Nitrogen - preparation and properties (Item No.: P7153800)

Curricular Relevance

Area of Expertise: Chemie
Education Level: Klasse 7-10
Topic: Anorganische Chemie
Subtopic: Nichtmetalle, Gase und Halbmetalle
Experiment: Stickstoff, Darstellung und Eigenschaften

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	2 Students

Additional Requirements:

Experiment Variations:

Keywords:

nitrogen, preparation of nitrogen, properties of nitrogen, non-metals

Task and equipment

Information for teachers

Learning objectives

- Nitrogen, as primary component of the air, can be obtained from it by removing the oxygen.
- Nitrogen has characteristic properties on which it can be recognised. One of its main properties is its ability to smother flames.

Notes on set-up and procedure

Remarks on the students' experiments

It is advisable to perform the experiment in small groups in which one student is responsible for the continuous air supply; whereas others undertake the heating of the iron wool and the filling of the residual air into the test tubes.

Ensure that the glass-rubber connections are lubricated with glycerol.

The gas supply tube must be removed from the plastic dish before the termination of heating, as otherwise water rises into the hot combustion tube and causes it to burst.

Hazards

- On heating iron wool red hot, high temperatures develop. Wear protective glasses!
- Lubricate rubber-glass connections with glycerol. Do not use force!

Note

The experiments can also be performed with nitrogen from steel cylinders. In this case the connection to the experiment on air analysis is negated.

Remarks on the method

This experiment is directly derived from the experiment on the determination of the components of air. Therefore, this can be

discussed again at this time and leads to a deeper understanding. It should be come clear to the students - in particular in working out Exercise 2 - that, in a strict sense, they are not investigating the properties of nitrogen but of the residual air. In this context, an aspect of the general problems of analysis can be treated.
If anyone asks whether nitrogen (as in the case of oxygen or carbon dioxide) can be obtained from compounds, this can be clarified with the reference to the hazardousness or poisonous of the corresponding compounds (ammonium nitrate; ammonium dichromate).

Waste disposal

The oxidised iron wool can be put in the heavy metal wastes.

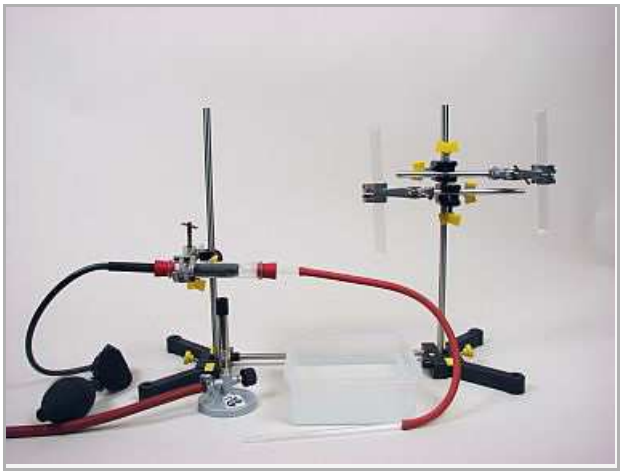
Nitrogen - preparation and properties (Item No.: P7153800)

Task and equipment

Task

How can nitrogen be obtained; what are its properties?

Obtain nitrogen from the air and investigate its properties.



Equipment

Position No.	Material	Order No.	Quantity
1	Rubber tubing, i.d. 6 mm	39282-00	1
2	Boss head	02043-00	3
3	Universal clamp	37715-00	3
4	Protecting glasses, clear glass	39316-00	1
5	Support base, variable	02001-00	1
6	Test tube brush w. wool tip,d25mm	38762-00	1
7	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	3
8	Dish, plastic, 150x150x65 mm	33928-00	1
8	Rubber bulb, double	39287-00	1
9	Test tube rack f. 6 tubes, wood	37685-10	1
9	Test tube, 18x188 mm, 10 pcs	37658-03	(3)
10	Rubber stopper, d = 22/17 mm, 1 hole	39255-01	2
11	Glass tube, straight, l=80 mm, 10/pkg.	36701-65	(2)
12	Combustion tube, l 120mm, DURAN	37029-01	1
13	Glass tubes,straight with tip, 10	36701-63	(1)
	Butane burner f.cartridge 270+470	47536-00	1
	Butane catridge CV 300 Plus, 240 g	47538-01	1
	Wood splints, package of 100	39126-10	(1)
	Glycerol, 250 ml	30084-25	1
	Iron wool 200 g	31999-20	1

Set-up and procedure

Set-up

Hazards

- On heating iron wool red hot, high tempreatures develop. Wear protective glasses!
- Lubricate rubber-glass connections with glycerol. Do not use force.

Set-up

Set up the support stand according to Fig. 1 - Fig. 7.

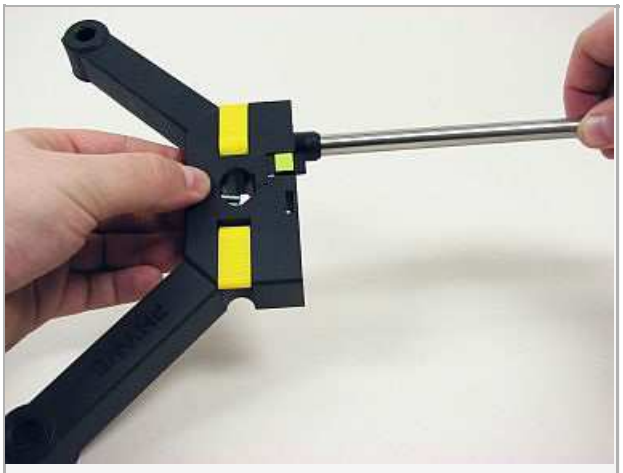


Fig. 1

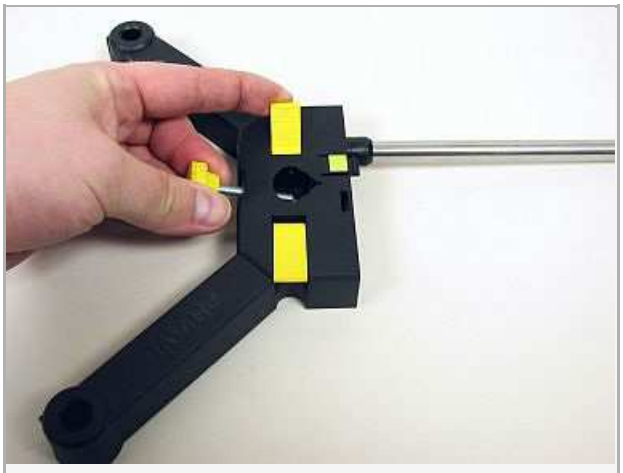


Fig. 2

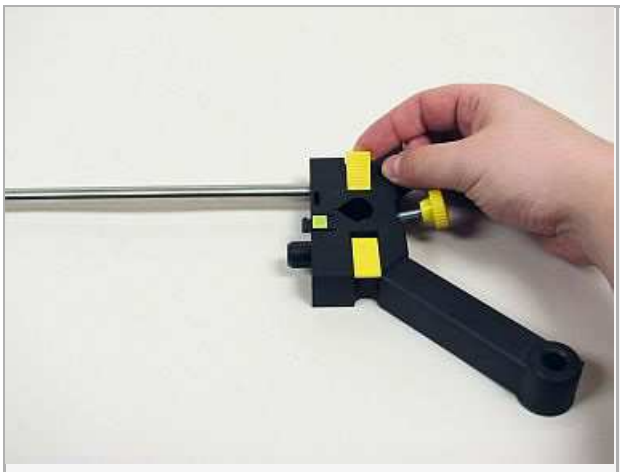


Fig. 3

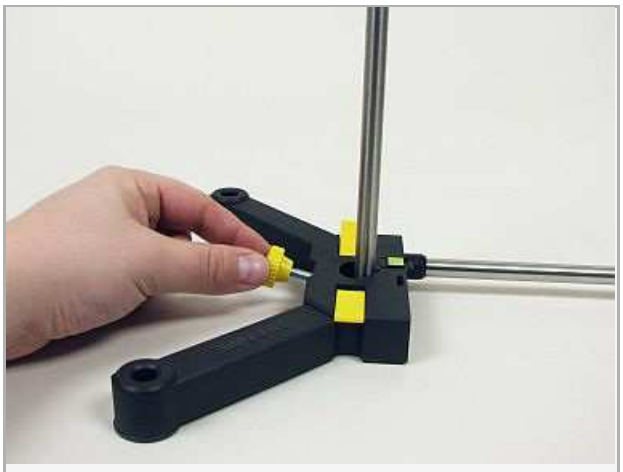


Fig. 4

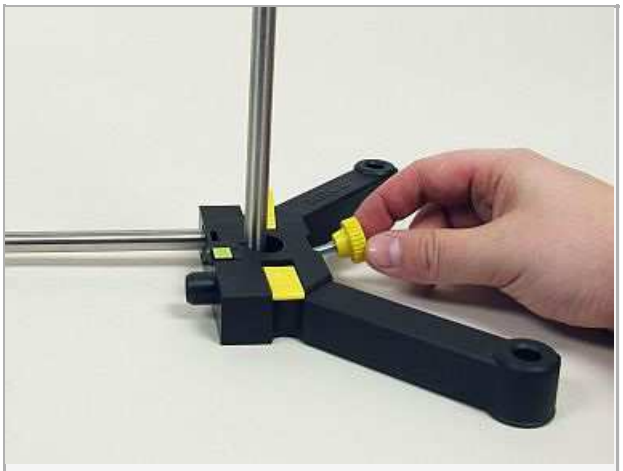


Fig. 5

Fig. 6

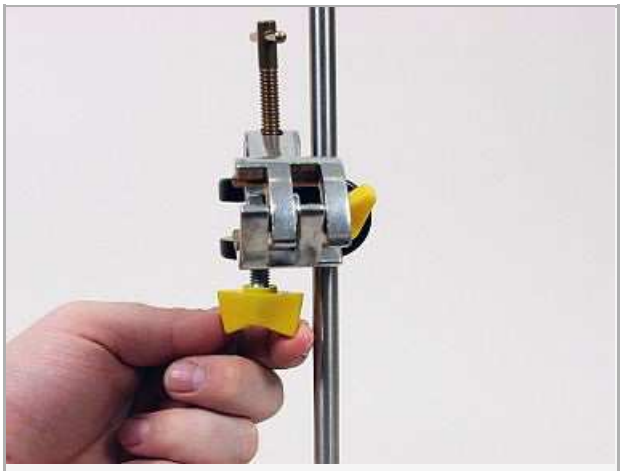


Fig. 7

Attach two bossheads with clamps to the right support rod. The clamps should be at right angles to each other (Fig. 8 - Fig. 11).

