Model of a fire extinguisher

In this student experiment, the model of a fire extinguisher is reproduced. Here, the carbon dioxide (represented by sodium carbonate and hydrochloric acid) forms a foam with washing-up liquid, which is sprayed onto burning petrol and the flame goes out (by displacing the oxygen).

Chemistry > Industrial Chemistry > Exhaust gas cleaning, environmental protection

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/633ac176370105000319f2e5

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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Carbon dioxide fire extinguishers are used for class B fires.

This means for fires of liquid substances, as well as materials that become liquid when exposed to heat. These include petrol, paraffin and diesel.

Carbon dioxide has many advantages as an extinguishing agent. It can be used to extinguish a fire without leaving any residue. In addition, carbon dioxide is non-conductive. This makes it ideal for electrical devices and server rooms.

One can continue working directly after using carbon dioxide without any damage caused by extinguishing. When using water, powder or foam, a small extinguished fire would render the machines unusable.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Other teacher information (1/3)

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Prior knowledge

In the case of CO2 - fire extinguisher, carbon dioxide is used as the extinguishing agent.

The carbon dioxide displaces the oxygen and smothers the flame.

Principle

- In this student experiment, the model of a fire extinguisher is reproduced.
- In the process, the carbon dioxide (formed from sodium carbonate and hydrochloric acid) forms a foam with washing-up liquid, which is sprayed onto burning petrol and the flame goes out.

Other teacher information (2/3)

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Learning objective

The flame-smothering effect of carbon dioxide is used in firefighting.

In foam extinguishers, carbon dioxide is generated and sprayed as foam with a greater density than air onto the burning substances.

Tasks

- The students build a model of a foam extinguisher.
- They are investigating how to use the properties of carbon dioxide in a foam extinguisher.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
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Other teacher information (3/3)

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Note on preparation

The sulphuric acid should be pre-diluted for the students by the teacher. The concentration of sulphuric acid used by the students in the experiment should be set to 5 %.

The potassium carbonate solution should also be prepared in advance by the teacher. For best foaming, a saturated solution should be provided.

Safety instructions

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- Acids cause severe burns.
- Use protective goggles/gloves!
- The general instructions for safe experimentation in science lessons apply to this experiment.
- For H and P phrases, please refer to the safety data sheet of the respective chemical.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

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Student information

Motivation

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In the illustration on the left, the sign of a fire extinguisher is shown. Wherever you see one of these signs, you will find a fire extinguisher. Fire extinguishers usually hang on the wall or are located in special cabinets for fire extinguishers. They are usually secured against accidental activation and must therefore be unlocked before use. The safety catch is usually located below the handle. One should use a fire extinguisher with caution. If the concentration of CO2 in closed rooms is too high, it is also difficult for people to breathe and suffocation occurs. In this experiment a CO2 - fire extinguisher is made and used.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

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Tasks

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- Build a model of a foam extinguisher.
- Investigate how the properties of carbon dioxide can be used.
- Note down your observations and answer the questions in the report.

How can the properties of carbon dioxide be used?

Fire extinguishers are

Nitrogen powered

Carbon powered

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
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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	Dish, plastic, 150x150x65 mm	33928-00	1
6	Beaker, Borosilicate, tall form, 50 ml	46025-00	1
7	Erlenmeyer flask, stopper bed, 100 mlSB 29	MAU-EK17082301	1
8	Glass tube,right-angled,.	MAU-10030703	1
9	Glass tubes, right-angled, 150 x 80 mm	MAU-10022500	1
10	Dropping funnel with drip nozzle, 50ml	36912-00	1
11	Universal clamp	37715-01	2
12	Rubber stopper 26/32, 2 holes 7 mm	39258-02	1
13	Rubber tubing, i.d. 6 mm	39282-00	1
14	Protecting glasses, clear glass	39316-00	1
15	Grad.cylinder,high,PP,50ml	46287-01	1
16	Glycerol 99% 100 ml	30084-10	1
17	Sodium carbonate, anhyd. 250 g	30154-25	1
18	Sulphuric acid, 95-97%, 500 ml	30219-50	1
19	Butane burner with cartridge, 220 g	32180-00	1
20	Stand.petrol b.p.60-95 C 1000 ml	31311-70	1

