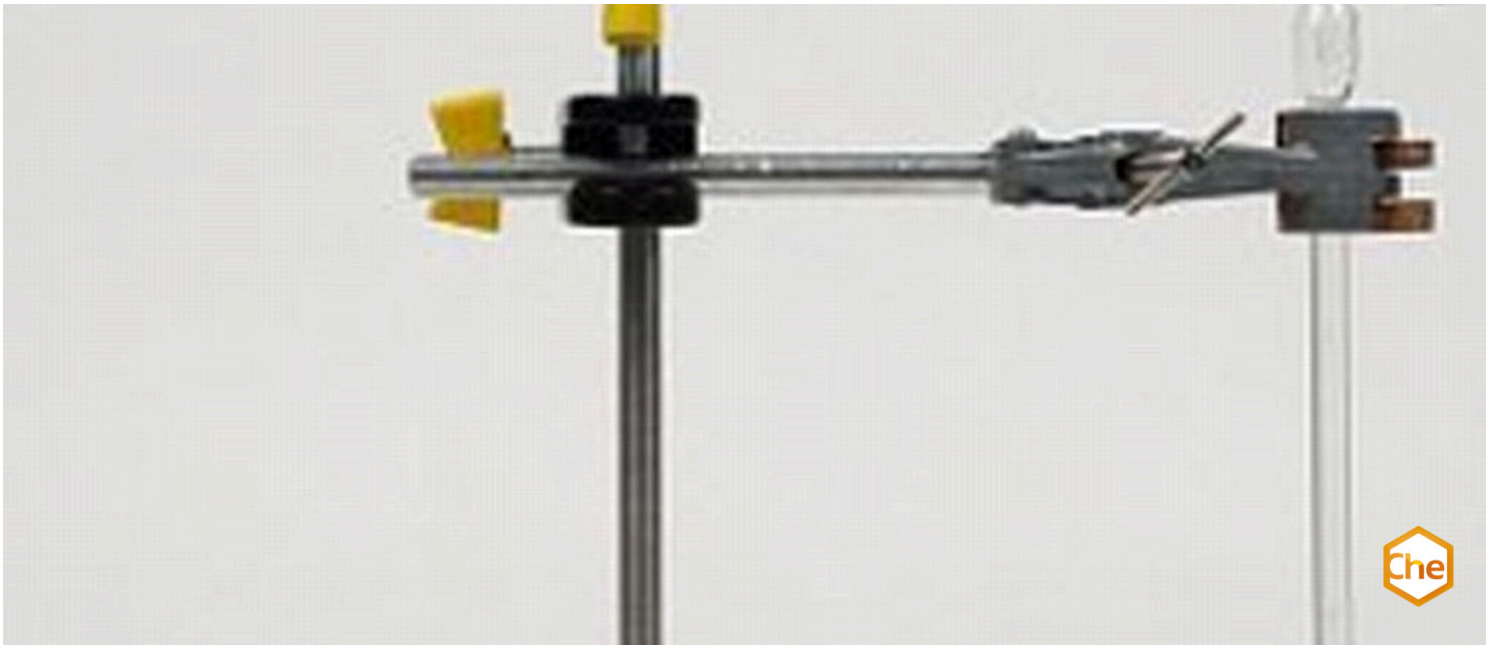
Properties of oxygen



In this student experiment, oxygen is produced from the reaction of manganese oxide with hydrogen peroxide and then examined for its properties.

Chemistry > Inorganic chemistry > Air, Combustion & Gases

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/6331f654e9165200034699e5

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Teacher information

Application

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A method of extracting oxygen

Oxygen is essential for life and, in addition to photosynthesis, can also be produced by many plants by chemical means. Oxygen is a component of many compounds and can thus be released as an element from oxygen-rich compounds.

In this student experiment, oxygen is produced from the reaction of manganese oxide with hydrogen peroxide and then examined for its properties.

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Other teacher information (1/2)

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Prior knowledge

Basic properties of oxygen and its biological significance should be known by the students.

Principle

In this experiment, oxygen is extracted from hydrogen peroxide through the catalytic effect of the manganese dioxide.

Other teacher information (2/2)

PHYWE

Learning objective

Oxygen is a component of many compounds and can be released from oxygen-rich compounds as an element. Oxygen has characteristic properties by which it can be identified.

Tasks

- Make oxygen from a compound and investigate its properties. Write down your observations.
- From which substances could oxygen have evolved? Name a substance you know that can also give off oxygen.
- Draw the conclusions from the observations.
- Enter the observed properties in the general substance profile, complete it by finding the missing information from the textbook.

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Safety instructions

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- For this experiment, the general instructions for safe experimentation in science lessons apply. For H and P phrases, please consult the safety data sheet of the respective chemical.
- Manganese compounds are harmful to health. Do not swallow! Hydrogen peroxide is corrosive. Put on protective goggles! Make rubber-glass connections slippery with water. Do not use force when inserting the glass tubes!

