Absorption of mineral substances by plants

(Item No.: P7156100)

Curricular Relevance

Area of Expertise: Chemie

Education Level: Klasse 10-13

Topic: Anorganische Chemie

Subtopic: Spezialtehmen: Brandbekämpfung, großtechnische Verfahren, Explosivstoffe , Kristalle, Baustoffe und Dünger

Experiment: Mineralstoffaufnahme von Pflanzen

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

Additional Requirements:

Experiment Variations:

Keywords:

minerals, absorption of minerals, plant content

Task and equipment

Information for teachers

Learning objectives

- Plants absorb mineral matters withdrawn from the soil by means of their roots and transport them up to their leaves.
- The presence of the mineral salts can be proven with the aid of various standard tests like, for instance, the flame coloration.

Notes on set-up and procedure

Preparations
It is recommended to prepare this experiment already when examining the ashed plants for mineral matters in the course of the preceding experiment. The plants (grass, small flowers and especially all kinds of cereals are suitable) must be left for at least 3 days in the nutrient solution. When there is lithium nitrate, it is not necessary to add potassium nitrate.

Remarks on the students' experiments
As far as the incineration is concerned, start with the leaves. It is absolutely sufficient to demonstrate the flame coloration for a short moment only since otherwise the nasal nuisance would be too hard.



Hazard and Precautionary statements

Lithium chloride:

H302:	Harmful if swallowed.
H315:	Causes skin irritation.
H319:	Causes serious eye irritation.
P302 + P352:	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Potassium nitrate:

H272:	May intensify fire; oxidiser.
P210:	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Hazards

- When the salt is heated, tiny crystal particles might crack off. Put on protective glasses!

Remarks on the method

This experiment offers the opportunity to treat the flame coloration as a test method once more. If desired, cobalt glasses can be used for demonstrating the violet coloration due to potassium ions and sodium ions also in the case of the non-fertilized plant in order to show that mineral matters are even contained in drinking water/ground water and that these mineral matters are absorbed by the plants, too.

Waste disposal

Put the salt solutions into the collecting container for acids and alkalis.

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Task and equipment

Task

How do plants absorb mineral matters?

Let plants grow in water containing mineral fertilizers as well as in normal drinking water.

Equipment

Position No.	Material	Order No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Students thermometer,-10...+110°C, l = 180 mm	38005-02	1
3	Spatula, powder, steel, l=150mm	47560-00	1
4	Mortar w. pestle, 70ml, porcelain	32603-00	1
5	Glass beaker DURAN®, tall, 50 ml	36001-00	1
6	Pipette with rubber bulb	64701-00	1
7	Glass rod,boro 3.3,l=200mm, d=5mm	40485-03	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane catridge CV 300 Plus, 240 g	47538-01	1
	Potassium nitrate 250 g	30106-25	
	Lithium chloride 100 g	31526-10	
Additional material			
	Plants		
	Tap water		

Set-up and procedure

Set-up

Hazards

- When the salt is heated, tiny crystal particles might crack off. Wear protective glasses!



Set-up

Fill both beakers nearly up to the brim with water (Fig. 1). Fill a spatula-tipful of potassium nitrate and a slightly larger portion of lithium chloride into one of the two beakers (Fig. 2) and mark this beaker (Fig. 3). Stir the water in this beaker by means of the glass rod, until the salt has completely dissolved (Fig. 4).


Fig. 1


Fig. 2

Fig. 3

Fig. 4

Place one plant into each of the two beakers and make sure that all the roots are immersed in the water (Fig. 5). Store both beakers in a safe place for the next lesson.

Fig. 5

Procedure

Procedure

Put a spatula-tipful of lithium chloride onto the watch glass (Fig. 6). Glow the tip of a magnesia rod thoroughly in the flame (Fig. 7), use it to withdraw some of the salt (Fig. 8) and hold it into the burner flame.

Fig. 6

Fig. 7

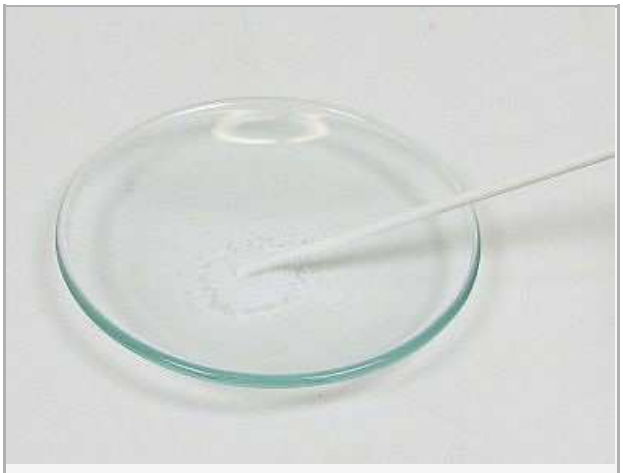

Fig. 8

Use the crucible tongs to take a part of the plant (leaf or something like that) out of the beaker containing only water and burn it

in the flame (Fig. 9).

Fig. 9

Proceed in the same way with a plant part taken from the beaker containing the salt solution.

Waste disposal

Put the salt solution into the collecting tank for acids and alkalis.

Report: Absorption of mineral substances by plants

Result - Observations

Note your observations.

a) Magnesia rod:

b) Plant/water:

c) Plant/salt solution:

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Evaluation - Question 1

Draw the conclusions from your observations.

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Evaluation - Question 2

How do plants absorb mineral matters and what are they needed for?

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