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Set-up (1/5)

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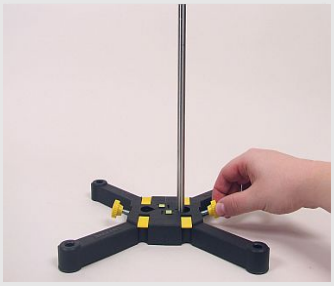
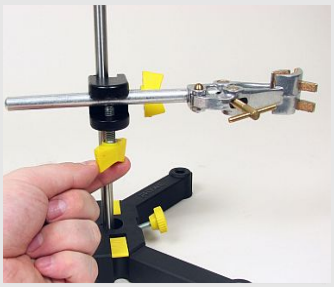
Build the tripod as shown in the picture on the right.

To do this, put the two halves of the tripod foot together and position a tripod rod in the tripod foot (as in the picture on the right).

Attach a sleeve to the stand rod and fix a clamp in this sleeve (as in the picture on the right).

Attach the Erlenmeyer flask to this so that it stands firmly on the workstation.





Set-up (2/5)

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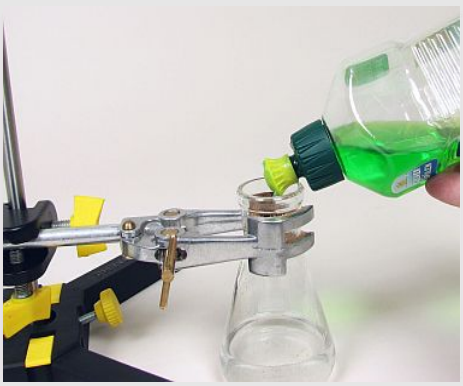
Fill the Erlenmeyer flask with 80 ml sodium carbonate solution.

Add a splash of shampoo or dishwashing liquid. Mix both solutions as shown in the pictures below,



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Set-up (3/5)

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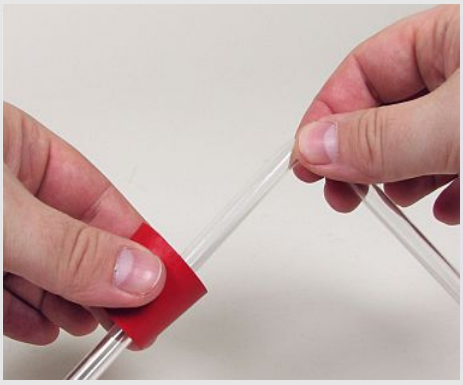
After adding a drop of glycerine, insert the long angled tube into the stopper so that it ends about 1 cm above the liquid level when closed. Then insert the dropping funnel into the second hole so that part of the outflow protrudes from the stopper and close the flask. See the illustrations below.



Set-up (4/5)

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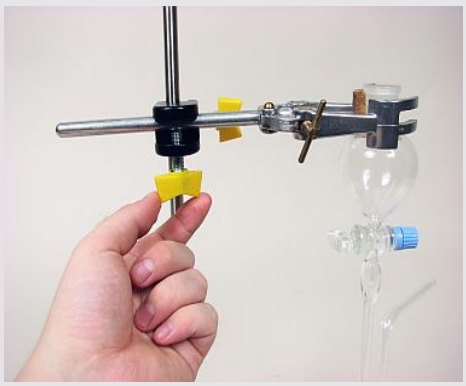
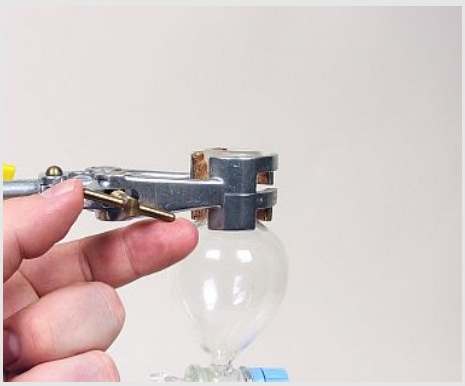
Position another socket on the stand rod and fix another clamp in it.

