

Test of nitrogen

Task and equipment

Information for teachers

Learning objectives

- Nitrogen, which is present in many substances, can frequently be transformed into ammonia.
- Ammonia, and thus nitrogen, can be recognised by its characteristic odour.

Notes on set-up and procedure

Preparation: Other proteinaceous substances can also be used instead of gelatin; thus e. g., a few locks of hair which the students themselves can provide.

Remarks on the students' experiments

Ensure that the samples are only heated briefly, as otherwise the malodour becomes very strong, particularly in partial experiment 2.



Hazard and Precautionary statements

Ammonium chloride:

- H302: Harmful if swallowed.
H319: Causes serious eye irritation.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Sodium hydroxide:

- H314: Causes severe burns.
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.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Ammonia:

- H314: Causes severe skin burns and eye damage.
H335: May cause respiratory irritation.
H400: Very toxic to aquatic life.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P273: Avoid release to the environment.
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

Teacher's/Lecturer's Sheet

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- Sodium hydroxide flakes are strongly caustic. Do not let them come into contact with the skin! If you touch them rinse the area with abundant water!
- Ammonia vapours are poisonous in high concentrations!
- Wear protective glasses and gloves!

Remarks on the method

With this experiment the general limits of confirmatory tests (see Exercise 3) can be demonstrated. In principle, the absence of a substance cannot be determined, only the presence of a substance can be positively proven. This becomes obvious in this experiment: the presence of ammonia proves the presence of nitrogen; the absence of ammonia ultimately proves nothing.

Waste disposal

Add some water to the contents of both test tubes (caution, heat is generated!), and pour them into the collection container for acids and alkalis.

Test of nitrogen

Task and equipment

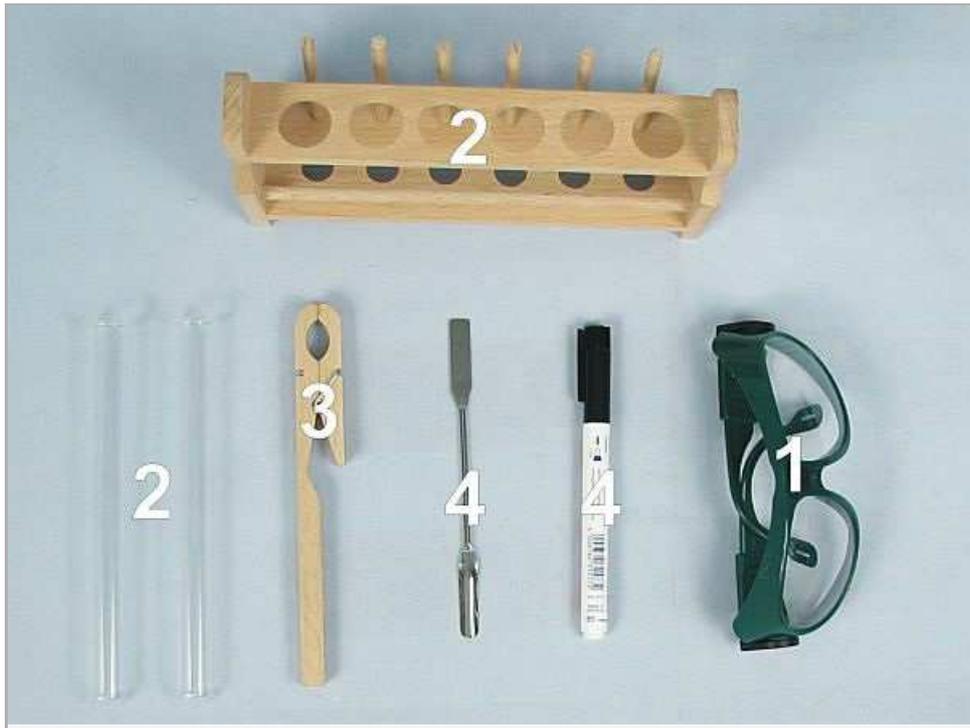
Task

How can one determine whether substances contain nitrogen?

Detect nitrogen in certain compounds using an odour test.



Equipment



Position No.	Material	Order No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Test tube, 18x188 mm, 10 pcs	37658-03	(2)
2	Test tube rack f. 6 tubes, wood	37685-10	1
3	Test tube holder, up to d 22mm	38823-00	1
4	Labor pencil, waterproof	38711-00	1
4	Spatula, powder, steel, l=150mm	47560-00	1
	Butane burner f. cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Ammonium chloride 250 g	30024-25	1
	Gelatin powder 250 g	30083-25	1
	Sodium hydroxide, flakes, 500 g	30157-50	1

Set-up and procedure

Set-up

Hazards

- Sodium hydroxide flakes have a strong caustic action. Do not allow them to come into contact with skin! If you touch them, rinse the area with abundant water!
- Ammonia vapours are poisonous in high concentrations!
- Wear protective glasses and gloves!



Set-up

Number the test tubes with 1 and 2 and put them in the test tube rack (Fig. 1).



Fig. 1

Put 2 sodium hydroxide flakes in test tube 1 (Fig. 2) and 4 of them in test tube 2 (Fig. 3).

