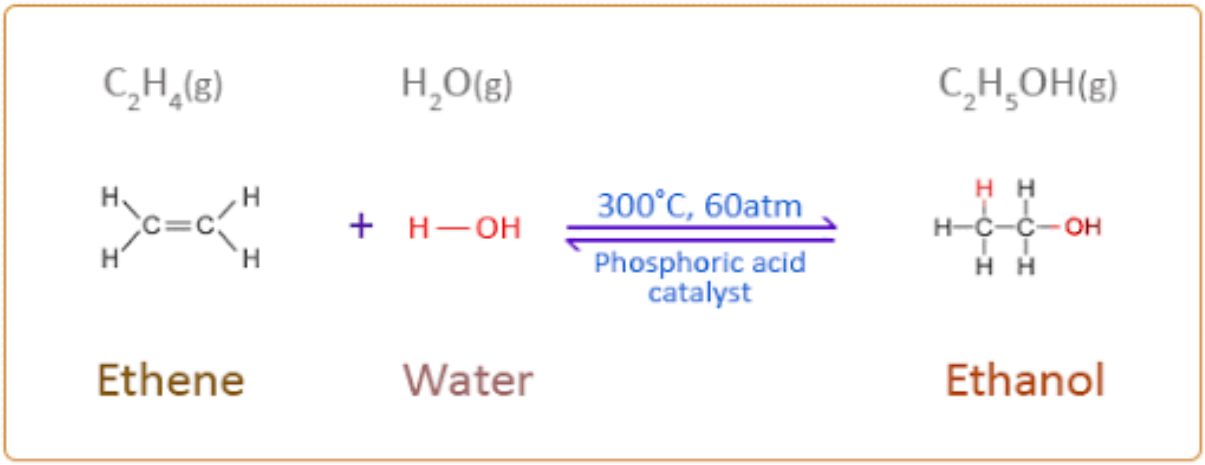
Halogenation is the addition of a halogen to the alkene. This may come in the form of chlorine gas, bromine vapour, or bromine solution.



(c) Hydration

This is the addition of a water molecule to the alkene. It occurs at 300^0C and 60 - 70 atmospheres of pressure in the presence of a phosphoric(V) catalyst(H_3PO_4)

Hydration yields the corresponding alcohol.



References

1. https://www.chemguide.co.uk/organicprops/alkenes/halogenation.html
2. https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/08%3A_Alkenes-_Reactions_and_Synthesis/8.03%3A_Halogenation_of_Alkenes_-_Addition_of_X