Disposal

- Filter the contents of the flask and put the filtrate into the container for acids and alkalis. Add the residue to the heavy metal waste. Remove manganese residues adhering to the flask with acidified sodium thiosulphate solution and dispose of as with the filtrate.

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Student information

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Motivation

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Photosynthetically active plants

Oxygen is essential for life in many ways. Certain plants produce oxygen during photosynthesis and other metabolic pathways. For us humans, oxygen plays a significant role in cellular respiration. Without it, none of us would be able to live.

Oxygen, however, does not only occur in elemental form, but rather in a more concentrated form. Thus, a large number of compounds contain oxygen. In this student experiment, the properties of oxygen are to be investigated.

Tasks

PHYWE

- Make oxygen from a compound and investigate its properties. Write down your observations.
- From which substances could oxygen have evolved? Name a substance you know that can also give off oxygen.
- Draw conclusions from the observations and enter the observed properties in the general substance profile.

Oxygen in the air.

The air we humans breathe consists exclusively of oxygen.

False

True

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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	3
3	Boss head	02043-00	3
4	Dish, plastic, 150x150x65 mm	33928-00	1
5	Erlenmeyer flask, stopper bed, 100 mlSB 29	MAU-EK17082301	1
6	Glass tube,right-angled,.	MAU-10030703	1
7	Glass tubes,straight, 200 mm, 10	MAU-16074543	1
8	Dropping funnel with drip nozzle, 50ml	36912-00	1
9	Test tube, 180x18 mm,100pcs	37658-10	1
10	Test tube rack f. 6 tubes, wood	37685-10	1
11	Universal clamp	37715-01	3
12	Test tube brush w. wool tip,d20mm	38762-00	1
13	Test tube holder, up to d 22mm	38823-00	1
14	Rubber stopper 26/32, 2 holes 7 mm	39258-02	1
15	Rubber tubing, i.d. 6 mm	39282-00	1
16	Protecting glasses, clear glass	39316-00	1
17	Grad.cylinder,high,PP,50ml	46287-01	1
18	Spatula, powder, steel, l=150mm	47560-00	1
19	Manganese-IV oxide,powder 500 g	30138-50	1
20	Hydrogen peroxide,30%,tech.gr.,1l	31942-70	1
21	Wood splints, package of 100	39126-10	1

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Set-up (1/7)

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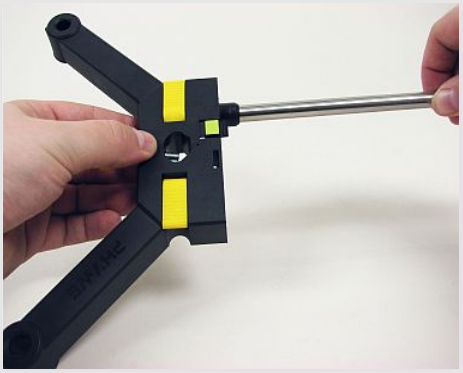
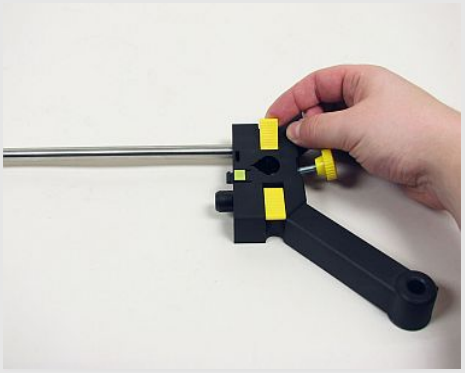
Set up the tripod according to the illustrations below.

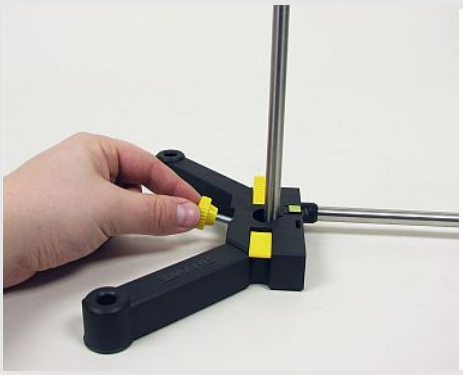




Set-up (2/7)

PHYWE

Make sure you have set up the tripod properly and place it on a flat surfaces.



