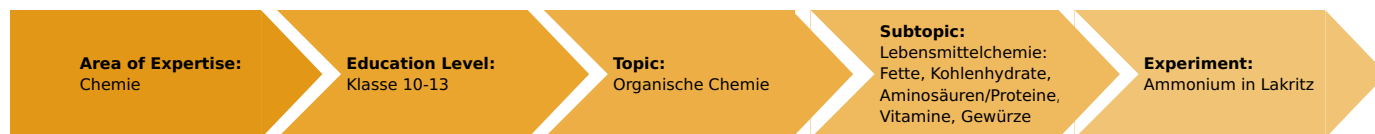


Ammonia in liquorice (Item No.: P7188200)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



20 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

ammonia, tests for ammonia

Task and equipment

Information for teachers

Additional Information

Liquorice is popular because of its refreshing taste. The taste is stronger when it is sucked.

Notes on content and learning objectives

- Liquorice has a sharp taste, because it contains ammonium chloride.
- Ammonia can be detected with sodium hydroxide solution, chloride with silver nitrate.

Notes on the method

It can be shown by the example ammonia and ammonium salts, that substances can be used for very different purposes, according to their concentration.

References to further reading are required to answer particular questions.

Fundamentals and remarks

Liquorices are confectioneries which contain an extract from sweet root. Sweet root extract is won from the roots of a leguminous plant and is used in large quantities in the confectionery industry and in the pharmaceutical industry. The ingredient which is responsible for the taste of sweet root extract is glycyrrhiza.

Liquorice contains at least 5 % sweet root extract, and in addition sugar, flour, starch syrup, gelatin and ammonium chloride.

Hints on going deeper

- Examination of similar products.

Notes on set-up and procedure

Preparation:

Different liquorice products can be used in this experiment.

Notes on the students experiment:

German made liquorice contains up to 2 % ammonium chloride. Dutch and Danish "sharp" liquorice products can contain distinctly higher concentrations of ammonium chloride (up to 6 %).

Magnesium oxide can be added to the liquorice solution in place of sodium hydroxide. The mixture must then be warmed o

liberate ammonia.



Hazard and Precautionary statements

Ammonium chloride:

H302: Gesundheitsschädlich bei Verschlucken.

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 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+P310: IF exposed or you feel unwell: 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.

Silver nitrate:

H272: May intensify fire; oxidizer.

H314: Causes severe skin burns and eye damage.

H410: Very toxic to aquatic life with long lasting effects.

P273: Avoid release to the environment.

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+P310: IF exposed or you feel unwell: Call a POISON CENTER or doctor/physician.

Hazards

- Nitric acid, silver nitrate and sodium hydroxide are corrosive. Ammonium chloride is poisonous in large quantities. Ensure complete avoidance of skin contact with the chemicals.
- Wear protective glasses and protective gloves!

Waste disposal

Pour the residues to drain after neutralizing them.

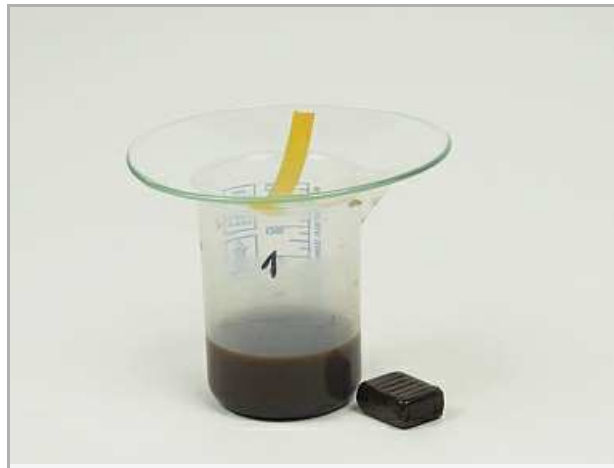
Ammonia in liquorice (Item No.: P7188200)

Task and equipment

Task

Why does liquorice have a sharp taste?

Detect ammonium chloride in liquorice.



Equipment



Position No.	Material	Order No.	Quantity
1	Beaker, 100 ml, low form, stackable, plastic	36081-00	2
2	Graduated cylinder 100 ml, PP transparent	36629-01	1
3	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
4	Test tube, 180x18 mm,100pcs	37658-10	(2)
5	Test tube holder, up to d 22mm	38823-00	1
6	Test tube brush w. wool tip,d25mm	38762-00	1
7	Wash bottle, 250 ml, plastic	33930-00	1
8	Watch glass, dia.100 mm	34574-00	2
9	Pipette with rubber bulb	64701-00	3
10	Spoon, special steel	33398-00	1
11	Glass rod, boro 3.3, l=200mm, d=6mm	40485-04	2
12	Labor pencil, waterproof	38711-00	1
13	Protecting glasses, clear glass	39316-00	1
14	Rubber gloves, size S (7)	39325-00	1
	Ammonium chloride 250 g	30024-25	1
	Nitric acid 1,40 g/ml, 65%, 500 ml	30213-50	1
	Silver nitrate solution 5% 100 ml	30223-10	1
	Caustic soda sol. 32% 1000 ml	30266-70	1
	Water, distilled 5 l	31246-81	1
	Indicator paper, pH1-14, roll	47004-02	1
Additional material			
	Liquorice sweets or ammoniac-liquorice pastilles		

