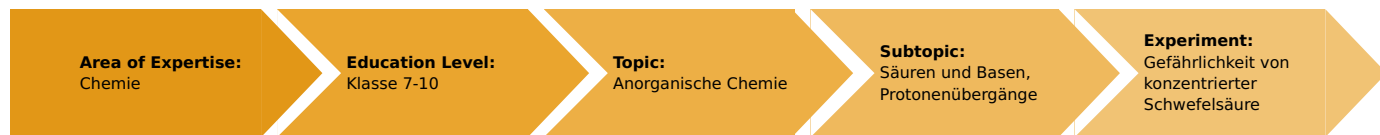


# Hazardousness of concentrated sulphuric acid

(Item No.: P7157100)

## Curricular Relevance



### Difficulty



Intermediate

### Preparation Time



10 Minutes

### Execution Time



10 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

sulphuric acid, material property, safety precautions, hazardousness

## Task and equipment

## Information for teachers

## Learning objectives

- Concentrated acids are highly dehydrating.
- When acids are diluted, a large amount of energy is released in the form of heat.

## Notes on set-up and procedure

Preparations: Not only sucrose but also glucose is very appropriate for this experiment. Even commercially available sugar can be used though in this case the charring times may vary.

Remarks on the students' experiments: Repeat the safety precautions to be taken together with the students. Use large white paper sheets allowing to spot spilled acid or acid splashes immediately.



## Hazard and Precautionary statements

Sulphuric acid:

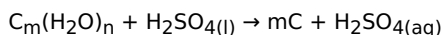
- H314: Causes severe skin burns and eye damage.  
 H290: May be corrosive to metals.  
 P280: Wear protective gloves/protective clothing/eye protection/face protection.  
 P301 + P330 + P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.  
 P309: IF exposed or if you feel unwell:  
 P310: Immediately call a POISON CENTER or doctor/physician.  
 P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

## Hazards

- Concentrated acids and alkalis are highly corrosive!
- Put on protective glasses and rubber gloves!
- Splashes on skin or clothes must be washed out immediately with a lot of water!
- Spilled acid or alkaline solutions must be diluted with water and soaked off by means of a humid cloth!
- When sulphuric acid reacts with water, evil smelling gases are released which are hazardous to health. Do not inhale these gases! The first part of the experiment must be carried out under the fume hood!

## Notes

The values given in Table 1 are examples which can only be obtained when using undiluted sulphuric acid. The separation of water from carbon hydrates basically takes place in the form of a proton-catalysed elimination process and therefore not in the form of a withdrawal of water molecules (which are not present in this form anyway). However, from a formal point of view this corresponds to a dehydration of the carbon hydrates:



## Remarks on the method

If the students do not know that carbon hydrates are (under a formal point of view) made up of carbon and water (which they might have heard of in biology classes), this information must be given to them during the discussion in class so that they are able to interpret the experimental results. The second part of the experiment can also be carried out by several groups of students using different acids (e.g. hydrochloric acid). In this way it becomes clear that the dilution of all kinds of acids causes energy to be released though, however, to different extents.

## Waste disposal

- The acid of the second part of the experiment can be further used in the form of diluted sulphuric acid or put into the collecting container for acids and alkalis.
- The charred sugar can be further used as carbon after having been put into water for at least 24 hours and having been dried afterwards.

# Hazardousness of concentrated sulphuric acid

(Item No.: P7157100)

