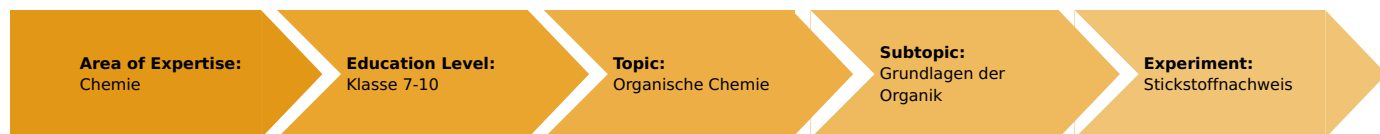


# The detection of nitrogen (Item No.: P7170400)

## Curricular Relevance



### Difficulty



Easy

### Preparation Time



10 Minutes

### Execution Time



10 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

organic compounds, tests for nitrogen

## Task and equipment

## Information for teachers

## Learning objectives

- Many organic compounds contain (basic) nitrogen.
- Nitrogen can be detected as ammonia when such substances are decomposed by strong bases.

## Notes on setup and procedure

### Preparation:

Keep the eyewash bottle readily available! The substances (especially the bread) should be well dried.

### Remarks on the students experiments:

Ensure that the test substances are well mixed with the soda lime. Stop the experiments as soon as ammonia is noticeable to keep the odour nuisance as little as possible.



## Hazard and precautionary statements

Soda lime:

- H314: Causes severe skin burns and eye damage.  
 P280: Wear protective gloves/protective clothing/eye protection/face protection.  
 P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.  
 P310: IF exposed or you feel unwell: Immediately call a POISON CENTER or doctor/physician.  
 P501: Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

Hydrochloric acid  
(conc.):

- H290: May be corrosive to metals.  
H314: Causes severe skin burns and eye damage.  
P280: Wear protective gloves/protective clothing/eye protection/face protection.  
P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.  
P309 + P311: IF exposed or you feel unwell: Immediately call a POISON CENTER or doctor/physician.  
P501: Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

## Hazards

- Gases with an unpleasant smell are evolved when the substances are heated. Do not inhale them! Carry out the experiments in the fume hood!
- Hydrochloric acid and soda lime are both highly corrosive. Should they contact skin, wash them off with plenty of water!
- Wear protective glasses!

## Notes

Not all organic compounds which contain nitrogen decompose under the formation of ammonia, but only those which contain nitrogen in basic form. These include the majority of the common organic nitrogen compounds.

## Remarks on the method

This experiment follows up on the previously described detection of ammonia ("Detection of nitrogen" experiment). Should this not yet have been taught, then a demonstration experiment showing the formation of ammonium chloride from hydrogen chloride and ammonia should first be carried out.

## Waste disposal

- Carefully dissolve decomposition products containing soda lime and residual acid in water and pour the solution into the acid and alkali waste container.

# The detection of nitrogen (Item No.: P7170400)

## Task and equipment

### Task

### Which other elements can organic compounds contain? (2)

Examine the various organic compounds for nitrogen content.



Equipment



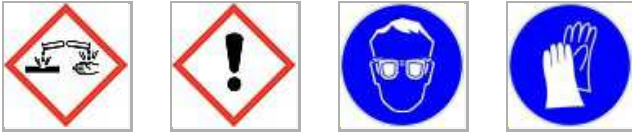
Position No.	Material	Order No.	Quantity
1	Test tube, 180x18 mm,100pcs	37658-10	(4)
2	Test tube brush w. wool tip,d25mm	38762-00	1
3	Rubber gloves, size S (7)	39325-00	1
4	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
5	Pipette with rubber bulb	64701-00	1
6	Spoon, special steel	33398-00	1
7	Labor pencil, waterproof	38711-00	1
8	Protecting glasses, clear glass	39316-00	1
9	Test tube holder, up to d 22mm	38823-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Urea, 250 g	30086-25	1
	Soda lime, gran. a.r. 250 g	30170-25	1
	Hydrochloric acid 37 %, 1000 ml	30214-70	1
	Indicator paper, pH1-14, roll	47004-02	1
Additional material			
	Hairs		
	Dry bread		

## Set-up and procedure

### Set-up

### Hazards

- Gases with an unpleasant smell are evolved when the substances are heated. Do not inhale them! Carry out the experiments in the fume hood!
- Hydrochloric acid and soda lime are both highly corrosive. Should they contact skin, wash them off with plenty of water.
- Wear protective glasses!