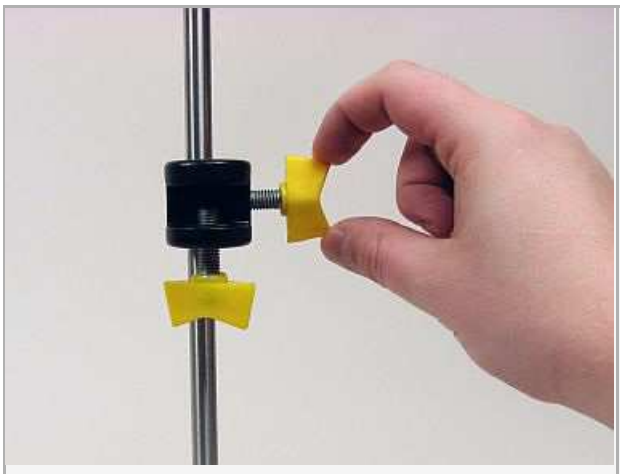


Fig. 8

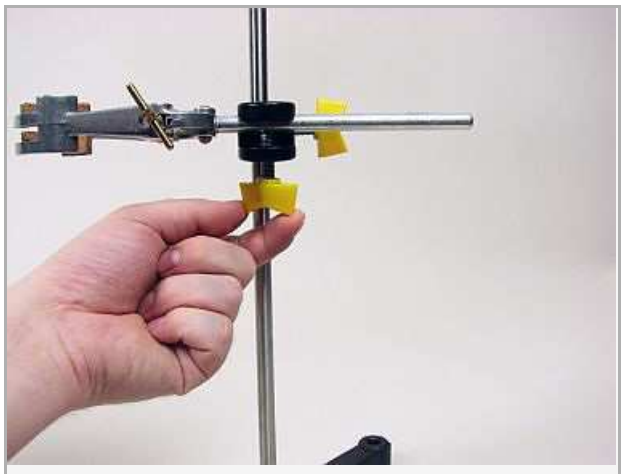


Fig. 9

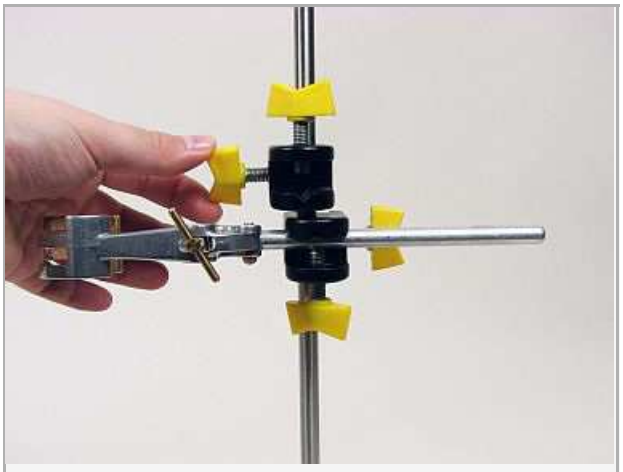


Fig. 10

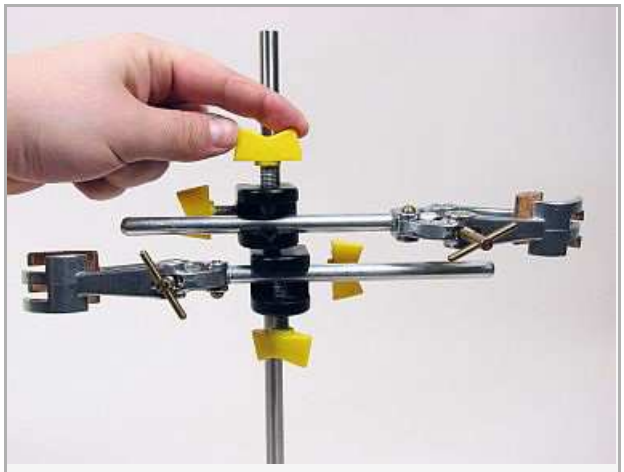


Fig. 11

Clamp one end of the combustion tube onto the left support rod (Fig. 12). Place a densely pack wad of iron wool in the middle of the combustion tube (Fig. 13). Seal it on each side with a stopper (Fig. 15 +Fig. 16) in which a short glass tube has been inserted (Fig. 14). Slip a short piece of tubing onto the right glass tube (Fig. 17) and connect this with a glass tube with tip such that a "gas supply tube" is created (Fig. 18).