## Task and equipment

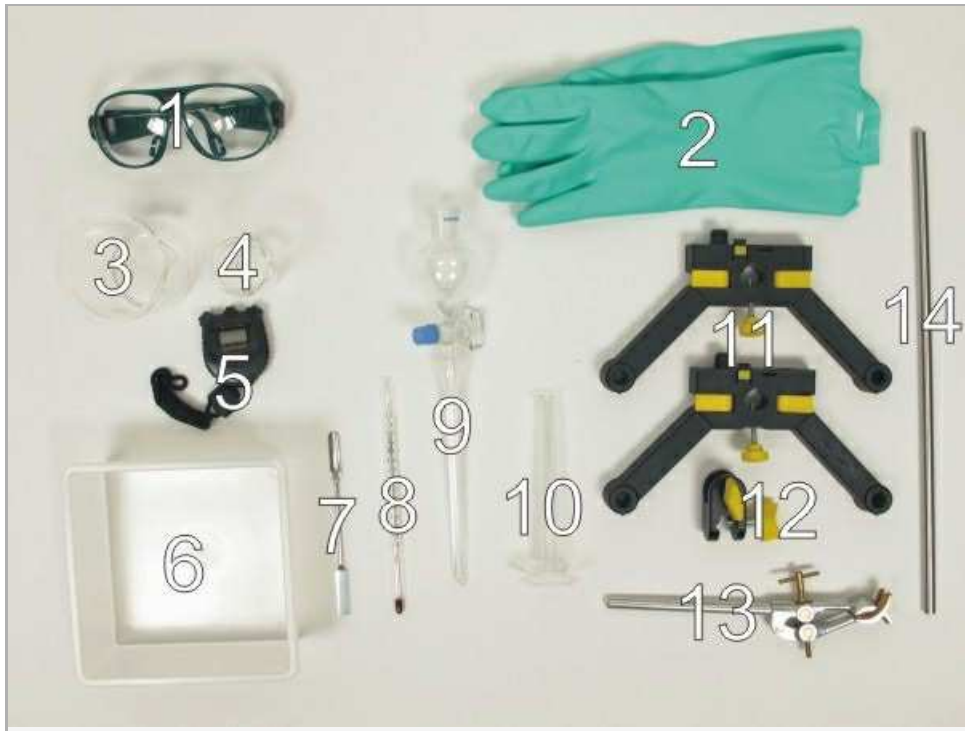
### Task

#### What additional hazards can be caused by acids?

Examine several reactions of concentrated sulphuric acid for their dangerousness.



Equipment



Position No.	Material	Order No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Rubber gloves, size S (7)	39325-00	1
3	Glass beaker DURAN®, short, 250 ml	36013-00	1
4	Glass beaker DURAN®, tall, 50 ml	36001-00	1
5	Digital stop watch, 24 h, 1/100 s & 1 s	24025-00	1
6	Dish, plastic, 150x150x65 mm	33928-00	1
7	Spatula, powder, steel, l=150mm	47560-00	1
8	Students thermometer,-10...+110°C, l = 180 mm	38005-02	1
9	Dropping funnel with drip nozzle, 50ml	36912-00	1
10	Grad.cylinder,high,PP,50ml	46287-01	1
11	Support base, variable	02001-00	1
12	Boss head	02043-00	1
13	Universal clamp	37715-00	1
14	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
	D (+)-Sucrose 100 g	30210-10	1
	Sulphuric acid, 95-98% 500 ml	30219-50	1
	Ammonia solution, 25% 1000 ml	30933-70	1
Additional material			
	Cloth for cleaning		
	Paper sheet (white)		
	Water		

## Set-up and procedure

### Set-up

#### Hazards

- Concentrated acids and alkalis are highly corrosive!
- Put on protective glasses and rubber gloves!
- Splashes on skin or clothes must be washed out immediately with a lot of water!
- Spilled acid or alkaline solutions must be diluted with water and soaked of by means of a humid cloth!
- When sulphuric acid reacts with water, evil smelling gases are released which are hazardous to health. Do not inhale these gases! The first part of the experiment must be carried out under the fume hood!



### Set-up

Cover the working place completely with a white paper sheet. Put the required materials and chemicals onto this paper sheet. Set up the support system according to Fig. 1 - Fig. 4.



Fig. 1



Fig. 2

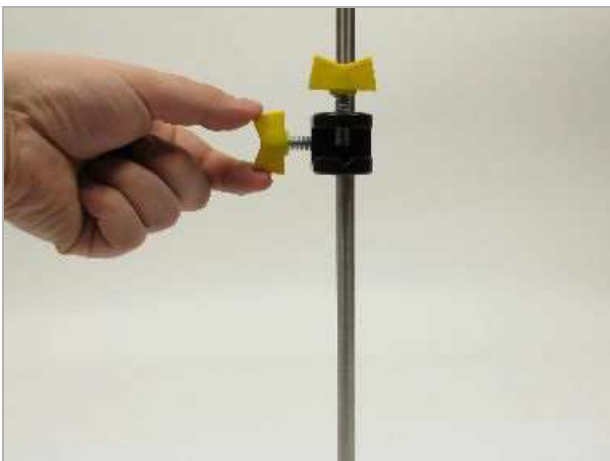


Fig. 3

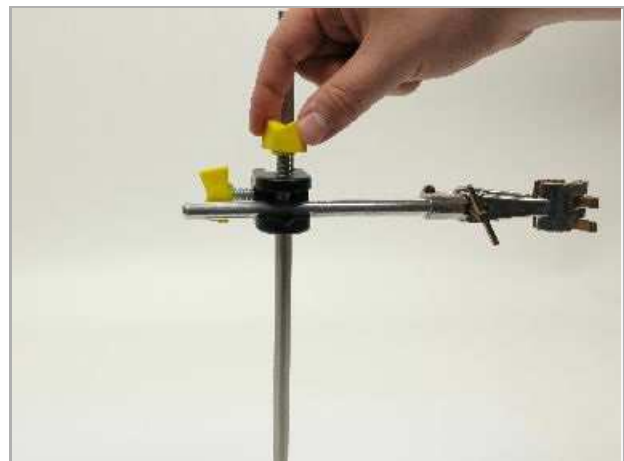


Fig. 4

Fix the separatory funnel into the universal clamp (Fig. 5), close the tap (Fig. 6) and fill it with 10 ml of concentrated sulphuric acid (Fig. 7).

