

Mineral constituents of plants



Chemistry

Industrial Chemistry

Exhaust gas cleaning, environmental protection



Difficulty level

easy



Group size

1



Preparation time

10 minutes



Execution time

20 minutes

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Teacher information

Application

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Experiment set-up

Plants contain many water-soluble minerals, such as sodium chloride and sodium carbonate. In order for the plants to grow, fertilizer must be used.

These are present as salt and are connected by ionic bonding. The raw materials for mineral fertilizers must be chemically converted so that they are present in the soil in their ionic form. In this way they can be absorbed by plants.

In this experiment, the water-soluble minerals are extracted from plants and evaporated and the resulting mineral salts are examined with the flame test.

Other teacher information (1/2)

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Prior knowledge



- Mineral fertilizer is a fertilizer.
- Here the nutrients are present in a solid "ion bond".
- Mineral fertilizers are often also called "fertilizer salts".

Scientific principle



The students are to extract the water-soluble minerals from dried plants and evaporate them.

Preparations

Any plants are dried in a drying cabinet at about 80°C for about 2 days. Plants that have been "over-fertilized" before are especially productive.

Other teacher information (2/2)

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Learning objective



- Plants contain water-soluble minerals.
- To promote plant growth, (mineral) fertiliser must therefore be added.

Tasks



1. Plants are examined for their ingredients.
2. The water-soluble minerals are extracted and evaporated.
3. Mineral salts are examined with the flame test.

Safety instructions

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- Perform test under the trigger.
- Use safety glasses/protective gloves!
- The general instructions for safe experimentation in science lessons apply to this experiment.

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Student Information

Motivation

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Various plants

Besides water and carbon dioxide, plants also need mineral salts to survive. For their optimal development, seed plants need the ten main elements C, O, H, N, S, P, K, Ca, Fe, Mg.

To prevent the plants from suffering a nutrient deficiency, one fertilizes. Potted plants that you often have at home are given fertilizer sticks and if the mineral salts are not supplied, you will notice deficiency symptoms.

Tasks

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Why do plants need fertilizer?

- Compare the growth of two plants with and without fertilizer.
- Examine dried plants for ingredients.
- Write down your observations and answer the questions in the minutes.

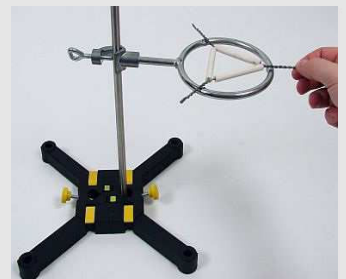
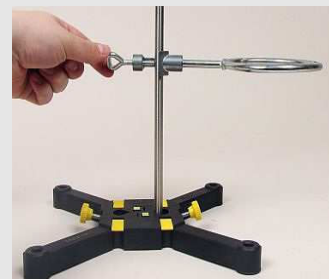
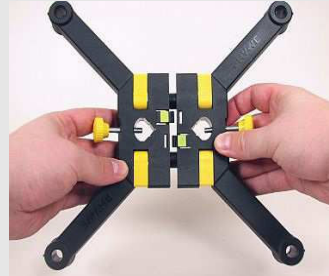
Equipment

Position	Material	Item No.	Quantity
1	Butane burner with cartridge, 220 g	32180-00	1
2	Support base, variable	02001-00	1
3	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
4	Boss head	02043-00	1
5	Porcelain dish, 75ml, d = 80 mm	32516-00	1
6	Porcelain crucible, dia.34mm, 25 ml	32683-00	1
7	Circular filter, d 125 mm, 100 pcs	32977-05	1
8	Triangle w. pipeclay, l 60mm	33278-00	1
9	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
10	Crucible tongs, 200 mm, stainless steel	33600-00	1
11	Wash bottle, 250 ml, plastic	33930-00	1
12	Funnel, glass, top dia. 80 mm	34459-00	1
13	Beaker, Borosilicate, tall form, 250 ml	46027-00	1
14	Ring with boss head, i. d. = 10 cm	37701-01	1
15	Universal clamp	37715-01	1
16	Protecting glasses, clear glass	39316-00	1
17	Glass rod, boro 3.3, l=200mm, d=5mm	40485-03	1
18	Scissors, l = 110 mm, straight, point blunt	64616-00	1

Set-up (1/2)

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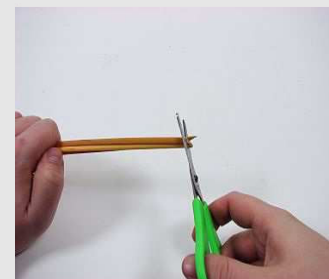
- Set up a tripod with tripod ring and wire triangle.
- Please note the illustrations on the top right
- Attach a tripod ring to the tripod pole-
- Move the stand ring in the height so that the flame of the burner underneath just reaches the wire triangle.
- Place a sound triangle on the tripod ring
- Please note the illustrations on the bottom right



Set-up (2/2)

