

Oxidation of ethanol to ethanal

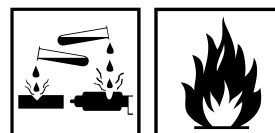
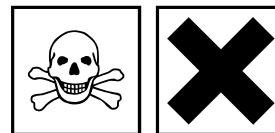
Aims

To oxidise ethanol to ethanal (an aldehyde), and to compare the properties of these two compounds.



Apparatus

Goggles	Delivery tube and bung	Stand, boss, clamp
Bench mat	250cm ³ beaker	Weighing bottle
Boiling tube	Teat pipettes	Digital balance
Test tubes	Bunsen burner	Broken porcelain



Reagents

Ethanol	2M sodium hydroxide solution	Silver nitrate solution
Sodium dichromate(VI)	1M ammonia solution	Fehling's solutions 1 and 2
1M sulphuric acid	0.5M sodium carbonate solution	Universal Indicator solution

Methods

Part One Oxidation of ethanol to ethanal

- Place about 10cm³ of dilute sulphuric acid in the boiling tube. Add 2–3g of sodium dichromate(VI) and a few pieces of broken porcelain. Shake the contents of the tube until the solution is complete (warm if necessary).
- Cool the mixture and add 1–2 cm³ of ethanol **dropwise**, shaking the tube between additions.
- Connect the delivery tube and bung to the boiling tube, and clamp it. Apply **gentle** heat to distil 2–3 cm³ of your product into a test tube. Make sure that none of the reaction mixture splashes over.

Part Two Tests on your product

- Notice the smell of your product. Compare it with that of ethanol.
- Find out if your product will neutralise sodium carbonate solution.
- Mix 1cm³ of Fehling's solution 1 with 1cm³ of Fehling's solution 2 in a test tube. Add a few drops of your product, **carefully** boil the mixture, and note the result.
- Put 2 cm³ of silver nitrate solution in a test tube, add **one** drop of sodium hydroxide solution, then add just enough ammonia solution to bring the precipitate formed into solution.

Do not allow this mixture to stand because it sometimes forms dangerously explosive silver salts.

Add a few drops of your product and warm **very carefully**. Repeat this test with ethanol.

Analysis

- Fehling's solution contains a copper(II) compound.
 - What might the precipitate be when ethanal was added to the Fehling's solution?
 - What type of reaction has taken place, and what does this tell you about the nature of the aldehyde?
- Write equations for the reactions you have observed.

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Technician's Notes

In addition to normal laboratory apparatus:

Per class

Minimum of one digital top pan balance

Small pieces of broken porcelain

Reagents:

Sodium dichromate(VI) with a small spatula

Ethanol (allow 4cm³ per student)

Fehling's solutions 1 and 2 (allow 2cm³ of each per student)

0.5M sodium carbonate solution (Na₂CO₃) (allow 5cm³ per student)

Please ensure plentiful supply of:

- bench sulphuric acid
- bench sodium hydroxide solution
- ammonia solution
- silver nitrate solution
- Universal Indicator solution

Per student

2 x boiling tubes

4 x test tubes

2 x teat pipettes

1 x wash bottle of de-ionised water

1 x 10cm³ measuring cylinder

Delivery tube and bung to fit one of the boiling tubes:

