

Addition reaction (properties and identification of hydrocarbons)

Objectives:

1. Know how to run qualitative analysis for unknown samples.
2. To be able to run tests that differentiate between saturated and unsaturated hydrocarbons

Chemicals:

1. cyclohexane
2. cyclohexene
3. bromine
4. distilled water

Apparatus:

Test tubes, droppers.

Theory:

Hydrocarbons are compounds that only contain carbon and hydrogen. Hydrocarbons can be classified further by the type of bonds they contain. If a hydrocarbon contains only single bonds, it is an **alkane**. If it contains one or more carbon-carbon double bonds, it is classified as an **alkene**. If it contains one or more triple bonds between two carbon atoms, it is an **alkyne**. If it contains a benzene ring, it is considered **aromatic**. (If it does not contain a benzene ring, it is **aliphatic**. Therefore, alkanes, alkenes, and alkynes are all aliphatic hydrocarbons.) These types of compounds react in different ways, so it is possible to distinguish between them using experimental tests.

Halogenation

All hydrocarbons can be **halogenated** under certain conditions. Alkanes are very unreactive, but they can be brominated or chlorinated in the presence of ultraviolet (UV) light. This is a **substitution** reaction in which a hydrogen is removed from the alkane and a halogen (Br or Cl) takes its place. The halogen atom can substitute at any site on the molecule. Furthermore, the halogenated products can react further to give disubstituted or trisubstituted products (and so on). This reaction is therefore not at all selective, and mixtures of many products will result.

In this experiment, the bromination of several compounds will be attempted. A solution containing bromine will be added to the compounds being tested. The bromine has an orange or brown color. If this color disappears, it means that the bromine is getting used up and therefore the compound is reacting with the bromine. Thus, disappearance of the orange color corresponds to a positive reaction.

Procedure:

- 1- You will be testing 2 different liquids: hexane, cyclohexene.
- 2- Place 5 drops of each liquid to be tested in separate clean, dry test tubes.
- 3- Label the tubes. Carefully add 3 drops of the bromine solution to each tube.
- 4- Note whether the orange color of the bromine disappears immediately or not.
The disappearance of the bromine color is a positive reaction

Results:

Justify your results with equations.