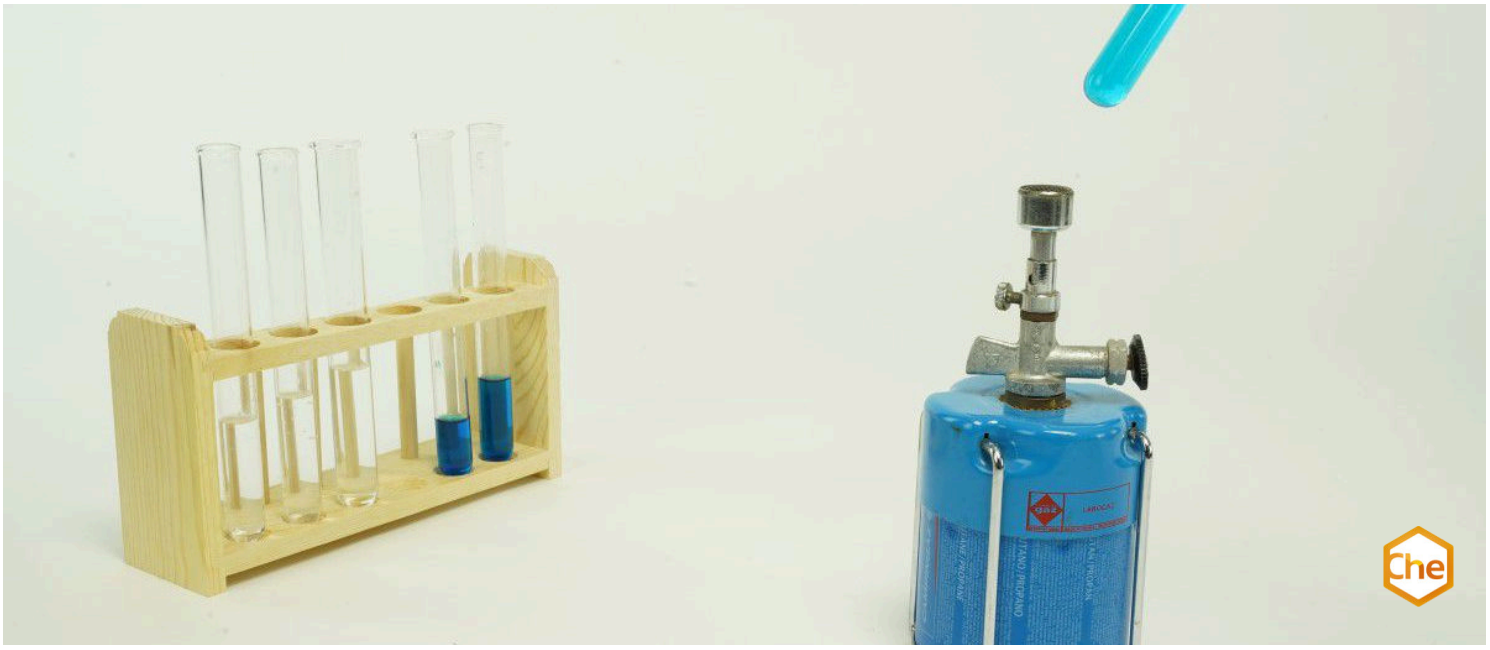
Schiff's test and Fehling's test



Chemistry > Organic chemistry > Organic compounds containing oxygen

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/638b2b2aabe2e70003a7e472

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Teacher information

Application

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The experimental setup

The substance group of alkanals (aldehydes) and alkanones (ketones) represent the oxidation products of alcohols. Primary alcohols oxidise to alkanals and secondary alcohols to alkanones. These two groups of substances can be distinguished via the Schiff and Fehling samples. Alkanals react with Schiff's reagent with violet colouration, with Fehling's solution with the formation of a yellow-red precipitate. Alkanones do not show this reaction.

This can be traced back to the property that alkanals can oxidise further (e.g. to carboxylic acids) whereas this is not possible with alkanones.

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Other teacher information (1/5)

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Prior knowledge

The students should already have basic knowledge about the substance group of alkanes and their nomenclature.

Further, students should be familiar with the basics of working safely with chemicals and a butane or Bunsen burner.

Principle

This and other investigation reactions (silver levels) for aldehydes and ketones are based on the further oxidisability of the alkanals due to the presence of hydrogen at the oxidising carbon atom.

Other teacher information (2/5)

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Learning objective

The students should learn that alkanals can be distinguished from alkanones by reacting with fuchsin sulphurous acid (Schiff's sample) and with Fehling's solution. The reaction with both solutions is based on the oxidisability of alkanals, which is no longer given with alkanols.

Tasks

Perform the Schiff's test and the test with Fehling's solution.

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Other teacher information (3/5)

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Notes on set-up and procedure

Preparations

Prepare the vessels with the oxidation products from the previous experiment (P7172300).

Notes on the student experiments

Make sure that the test tubes containing Fehling's solution are heated carefully. This shows strong boiling distortion and tends to splash out intermittently.

The experiment can still be carried out with a regular Bunsen burner.

