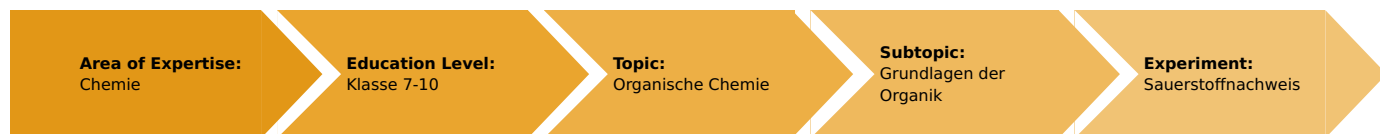


The detection of oxygen (Item No.: P7170300)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

organic compounds, tests for oxygen

Task and equipment

Information for teachers

Learning objectives

- A very large number of organic compounds contain oxygen.
- Oxygen can be detected as water when such substances decompose.

Notes on setup and procedure

Preparation:

Egg white (albumin) can be used instead of casein, which smells strongly when decomposing. Normal sugar can be used instead of glucose. Prior to the experiment the organic substances must be dried overnight in a drying oven at approx. 80 °C, as otherwise they would in any case liberate water when heated.

Remarks on the students experiments:

Stop heating as soon as the substances start to decompose, as otherwise the odour nuisance will be too great. Carry out the experiments in a fume hood when possible.



Hazard and precautionary statements

Citric acid:

H319:	Causes serious eye irritation.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
P501:	Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

Copper(II) sulphate, anhydr.:

H302: Harmful if swallowed.

H410: Very toxic to aquatic life with long lasting effects.

P273: Avoid release to the environment.

P501: Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

Hazards

- Gases with an unpleasant smell are evolved when the substances are heated. Do not inhale them! Air the room well!
- Wear protective glasses!

Remarks on the method

In a demonstration experiment the indirect detection can be carried out under a nitrogen atmosphere or vacuum to prove that the oxygen really does originate from the compound.

Waste disposal

- Put decomposition products in the biodegradable waste (compost) or in the normal house waste
- Dissolve the copper sulphate and dispose the solution as heavy metal waste.

The detection of oxygen (Item No.: P7170300)

Task and equipment

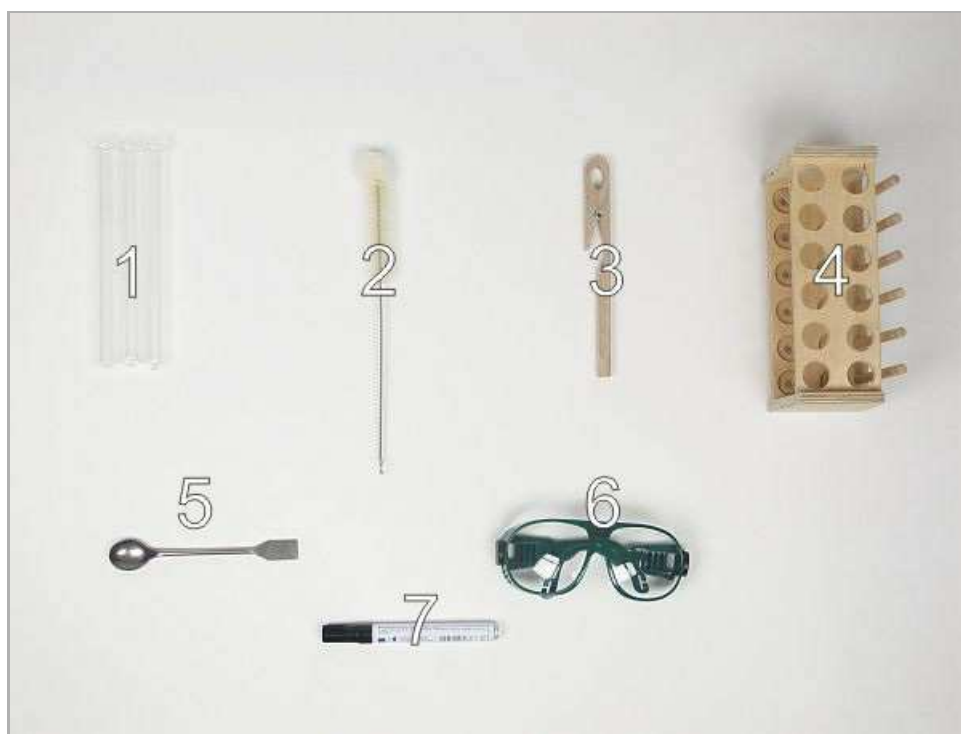
Task

Which other elements can organic compounds contain? (1)

Examine various organic compounds for oxygen content.