Secure the dropping funnel with a universal clamp as shown in the illustrations.





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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

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Set-up (5/5)

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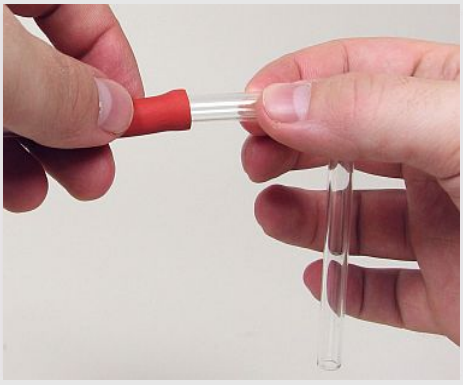
Connect the long angle pipe to the short angle pipe with a piece of hose so that its opening points downwards.

Then place the exhaust tray in the tub under the outlet of the angled tube.



Procedure (1/2)

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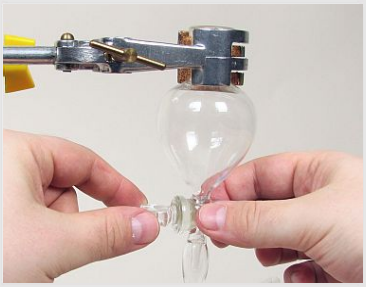

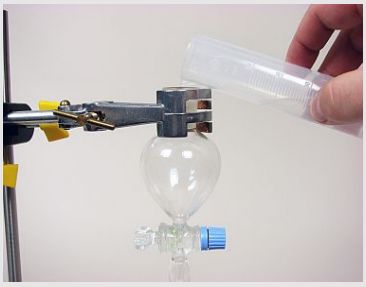

Close the tap of the dropping funnel.

Fill 40 ml hydrochloric acid into a measuring cylinder and carefully pour it into the dropping funnel. The dropping funnel is not closed with a stopper.

Be careful when handling concentrated acids. Observe the illustrations on the left when carrying out the experiment

Use a pipette to pour 1 - 2 ml of petrol into the evaporating dish.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

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Procedure (2/2)

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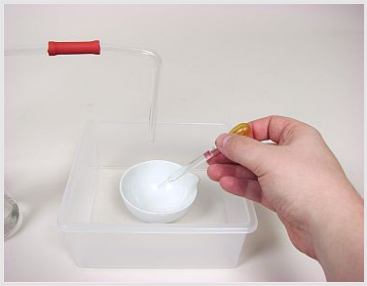

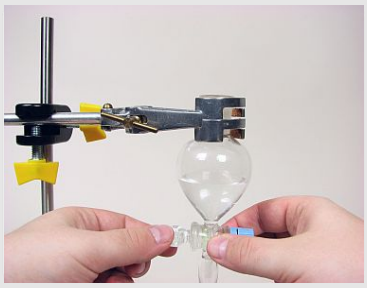

Carefully ignite the petrol in the evaporating dish and open the tap of the dropping funnel.

Press the stopper firmly and hold it during the reaction.

Disposal

Put petrol residues in the collection container for combustible organic substances.

Dispose of sodium carbonate solution in the container for acids and bases.

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Report

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

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Task 1

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Write down your observations.

Task 2

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The safety latch is usually

- marked red
- marked yellow

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

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Task 3

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Function of a fire extinguisher.

In public facilities and also in schools, _____ are to be placed in easily _____ places and marked with clearly visible _____.

Carbon dioxide extinguishing agents are suitable for _____. The extinguishing effect occurs because carbon dioxide seals off the source of the fire from the _____ and is itself not _____.

- class B fires
- combustible
- information signs
- accessible
- fire extinguishers
- air

Check

Slide	Score / Total
Slide 9: Fire extinguisher	0/1
Slide 20: Fire extinguisher assembly	0/4
Slide 21: Function of a fire extinguisher	0/6

Total 0 / 11

Solutions | Repeat | Export text

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de