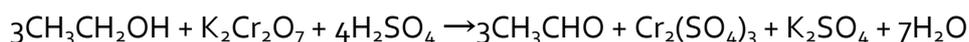


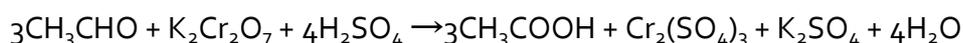
# Ethanol

## Background

Under acidic conditions ethanol is oxidised to acetaldehyde by potassium dichromate.



The acetaldehyde is itself oxidised to acetic acid.



As the dichromate oxidises the reactants it is reduced to trivalent chromium  $\text{Cr}^{3+}$  which is green.

The intensity of the green colour can be measured with the colorimeter and compared to known concentrations to measure the concentration of ethanol in the original sample.

It should be noted that other organic molecules can also be oxidised by dichromate with similar results, though the only example we have found where this is significant is the oxidation of glucose.

## Method

The test sample is acidified with  $\text{H}_2\text{SO}_4$  and heated. Different concentration of the acid and different incubation temperatures can be tried and will give different results.

The method we have used and described in the example illustrated used  $0.5\text{cm}^3$  of sample to which was added  $1\text{cm}^3$  of  $1\text{M H}_2\text{SO}_4$ .

Incubation was at  $50^\circ\text{C}$  for 30 minutes.

The colour change can be measured at this point or after the addition of  $2\text{cm}^3$  of  $2\text{M NaOH}$  (corrosive) to remove the remaining dichromate and reveal the green chromium  $\text{Cr}^{3+}$

### SAFETY

$1\text{M H}_2\text{SO}_4$  should be labelled 'Irritant'

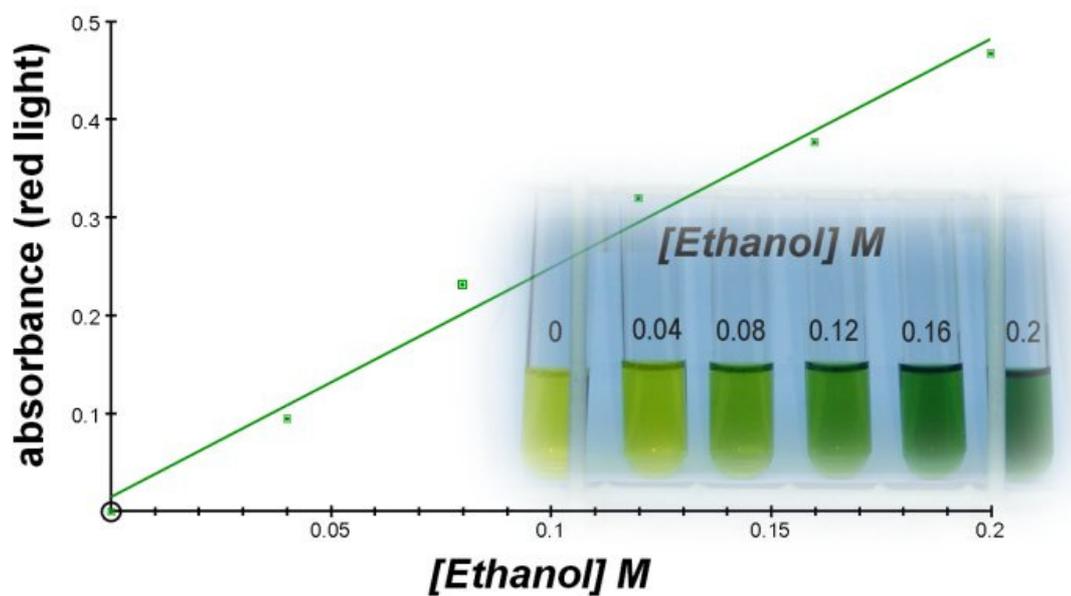


$2\text{M NaOH}$  should not be used with pupils before Y9 (S3, age 14) and should be labelled 'Corrosive'.  
The method works without the addition of  $\text{NaOH}$  though the green colour is less apparent.



## Standard curve

Using the method described above the results shown below were obtained. (0.1M = 0.46%). For higher concentrations of ethanol, e.g to measure the ethanol in alcoholic drinks, less powerful reagents can be used to reduce the safety issues.



More details, suggestions for investigations and sample results can be viewed on the Mystrica website, [www.mystrica.com](http://www.mystrica.com)