Set-up and procedure

Set-up

Hazards

- Nitric acid, silver nitrate and sodium hydroxide are corrosive. Ammonium chloride is poisonous in large quantities. Ensure complete avoidance of skin contact with the chemicals.
- Wear protective glasses and protective gloves!



Setup

Number two lab beakers and two test tubes 1 and 2 (Fig. 1).



Fig. 1

Drop 3 to 5 liquorice sweets in beaker 1. Add 25 ml of distilled water. Stir the mixture with a glass rod until most of the liquorice sweets is dissolved (Fig. 2).



Fig. 2

Put a spatula tip of ammonium chloride in beaker 2. Dissolve the salt in 25 ml of distilled water.

Procedure

Pour liquorice solution from beaker 1 to a height of 4 cm in test tube 1. Pour the same amount of ammonium chloride solution from beaker 2 to test tube 2 (Fig. 3).
Add 5 drops of nitric acid to each of the solutions in the test tubes, using a pipette with rubber bulb.

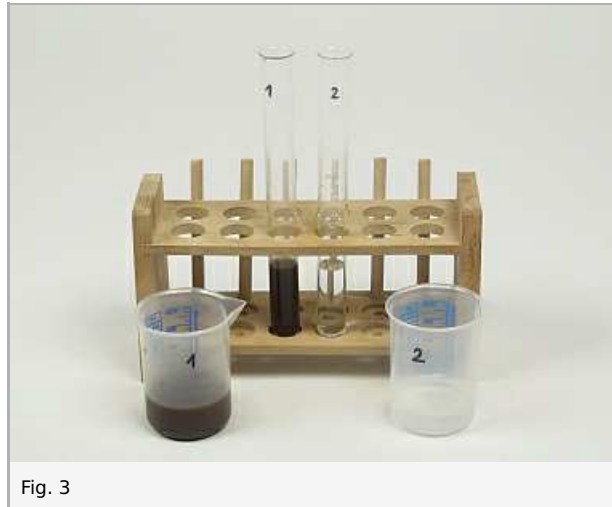


Fig. 3

Pipette five drops of silver nitrate solution into each of the solutions. Watch out for any precipitates which form.

Lay wetted indicator papers on the underside of each of the two watch glasses (Fig. 4).



Fig. 4

Add sodium hydroxide carefully and dropwise to each of the solutions in the two beakers until the solutions are alkaline. Cover the beakers with the prepared watch glasses holding the universal indicator paper strips (Fig. 5).
After a few minutes, check the colours of the indicator paper strips.

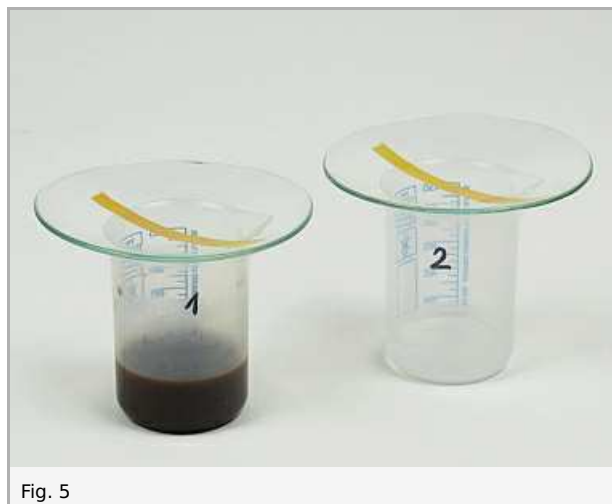


Fig. 5

Waste disposal

Pour the solutions to drain after neutralizing them.

Report: Ammonia in liquorice

Result - Observations

Describe your observations.

- a) Test tube 1: Liquorice solution with silver nitrate
- b) Test tube 2: Ammonium chloride solution with silver nitrate
- c) Beaker 1: Liquorice solution with sodium hydroxide
- d) Beaker 2: Ammonium chloride solution with sodium hydroxide solution

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Evaluation - Question 1

Complete the following equations:

Detection of:



Detection of:



Evaluation - Question 2

Draw conclusions from your observations.

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Evaluation - Question 3

What is "spirit of ammonia"?

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Evaluation - Question 4

Complete the following statements.

1. Liquorices are
2. They contain, which form a precipitate with silver nitrate.
3. Liquorice contains, as is liberated with sodium hydroxide.