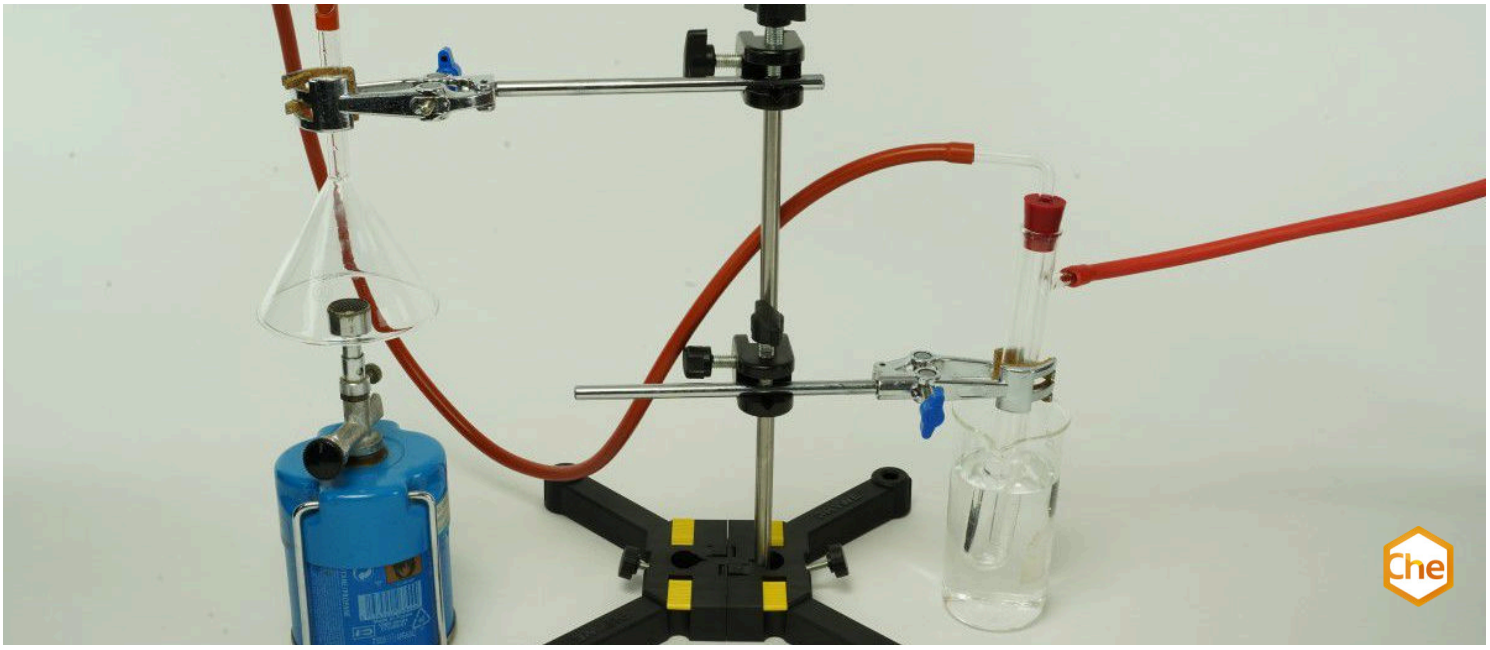
Water, an oxide



Chemistry > Inorganic chemistry > Water

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/634122751fa0ea00031e40ce

PHYWE
Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

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Teacher information

Application

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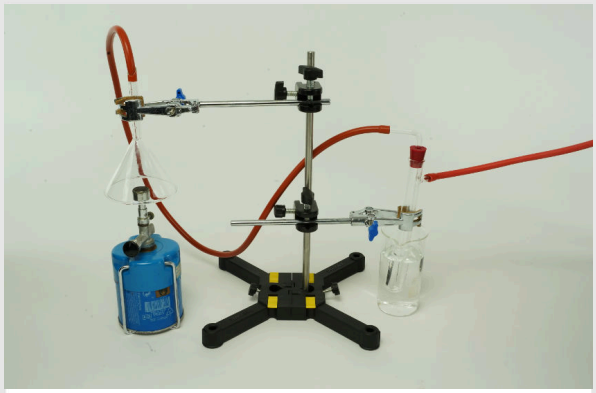

The experimental setup

Water plays an essential role in everyday life. Water is also used in many ways in chemistry. The question of whether pure water is an element, a pure substance or a compound can be answered experimentally by the fact that when substances containing hydrogen (hydrocarbons) are burnt, water is produced in addition to carbon dioxide.