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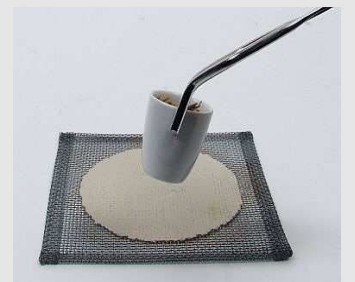
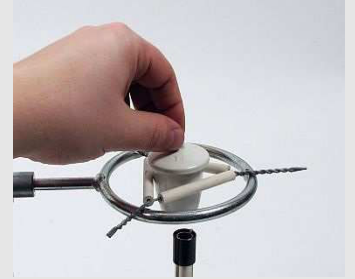
- Take a dried plant.
- Cut dried plants with scissors into maximum 0.5 cm long pieces.
- Place the pieces in the crucible.
- Please note the illustrations on the bottom right
- The crucible should not be filled to the top



Procedure (1/5)

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- Place the crucible filled to the brim in the wire triangle.
- Seal the crucible.
- Heat it with a strong flame until the plant parts have turned to ashes.
- Take the crucible with the crucible tongs and place it on the wire mesh to cool down.



Procedure (2/5)

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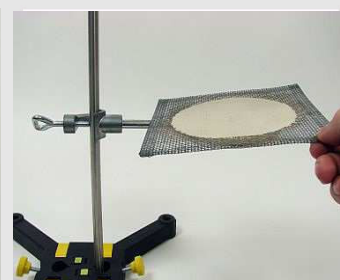
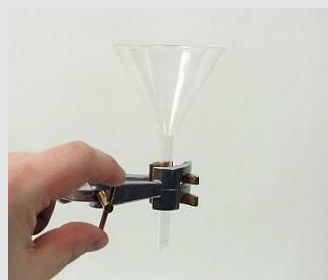
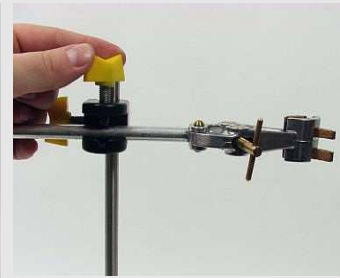
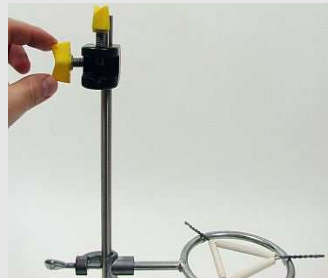
- Fill the beaker with approx. 20 ml distilled water.
- After cooling down, add the plant ashes.
- Stir with the glass stick.



Implementation (3/5)

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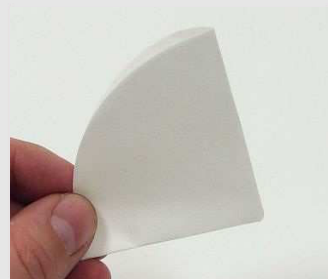
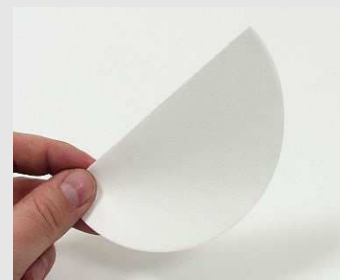
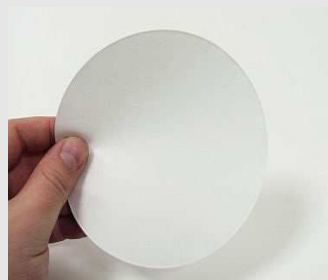
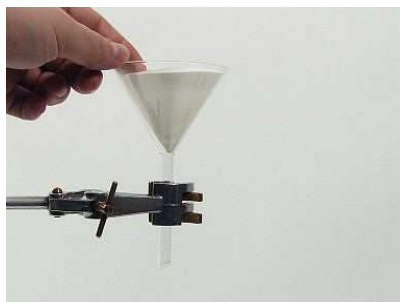
- Attach a universal clamp above the tripod ring.
- Secure the funnel with the universal clamp.
- Replace the wire triangle with the wire mesh.



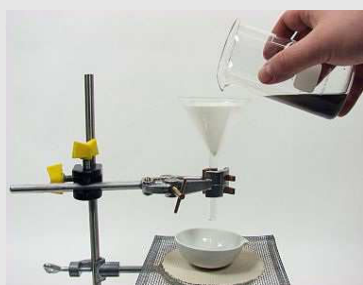
Procedure (4/5)

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- Fold the round filter. See illustrations on the right.
- Place it in the hopper as shown in the figure below.



Procedure (5/5)

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- Place the evaporating dish on the wire netting.
- Filter the mixture into it.
- Steam the filtrate until the water has almost completely evaporated.

Disposal

Dissolve the substance formed during evaporation and place it in the collection container for acids and alkalis.

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Report

Monitoring

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Write down your observations.

Task 1

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Complete the cloze !

Plants contain components that or
when heated, and those that are in the ashes.
Of these, components are , which form
 after evaporation.

Check

Task 2

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Since the substances that are created during evaporation are water-soluble and crystalline, they are salts.

Task 3


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Answer the initial question based on the results.

Since plants contain which they extract from the , the extracted substance must be to the soil in the form of .

Slide	Score/Total
Slide 19: Components of the plants	0/5
Slide 20: Type of material during evaporation	0/2
Slide 21: Fertilizer	0/4

Total amount  0/11

 Solutions

 Repeat

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