Identifying aldehydes and ketones

Transcript

A functional group is an atom, or group of atoms, within an organic compound that determine the characteristic reactions of a homologous series. Some familiar examples include **alkanes**, **alkenes**, **alcohols**, **aldehydes**, **ketones**, **esters** and **amines**.

Unknown organic compounds can be identified using qualitative tests. Here, the tests for identifying aldehydes and ketones are described.

To distinguish between an aldehyde and a ketone, in organic chemistry, two different tests can be carried out. The Fehling's test or the Tollen's silver mirror test.

First, Fehling's reagent is added to two test-tubes.

Then propanal is added to test-tube 1 and propanone is added to test-tube 2.

Both test-tubes are placed in a hot water bath for about 5 minutes.

In test-tube 1, a brick red precipitate forms. In test-tube 2, there is no colour change as oxidation has not occurred.

The propanal in test-tube 1 is oxidised to a carboxylic acid. The copper(II) ions are reduced to copper(I) ions producing the brick red precipitate. Propanone is a ketone and is not oxidised.

In the Tollen's test, first Tollen's reagent is added to the labelled test-tubes 3 and 4. Tollen's reagent is a silver ammonium complex.

Propanal is added to test-tube 3 and propanone is added to test-tube 4.

The tubes are shaken and placed in a warm water bath.

A silver coating forms on the inside of test-tube 3. No silver mirror is observed in test-tube 4

The propanal in test-tube 3 contains an oxidisable hydrogen atom attached to the carbonyl group. However, in propanone, there is no such hydrogen atom. Propanone is therefore unable to reduce the silver ions and so no silver mirror forms.

The contents of the test-tube are then flushed down the sink with plenty of water as quickly as possible as explosive by-products can form.

To test for the presence of a carbonyl bond, within an aldehyde or ketone, Brady's reagent is used.

Brady's reagent is prepared by dissolving 2,4-dinitrophenylhydrazine in a solution containing some concentrated phosphoric acid.

A positive test would the production of a yellow, orange or red precipitate.

Into test-tube 1, benzaldehyde solution is added and into test-tube 2, methylbenzene solution is added.

Next, a few drops of Brady's reagent are added to each test-tube.

Immediately, a bright orange precipitate forms in test-tube 1 confirming the presence of a carbonyl group.

Test-tube 2 does not produce a precipitate as methylbenzene does not contain a carbonyl group.

In these experiments, the qualitative tests for identifying aldehydes and ketones have been described.