### Procedure

Number the test tubes from 1 to 4 (Fig. 1).

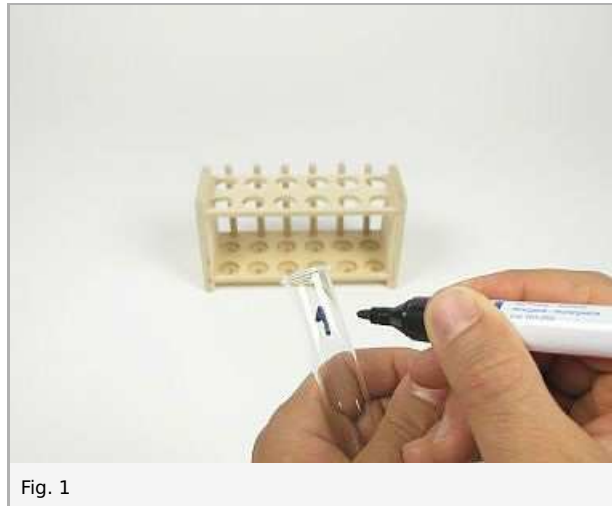


Fig. 1

Put half a spoonful of urea in test tube 1, a small bush of hair in test tube 2 and a few dry bread crumbs in test tube 3. Pour concentrated hydrochloric acid in test tube 4 until it is one third full (Fig. 2+3).

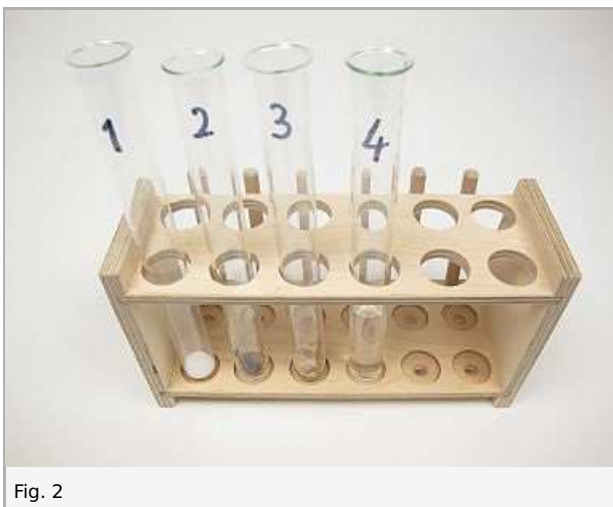


Fig. 2



Fig. 3

Mix the urea in test tube 1 with two spoonfuls of soda lime (Fig. 4) and heat the mixture in the flame of the Bunsen burner

(Fig. 5).



Fig. 4



Fig. 5

Hold a wetted strip of pH paper at the mouth of the test tube (Fig. 6). Then hold the mouth of the test tube against the mouth of the test tube containing hydrochloric acid (Fig. 7).



Fig. 6



Fig. 7

Repeat the experiment with the hair and the dry bread.

## Waste disposal

- Carefully dissolve decomposition products containing soda lime and residual acid in water and pour the solution into the acid and alkali waste container.

## Report: The detection of nitrogen

### Result - Observations

Note the observations you make when heating the substances.

- a) Urea
- b) Hair
- c) Bread

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### Result - Table 1

Record the change of the pH paper and the result of the reaction with hydrochloric acid.

Procedure	pH paper	Hydrochloric acid
Decomposition of urea	coloured blue <sup>1</sup>	a white smoke is formed <sup>1</sup>
Decomposition of hair	coloured blue <sup>1</sup>	a white smoke is formed <sup>1</sup>
Decomposition of bread	coloured blue <sup>1</sup>	a white smoke is formed <sup>1</sup>

### **Evaluation - Question 1**

Draw conclusions from your observations.

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### **Evaluation - Question 2**

Give the reason why this experiment serves to detect nitrogen.

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### Evaluation - Question 3

Name the most important nitrogen containing classes of organic compounds which are of significance for life.

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