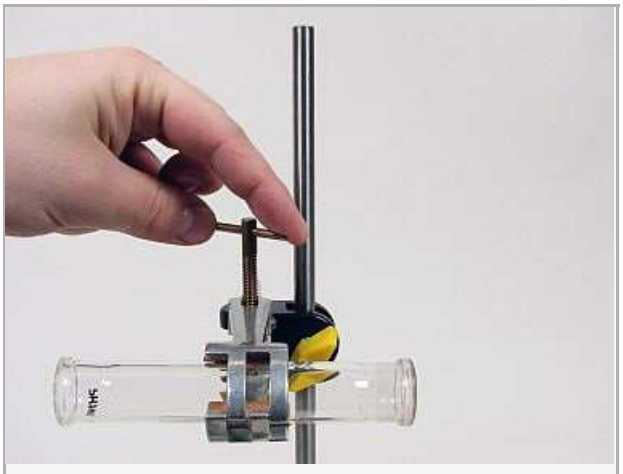


Fig. 12

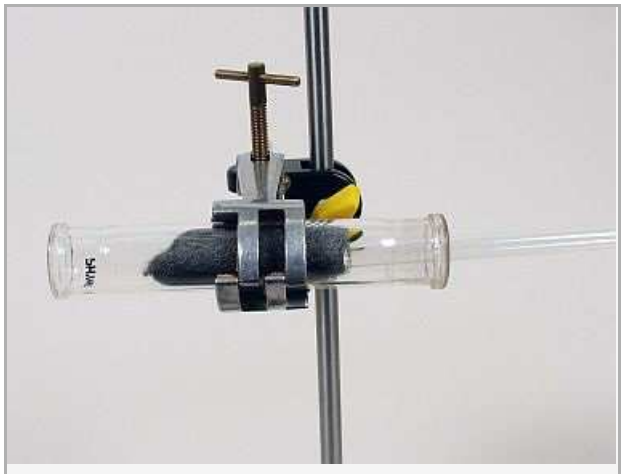


Fig. 13

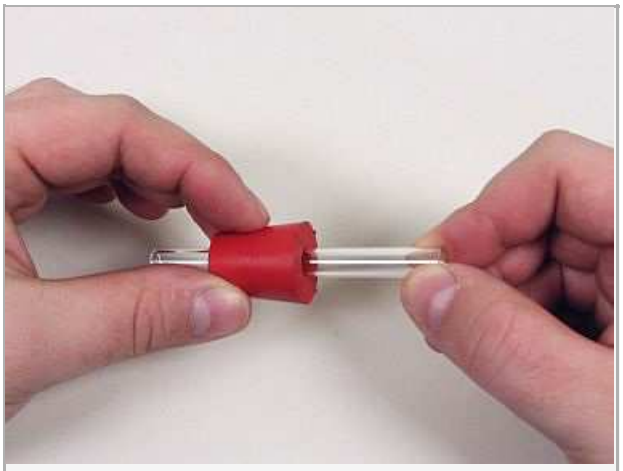


Fig. 14

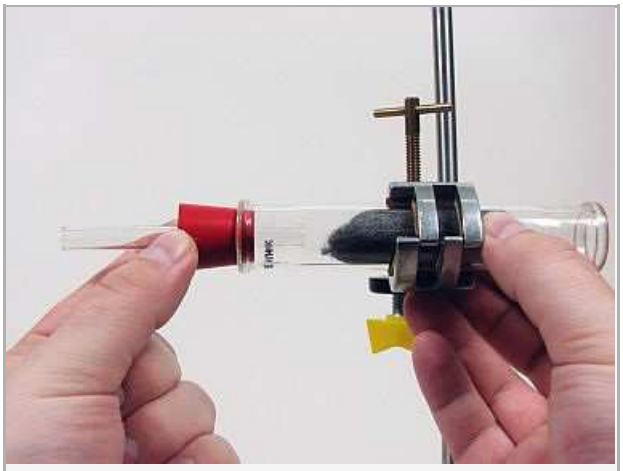


Fig. 15

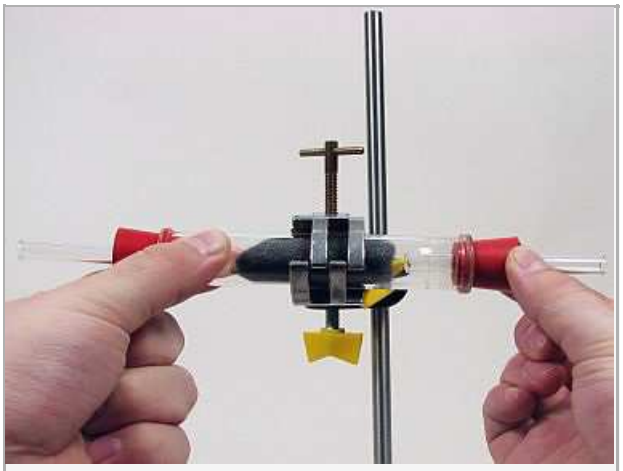


Fig. 16

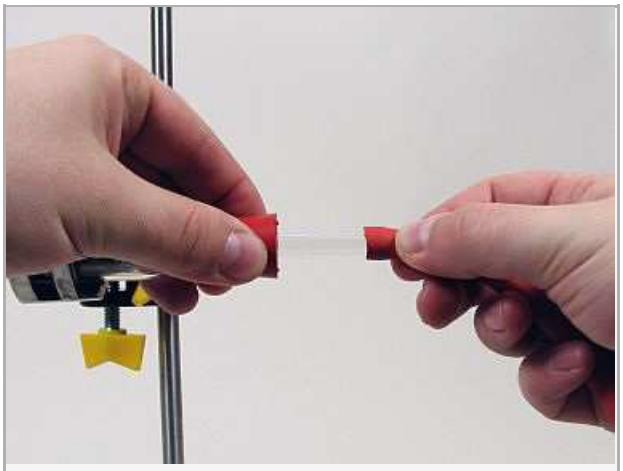


Fig. 17

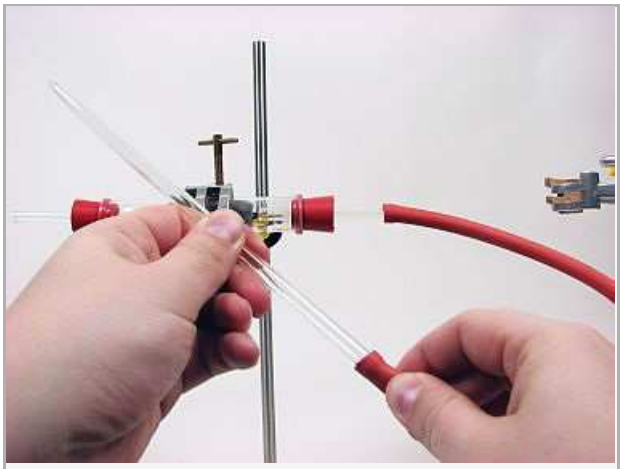


Fig. 18

Connect the left glass tube to the double rubber bulb (Fig. 19). Place the burner under the combustion tube and adjust the height of the latter to the propper height (Fig. 20).

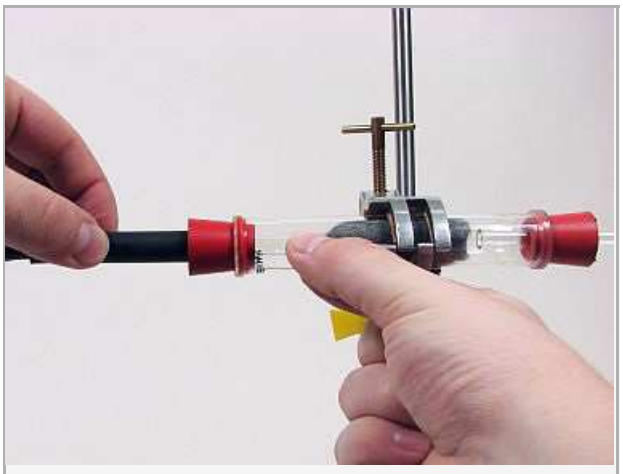


Fig. 19


Fig. 20

Fill the plastic dish more than half full. Place 3 test tubes in the dish so that they are completely filled with water.

