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| Chemical Investigations |
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| Teacher/Technician Guide |

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Testing for Unsaturation

*UNIT 2 PPA 1*

**INTRODUCTION**

Alkanes and cycloalkanes are described as saturated hydrocarbons because the carbon-carbon bonds they contain are all single covalent bonds. Hydrocarbons which contain at least one carbon = carbon double bond are said to be unsaturated.

The presence of unsaturation in organic compounds can be shown by using bromine solution. It has an orange/red colour as a result of the bromine molecules it contains. When bromine solution is shaken with an unsaturated hydrocarbon the bromine molecules 'add on' across the carbon=carbon double bonds and the reaction mixture rapidly turns colourless. When a saturated hydrocarbon and bromine solution are mixed the orange/red colour remains.

The aim of this experiment is to test for unsaturation in four different hydrocarbons labelled A (C6H14), B (C6H12), C (C6H12) and D (C6H10) and in the light of the results suggest a possible structure for each one.

**You will need**

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| test tubes and rack | ~ 1cm3 of hydrocarbons **A**, **B**, **C** and **D** |
| ~ 2 cm3 0.02 mol l-1 bromine solution\* | Pasteur pipette\*\* |

\* The risk is low but an even safer alternative is potassium manganate VII solution.

\*\* Pasteur pipettes are not needed if the bromine water is in dropping bottles.

**Hydrocarbons**

A = Hexane

B = Hex-1-ene

C = Cyclohexane

D = Cyclohexane

**Safety**

Bromine fumes can be given off from bromine water but the quantity will be small and the dilute solution means this is not a significant hazard.

All the hydrocarbons are highly flammable and irritating to the eyes, skin and lungs. In addition, hydrocarbons A and D are harmful. As with the bromine water, the quantities are small

Work in a well ventilated lab.

**Procedure**

For each of the hydrocarbons A, B, C and D follow the procedure outlined below:

1. Add the hydrocarbon to a test tube to a depth of about 0.5 cm.
2. To the hydrocarbon add about 10 drops of bromine solution.
3. Shake the contents of the test tube by 'waggling' it. Do not place your thumb on the mouth of the test tube.
4. Record your observations.
5. Repeat for the rest of the samples