Other teacher information (4/5)

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Notes

Alkanals (aldehydes) can be distinguished from alkanones (ketones) by the reaction with fuchsin sulphurous acid (Schiff's reagent) and with Fehling's solution. Alkanals react with Schiff's reagent under violet colouration, with Fehling's solution under formation of a yellow-red precipitate. Alkanones do not show this reaction. The oxidation of 1-propanol must therefore have produced an alkanal and the oxidation of 2-pronanol an alkanone.

The solutions contained in Fehling's Cu^{2+}-ions become Cu^{1+}-ions. Alkanals are therefore further oxidisable, alkanones are not.

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Other teacher information (5/5)

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Disposal

- Filter off the copper oxide from the Fehlingscheln solution and add to the heavy metal waste.
- Put remaining solutions into the collection container for flammable organic liquids.

Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

For H- and P-phrases please consult the safety data sheet of the respective chemical.

Dangers

- Alkanals and alkanones are highly flammable. Extinguish all open flames when filling! Wear protective goggles!
- Remove all storage bottles before heating. Place the burner at a sufficient distance from the beaker!
- Acetaldehyde is harmful to health. Do not inhale!
- Carry out the test under the fume cupboard!

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Student information

Motivation

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An alkanol

When alcohol is oxidised, either an alkanol or an alkanone is obtained. Although both groups of substances are oxidation products of alcohol, they have different properties. The exact differentiation is therefore extremely important and is made possible by several different detection reactions, which are only effective for one of the two substance groups.

The Schiff and Fehling samples are examples of such detection reactions, which we will get to know better in this experiment.

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Tasks

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The experimental setup

Perform the Schiff's test and the test with Fehling's solution.

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Equipment

Position	Material	Item No.	Quantity
1	Test tube, 180x18 mm,100pcs	37658-10	1
2	Test tube brush w. wool tip,d20mm	38762-00	1
3	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
4	Test tube holder, up to d 22mm	38823-00	1
5	Laboratory pen, waterproof, black	38711-00	1
6	Protecting glasses, clear glass	39316-00	1
7	Pipette with rubber bulb	64701-00	4
8	Acetone, extra pure, 1000 ml	30004-70	1
9	Fehling's solution I 250 ml	30079-25	1
10	Fehling's solution II 250 ml	30080-25	1
11	Butane burner with cartridge, 220 g	32180-00	1
12	Schiff's reagent 250 ml	31827-25	1

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Additional equipment

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Additional equipment	
	Oxidation product of 1-propanol from the experiment "The oxidation of alkanols".
	Oxidation product of 2-propanol from the experiment "The oxidation of alkanols".

Set-up (1/1)

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1. Number the test tubes from 1 to 8.

2. Fill test tubes 1 to 4 with Schiff's reagent (filling height approx. 2 cm).

3. Add 5 to 8 Fehling's solution I (filling level 1 cm) to the test tubes and about the same amount of Fehling's solution II until a deep blue solution is formed.

Figure 1

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Procedure (1/2)

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Figure 1

1. Pipette one drop of acetaldehyde into test tube (RG) 1, two drops of acetaldehyde into RG 5.

2. Change the pipette. Add one drop of acetone to RG 2, two drops of acetone to RG 6 (Fig. 2).

3. Using the third pipette, pipette two drops of the solution containing the oxidation product of 1-propanol (dispensed by the teacher) into RG 3. Also add 5 drops of this to RG 7.

4. Using the fourth pipette, pipette two drops of the solution containing the oxidation product of 2-propaol (dispensed by the teacher) into RG 4. Also add 5 drops of this to RG 8.

Procedure (2/2)

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Figure 1

5. Heat the test tubes 5 to 8 briefly one after the other in the burner flame (Fig. 3). Swirl them a little so that no liquid spurts out. Do not heat until boiling!

Disposal

Leave test tubes in the test tube rack for disposal.

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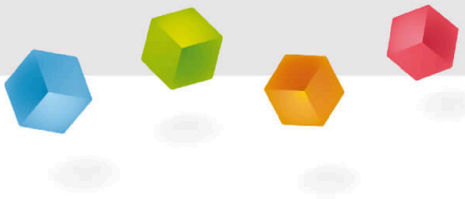

Report

Task 1

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Write down your observations.

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Task 2

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Summarise your observations in the table.

	Fehling's sample	Schiff's sample
Acetaldehyde (ethanal)		
Acetone (propanone)		
Oxidation product of 1-propanol		
Oxidation product of 2-propanol		

Task 3

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Drag the words into the correct boxes!

The Fehling sample is used for _____ of _____ and reduced sugars. This is a _____ which leads to the _____ of copper(I) oxide when struck.
If the sample is negative, the Fehling solution remains as a light blue _____ .

precipitation
redox reaction
liquid
aldehydes
detection

Check

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Task 4

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Which substance class is detected with the schiff sample?

- Aldehydes
- Alkanes
- Sulphides
- Acetate

Task 5

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Alkanals and alkanones differ in that in alkanals the carbonyl group has both a bond with an organic radical and one with a hydrogen atom.

Alkanones, on the other hand, are connected in both bonding directions with another carbon atom. Alkanals can oxidise further, whereas alkanones cannot.

○ True ○ False

Check

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Slide	Score / Total
Slide 20: Fehling	0/5
Slide 21: Schiff's sample	0/1
Slide 22: Ketones	0/1

Total 0 / 7

Solutions | Repeat | Export text

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