

MINISTRY OF EDUCATION
SECONDARY ENGAGEMENT PROGRAMME

GRADE 11

CHEMISTRY

WEEK 5

LESSON 2

TOPIC: Hydrocarbons

Sub-topic: Distinguishing Between Alkanes and Alkenes

Objectives: Given the information, students will state the differences between alkanes and alkenes.

To distinguish between an Alkane and an Alkene, the two hydrocarbon compounds are reacted with either bromine solution or acidified potassium manganate (VII) solution. Both of these reactions test to see whether the compounds contain a Carbon-Carbon double bond causing it to be unsaturated. Remember, Alkenes are unsaturated hydrocarbon compounds.

Test	Observations and their explanations	
	Alkane	Alkene
Add bromine solution (bromine dissolved in water)	Solution remains red-brown. This is because it occurs between the alkane and bromine water under standard laboratory conditions.	The solution rapidly changes colour from red-brown to colourless. This is because a rapid addition reaction occurs between the alkene and the bromine solution, forming a colourless haloalkane.
Add acidified potassium manganate (VII) solution	The solution remains purple. This is because it occurs between the alkane and bromine water under standard laboratory conditions.	The solution rapidly changes colour from purple to colourless. This is because a rapid addition reaction occurs in which the alkene reduces MnO_4^- ion to the colourless Mn^{2+} ion.

Table 1: Distinguishing between an Alkane and an Alkene

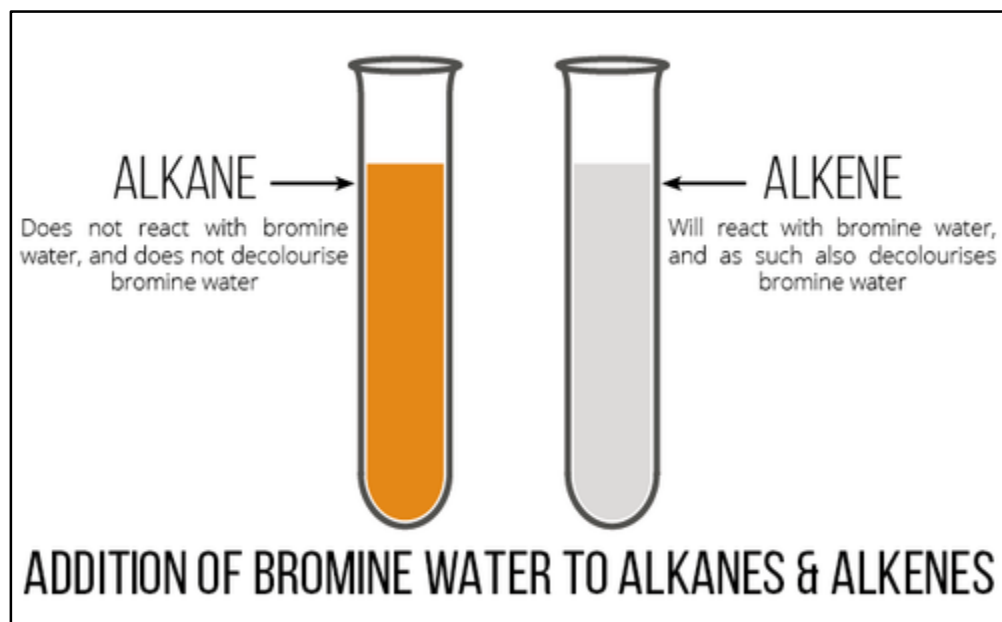


Figure 1: Distinguishing an Alkene from an Alkane using Bromine Solution (Bromine Water)

Differences	Alkanes	Alkenes
General formula	C_nH_{2n+2}	C_nH_{2n}
Type of hydrocarbon	Saturated hydrocarbon	Unsaturated hydrocarbon
Functional group	-	Double covalent bond between two carbon atoms, C=C
Type of bond in the molecule	Single covalent bond	Single and double covalent bonds
Type of chemical reaction	-Combustion reaction -Substitution reaction -Cracking reaction	-Combustion reaction -Addition reaction -Polymerisation reaction
Reaction with: *Bromine water *Acidified potassium manganate(VII) solution	No change	-Decolourizes the brown coloured bromine water -Decolourizes the purple coloured solution

Bibliography

Tindale, A. (2016). Distinguishing between an alkane and an alkene. In A. Tindale, *Concise Revision Course CSEC Chemistry* (pp. 139 - 140). London: HarperCollins Publishers Ltd.