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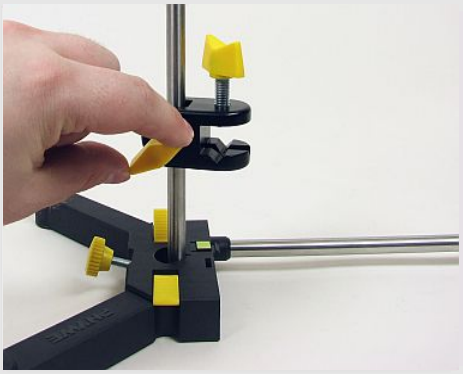
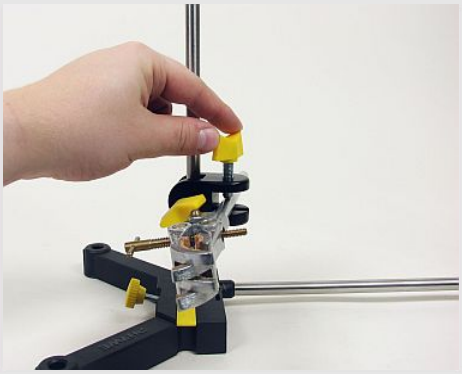
Set-up (3/7)

PHYWE

Clamp the Erlenmeyer flask so that it is secured on the work surface (Fig. left, centre and right).



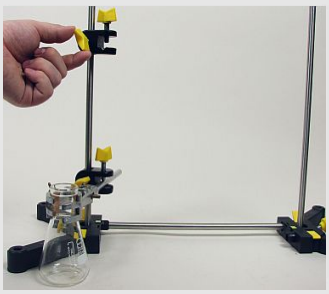


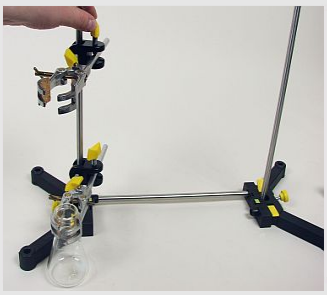
Set-up (4/7)

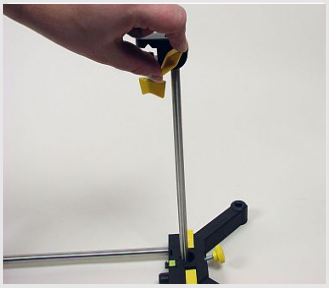
PHYWE

Attach one universal clamp to the first vertical stand rod (fig. top left + fig. top right) and a second to the second vertical stand rod (fig. bottom left + fig. bottom right).

Make sure that the universal clamps are straight and firmly attached.







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Set-up (5/7)

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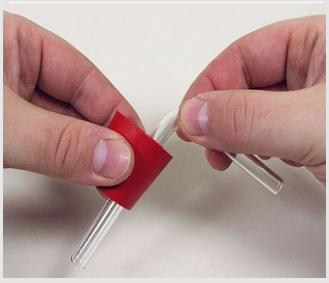
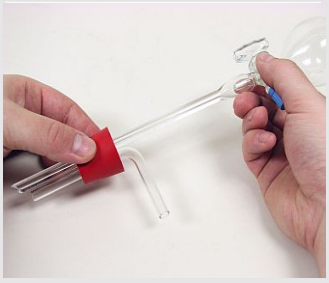
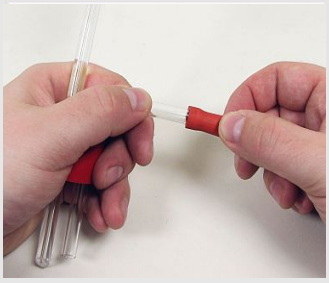
Insert the angled tube into the stopper by turning it (make it slippery with water) (Fig. top left), then insert the separating funnel into the second hole so that part of the outlet protrudes from the stopper (Fig. top right).

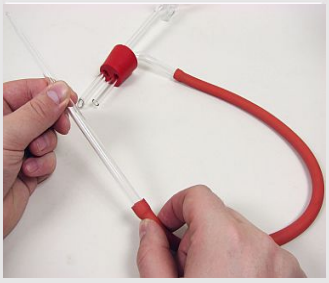
Connect the angled tube to the "gas inlet tube" (glass tube with tip) using a piece of tubing (Fig. below left + Fig. below right).

Make sure that all connections are tight and that there is no possibility for gases to escape.





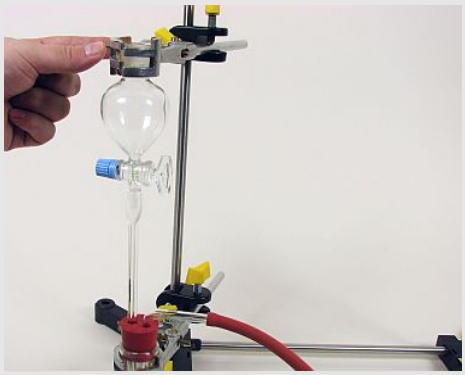




Set-up (6/7)

PHYWE

Put a spatula with manganese dioxide into the Erlenmeyer flask (fig. left) and close it with the stopper (fig. centre). Then press the stopper firmly and secure the separating funnel with the universal clamp (fig. right).