Procedure

Procedure

Heat the iron wool strongly (Fig. 21). As soon as it becomes red hot, supply air to it using the double rubber bulb (Fig. 22). Ensure that the air current is uniform while heating.

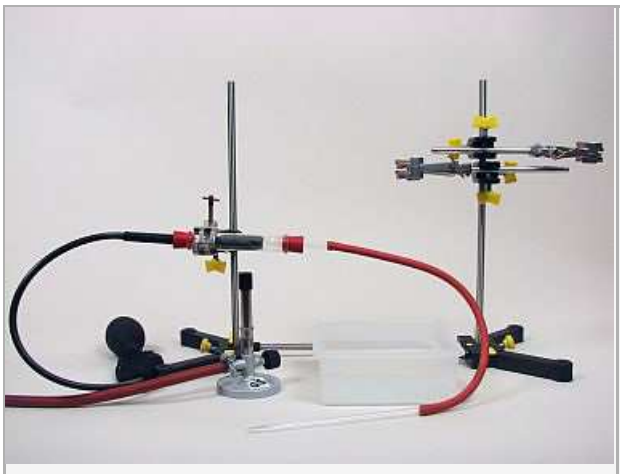


Fig. 21


Fig. 22

Lay the gas supply tube in the dish (Fig. 23). Seal the test tubes successively with your thumb. Hold each of them in turn under water with its opening downwards so that no water flows out of it (Fig. 24). Then, after about two minutes, allow the gas to flow (pneumatically) into the test tubes until they are completely filled with gas (Fig. 25). First, remove the gas supply tube from the dish; then stop heating the combustion tube.