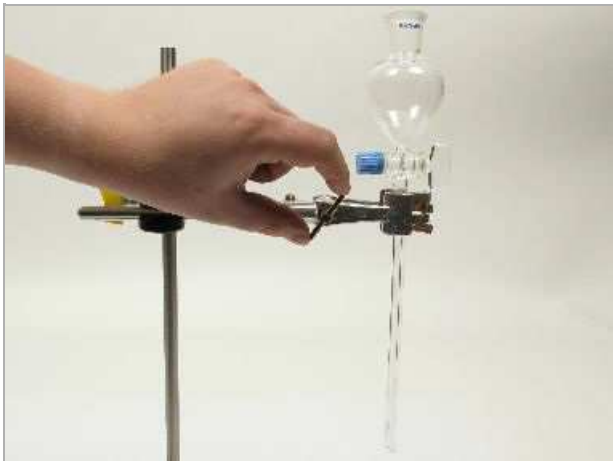


Fig. 5

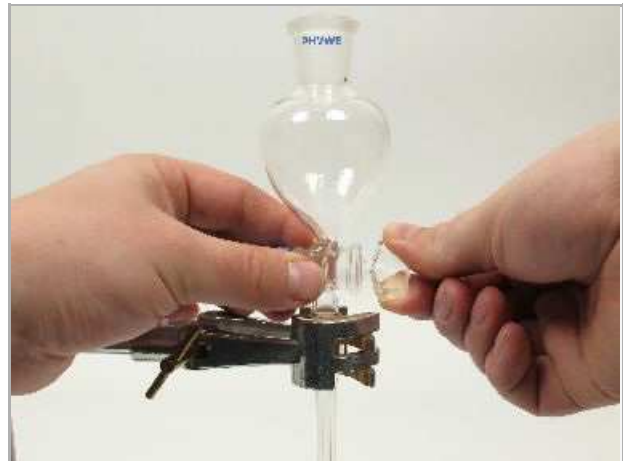


Fig. 6



Fig. 7

Put the cleaning cloth into the trough filled with water and keep it ready to hand (Fig. 8 + 9).



Fig. 8



Fig. 9

## Procedure

Fill 5 spatulas of cane sugar into the small glass beaker (Fig. 10). Slowly and carefully add 10 ml of concentrated sulphuric acid

(Fig. 11) and make sure that the sugar remains on the bottom of the glass beaker.



Fig. 10



Fig. 11

Fill the large glass beaker half full with water (Fig. 12), determine its initial temperature (Fig. 13) and enter this value into the table. Place the glass beaker under the outlet of the separatory funnel (Fig. 14) and open the tap to such an extent that the concentrated sulphuric acid drops into the water (Fig. 15). Measure the temperature every 30 seconds until all the sulphuric has completely dropped into the water. Enter these values into Table 1 in the report.



Fig. 12



Fig. 13

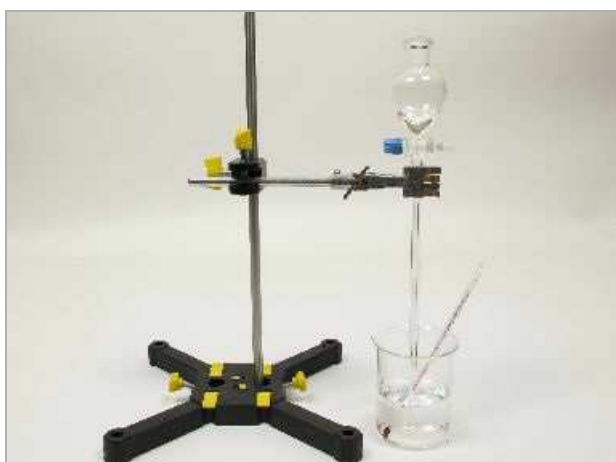


Fig. 14



Fig. 15

## Waste disposal

- Leave the sugar used in the first part of the experiment under the fume hood for disposal.
- Put the acid used in the second part of the experiment in the collecting tank for acids and alkalis.



## Report: Hazardousness of concentrated sulphuric acid

### Result - Observations 1

Write down your observations in a general form on the first and second part of the experiment.

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**Evaluation - Question 1**

draw the conclusions from your observations.

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**Evaluation - Question 2**

what are the resulting additional safety precautions to be taken when handling concentrated acids?

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**Evaluation - Question 3**

Give a reason for the fact that you should never add water to the concentrated acid but the concentrated acid to the water when diluting an acid.

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