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Set-up (7/7)

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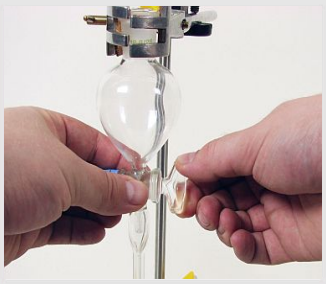
Fill the pneumatic tub about halfway with water (fig. left). Place the test tubes in the tub so that they are completely filled with water (fig. right).

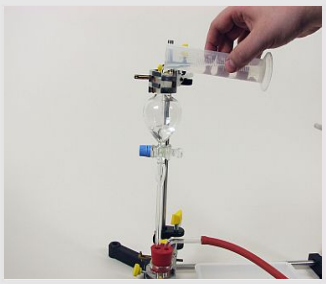
Procedure (1/3)

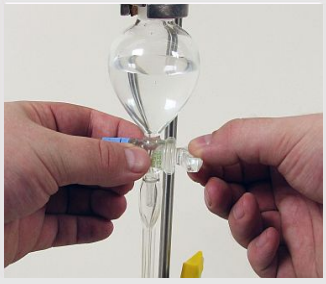
PHYWE

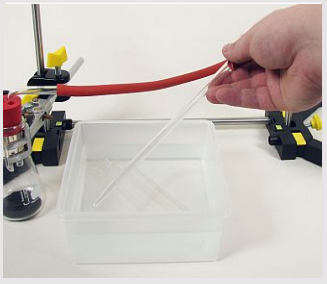
Close the tap of the separating funnel (fig. top left). Fill the measuring cylinder with 40 ml hydrogen peroxide and carefully pour it into the separating funnel (fig. top right).

Open the tap so that the hydrogen peroxide drops onto the manganese dioxide (Fig. bottom left). Put the "gas introduction tube" into the pneumatic tub and let gas escape for about 30 seconds (fig. bottom right).









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Procedure (2/3)

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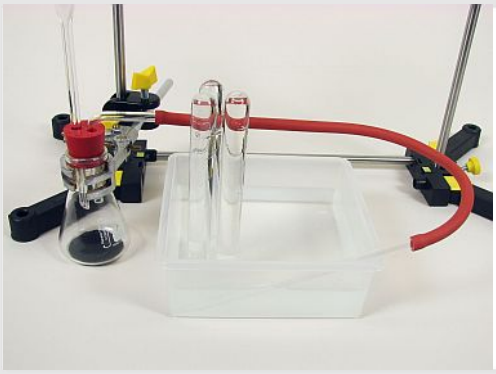
Close the test tubes one after the other with your thumb and place them upside down in the pneumatic tub without water running out (fig. left). Fill the test tubes pneumatically with the resulting gas (fig. right).



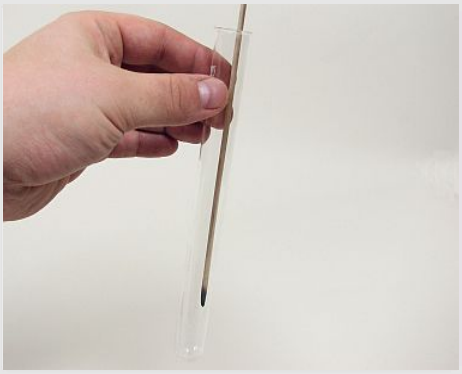
complete assembly

Filling with gas

Procedure (3/3)

PHYWE

Perform the glow chip test with the gas in the first test tube (fig. left). Clamp the second gas-filled test tube to the stand with the opening facing upwards (fig. centre). After approx. 30 seconds, also carry out the glow chip test. Finally, clamp the third test tube to the stand with the opening facing downwards (fig. right) and also carry out the glow test after approx. 30 seconds.



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Report

Task 1

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Write down your observations.

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Task 2

PHYWE

From which substances could oxygen have evolved? Name a substance you know that can also give off oxygen.

Task 3

PHYWE

Oxygen is a gas that is available in elemental form as ....

...diatomic molecule is present.

...single atom is present.

Oxygen has a ...

- ... strongly fire-reducing property.
- ... strongly fire-promoting property.

Check

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Task 4

PHYWE

Profile of oxygen.

Oxygen has the element symbol O and is _____. It occurs as a _____, has a melting point at _____ and a boiling point at _____. Oxygen occurs, for example, in our _____ and is used, for example, in _____, in the _____.

industry
-183 °C
atmosphere
welding of metals
colourless
atomic gas
-218.8 °C

Check

Slide	Score / Total
Slide 8: Components of the air.	0/4
Slide 23: Multiple tasks	0/2
Slide 24: Profile of oxygen.	0/7

Total 0 / 13

Solutions Repeat Export text

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