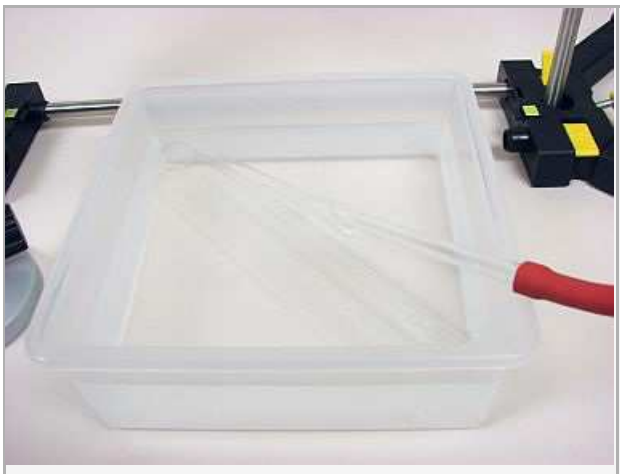


Fig. 23

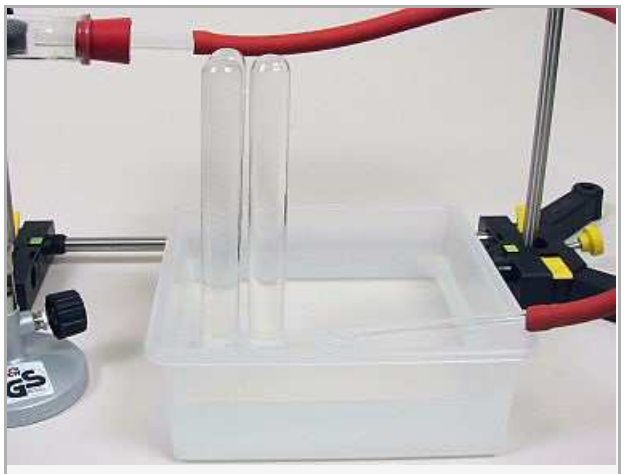


Fig. 24

Fig. 25

Remove one test tube and insert a burning wooden splint into it.

Clamp the other two test tubes - one with its opening facing upwards, the other with its opening facing downwards - onto the right support rod (Fig. 26). After approximately one minute, also insert a burning wooden splint into each of them.

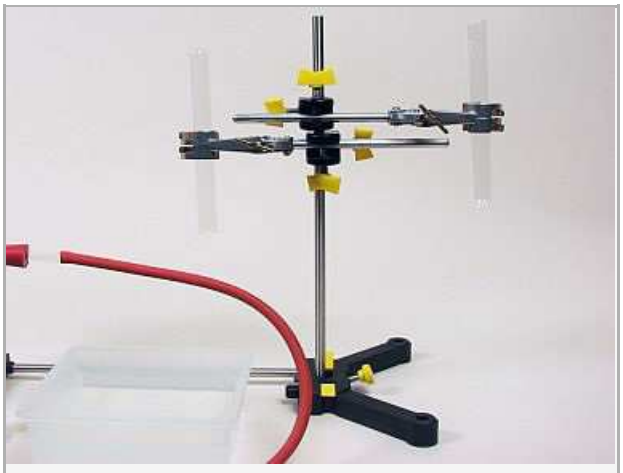


Fig. 26

Waste disposal

Dispose of the iron wool as heavy metal waste.

Report: Nitrogen - preparation and properties

Result - Observations

Note your observations.

.....

.....

.....

.....

Evaluation - Substance description form

Make conclusions from your observations. Record the observed properties in the general substance description form; complete it by taking the missing information from your textbook.

Name of the substar	1
Chemical symbol:	1 ±0
Colour:	1
State of aggregation	1
Melting point:	1 ±0
Boiling point:	1 ±0
Other properties:	1
Occurence:	1
Use:	1

Robert-Bosch-Breite 10
D - 37079 Göttingen

Tel: +49 551 604 - 0
Fax: +49 551 604 - 107

info@phywe.de
www.phywe.com

Evaluation - Question 1

Which substances were also collected in the test tube? Why could the properties of nitrogen be investigated despite this?

.....

.....

.....

.....