The experiment then makes it clear that water is a compound, namely an oxide.

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Fax: 0551 604 - 107

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Other teacher information (1/3)

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Prior knowledge

The students should have knowledge of the periodic table. Furthermore, the students should already know the terms reduction and reducing agent, as well as the difference between elements and compounds, which can be clearly understood and deepened through this experiment.

Students should know the basics of working with chemicals and be able to work with a butane gas or Bunsen burner.

Principle

In the experiment, the students observe the combustion of substances containing hydrogen and conclude from their observations which processes produce water.

Other teacher information (2/3)

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Learning objective

1. The students learn that water is not an element, but a compound.
2. Since water is formed by the combustion of hydrogen-containing substances, water is an oxide.

Tasks

1. Carry out burns of a) butane or natural gas and b) methylated spirits. Write down the observations.
2. Infer from the observations whether water is a compound or an element and how it is formed.

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Other teacher information (3/3)

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Notes on the set-up and procedure

- Instead of ice water, you can also use chilled water (from the refrigerator). When using water at room temperature as a coolant, the condensation effect is very low.
- The use of a water jet pump is not absolutely necessary. Combustion gas can also be sucked in with a pipetting ball or peleus ball or negative pressure can be dispensed with altogether. Without negative pressure, however, only the smallest amounts of condensed water are produced, which are hardly visible to the naked eye, but would require detection reactions, e.g. with copper sulphate.

Safety instructions

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

Methylated spirits are highly flammable. Extinguish all open flames!

Put on protective goggles!

Make rubber-glass joints slippery with glycerine. Do not use force!

For H and P phrases, please refer to the safety data sheet of the respective chemical.

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Student information

Motivation

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Water: an element?

Whether in a lake, river, the sea, rain, snow or morning dew, water is omnipresent to us. Even our bodies consist to a large extent of water. People were already aware of the importance of water in ancient times, and since then it has been one of the classical elements, along with air, fire and earth.

But is water really an element or is it a compound?

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Tasks

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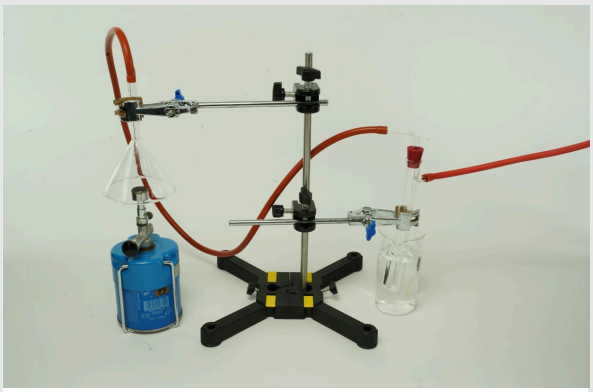

The experimental setup

1. Carry out burning of
   - Butane or natural gas
   - Methylated spirits.

Note down the observations.

2. Deduce from the observations whether water is a compound or an element and how it is formed.

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Equipment

Position	Material	Item No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
3	Boss head	02043-00	2
4	Porcelain dish, 75ml, d = 80 mm	32516-00	1
5	Crucible tongs, 200 mm, stainless steel	33600-00	1
6	Funnel, glass, top dia. 80 mm	34459-00	1
7	Beaker, Borosilicate, tall form, 250 ml	46027-00	1
8	Test tube,180x20 mm,side arm,PN19	MAU-17080301	1
9	Graduated cylinder, 10 ml, plastic	36636-00	1
10	Glass tubes,right-angled	MAU-10030701	1
11	Test tube rack f. 6 tubes, wood	37685-10	1
12	Universal clamp	37715-01	2
13	Test tube brush w. wool tip,d20mm	38762-00	1
14	Rubber stopper, d = 22/17 mm, 1 hole	39255-01	1
15	Rubber tubing, i.d. 6 mm	39282-00	1
16	Protecting glasses, clear glass	39316-00	1
17	Glycerol, 250 ml	30084-25	1
18	Denaturated alcohol (spirit for burning), 1000 ml	31150-70	1
19	Wood splints, package of 100	39126-10	1
20	Butane burner with cartridge, 220 g	32180-00	1
21	Water jet pump, plastic	02728-00	1
22	Rubber tubing,vacuum,i.d.6mm	39286-00	1