Equipment



Position No.	Material	Order No.	Quantity
1	Test tube, 180x18 mm,100pcs	37658-10	(3)
2	Test tube brush w. wool tip,d25mm	38762-00	1
3	Test tube holder, up to d 22mm	38823-00	1
4	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
5	Spoon, special steel	33398-00	1
6	Protecting glasses, clear glass	39316-00	1
7	Labor pencil, waterproof	38711-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Citric acid 250 g	30063-25	1
	D(+)-glucose 1000 g	30237-70	1
	Casein, alkali-soluble 100 g	31188-10	1
	Copper-II sulphate, anhydr. 250 g	31495-25	1

Set-up and procedure

Set-up

Hazards

- Gases with an unpleasant smell are evolved when the substances are heated. Do not inhale them! Air the room well!
- Wear protective glasses!



Procedure

Number the test tubes from 1 to 3 and put them in the test tube rack (Fig. 1+2).

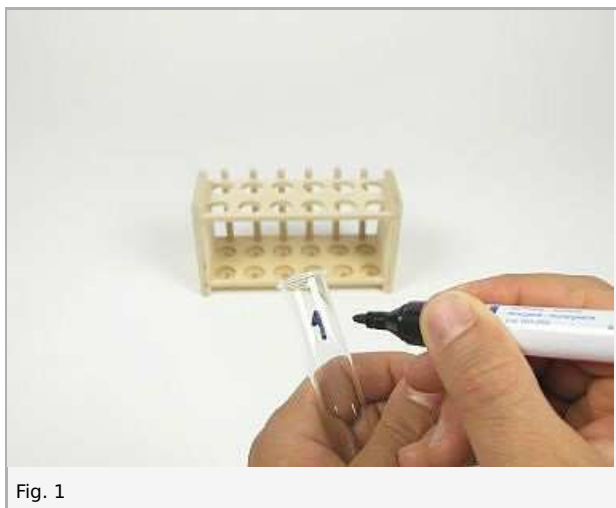


Fig. 1



Fig. 2

Put half a spoonful of citric acid in test tube 1 (Fig. 3), put the same amount of glucose in test tube 2 and of casein in test tube 3.



Fig. 3

Heat test tube 1 in the flame of the Bunsen burner, holding it horizontally (Fig. 4).



Fig. 4

Sprinkle some anhydrous copper sulphate onto the drops of liquid which are formed (Fig. 5).

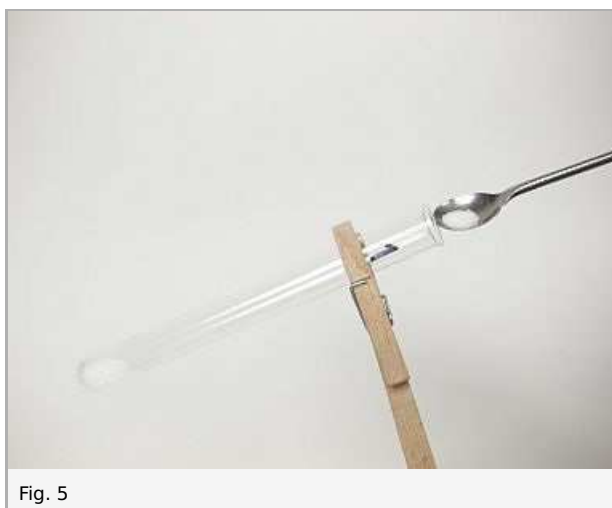


Fig. 5

Repeat this procedure with the other substances.

Waste disposal

- Put decomposition products in the biodegradable waste (compost) or in the normal house waste
- Dissolve the copper sulphate and dispose the solution as heavy metal waste.

Report: The detection of oxygen

Result - Observations

Note the observations you make when heating the substances.

- a) Citric acid.
- b) Glucose.
- c) Casein.

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Result - Table 1

Record the results of the copper sulphate test in the following table.

Procedure	Result
Decomposition of citric acid	The anhydrous copper sulphate turns blue. 1
Decomposition of glucose	The anhydrous copper sulphate turns blue. 1
Decomposition of casein	The anhydrous copper sulphate turns blue. 1

Evaluation - Question 1

Draw conclusions from your observations.

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Evaluation - Question 2

Which elements were detected in these experiments?

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Evaluation - Question 3

With which oxygen containing organic compounds does this experiment fail?

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