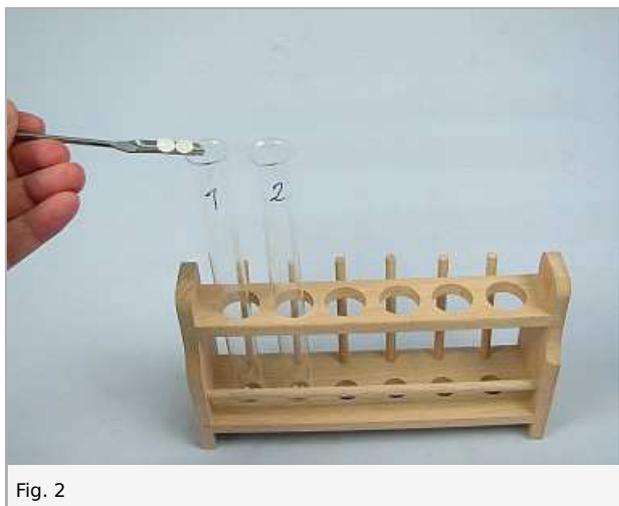


Fig. 2

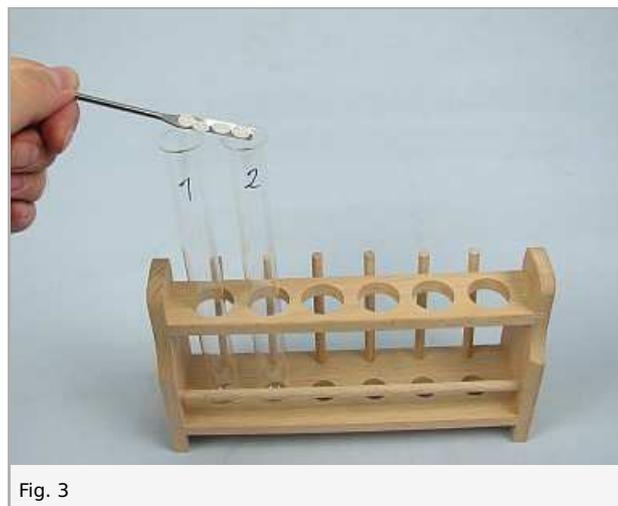


Fig. 3

Procedure

Student's Sheet

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Add a small spatulaful of ammonium chloride to the sodium hydroxide flakes in test tube 1 (Fig. 4). Remove the test tube from the test tube rack with the test tube holder (Fig. 5) and perform an odour test (fan it toward your nose with your hand) (Fig. 6).

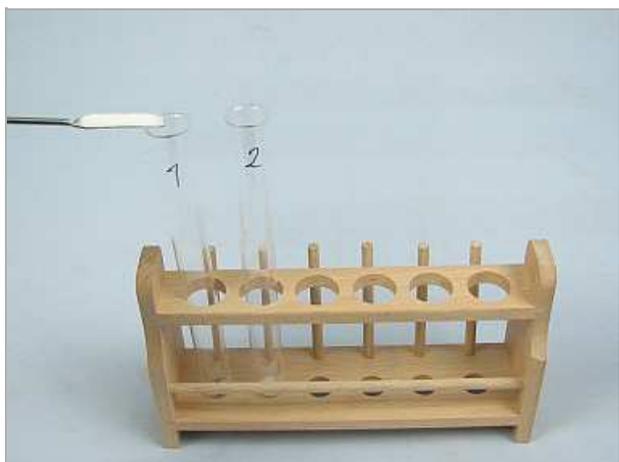


Fig. 4



Fig. 5



Fig. 6

If there is no detectable odour, heat the mixture briefly over a small burner flame (Fig. 7) and cautiously perform the odour test again. Then place the test tube in the exhaust hood. Note your observations under Result - Observations 1.



Fig. 7

Put a small amount of gelatin powder on to the sodium flakes in test tube 2 with the spatula tip (Fig. 8). Heat the mixture briefly over a small burner flame (Fig. 9) and cautiously perform the odour test again. Then also place the test tube in the exhaust hood. Record your observations under Result - Observations 1.

Student's Sheet

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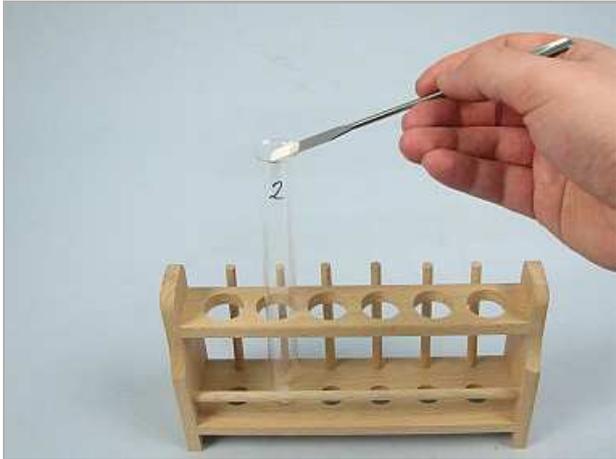


Fig. 8



Fig. 9

Waste disposal

Put the contents of both test tubes into the collection container for acids and alkalis.

Report: Test of nitrogen

Result - Observations 1

Note your observations on

- Test tube 1.
- Test tube 2.

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Evaluation - Question 1

Characterise the result of the odour test in both cases.

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Evaluation - Question 2

The substance evolved in these cases is termed ammonia; it is a nitrogen compound. Formulate concisely how this substance can be used as a test for nitrogen.

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Evaluation - Question 3

Give reasons as to whether the non-occurrence of the ammonia odour is proof of the absence of nitrogen.

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