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Set-up (1/2)

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1. Assemble the support with the suppoprt base, the support rod and the two sleeves according to Fig. 1 - Fig. 3.

2. Then attach the universal clamps at right angles to each other (Fig. 4).

Figure 1

Figure 2

Figure 3

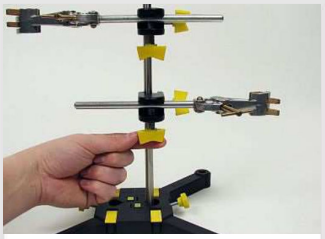

Figure 4

Set-up (2/2)

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3. Put a drop of glycerine on the end of the angle tube and turn it carefully and deeply into the hole of the stopper (fig. 5). Do not use force!

4. Close the test tube with the stopper (Fig. 6) and clamp it and the tricher each in a universal clamp.

Connect the glass funnel and the angled tube with a piece of tubing to form a closed apparatus. (Fig. 7)

5. Immerse one third of the test tube in a beaker filled with ice water (Fig. 8).

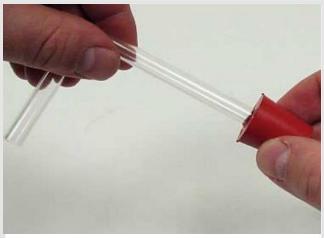

Figure 5

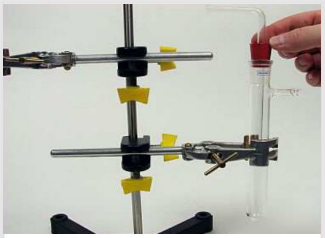

Figure 6

Figure 7

Figure 8

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Procedure (1/2)

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Figure 9

Figure 10

1. Connect the water jet pump via the vacuum hose to the attachment nozzle of the test tube (Fig. 9) and set a mild negative pressure.

2. Hold the pilot light of the burner under the funnel and let the combustion products flow through the apparatus for about 5 minutes (Fig. 10).

3. Pour out the ice water and dry the beaker. Extinguish the burner flame.

Procedure (2/2)

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Figure 11

Figure 12

4. Fill the evaporating dish with approx. 3 ml methylated spirits, remove the filling bottle and the measuring cylinder.

5. Light the wood chip, extinguish all other flames and light the methylated spirit with the wood chip (Fig. 11).

6. Hold the bottom of the dry and still cool beaker over the methylated spirit flame with the crucible tongs (Fig. 12).

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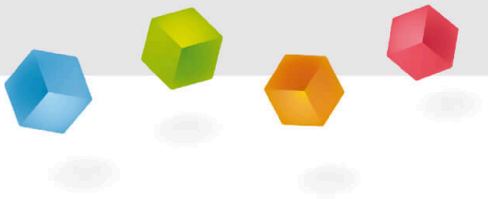

Report

Task 1

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Write down your observations.

Bunsen burner flame:	
Methylated spirits flame:	

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Fax: 0551 604 - 107

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Task 2

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According to the results of the experiment, to which substance class does water belong?

- **Oxides**
- **Noble gases**
- **Halogens**
- **Alkanes**

Which of these substances is found among the products of these oxidation reactions?

- Water
- Ammonia
- Helium
- Carbon monoxide

Task 3

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Water is a chemical element.

○ True ○ False

Check

The chemical formula of water is H_2O.

○ True ○ False

Check

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Slide	Score / Total
Slide 17: Multiple tasks	0/2
Slide 18: Multiple tasks	0/2

Total 0 / 4

Solutions | Repeat | Export text

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Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
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