Mixture separation - extraction

Chemistry > General Chemistry > Substances mixtures & separation

Difficulty level	Group size	Preparation time	Execution time
easy	1	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/5f51bfc9739d0a0003ee412d

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Teacher information

Application

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Dyed fabric

Dyes are used everywhere. Not only our clothes are dyed, in almost everything that is produced, the colouring plays a role. Even some foods are dyed.

In order to dye substances specifically, the desired dye must first be obtained. Many dyes can be extracted from plants. Food is often coloured with beetroot extract or carrot extract.

Green colour can easily be extracted from leaves with the help of methylated spirits. Spinach and herbs with dark green leaves are particularly suitable for this purpose due to their high chlorophyll content and easy extractability.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Other teacher information (1/2)

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Prior knowledge

To carry out this experiment, students should be familiar with the operation of a filter and have already carried out a filtration experiment. They should also be familiar with basic material properties, especially solubility.

Scientific principle

With the help of methylated spirits, the green dye is dissolved from plant material and then separated from the solid plant components by filtration. The solution is then stored in the dark, as it is used for another experiment.

Other teacher information (2/2)

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Learning objective

- Dyes can be washed out of the dyed substances by extraction.
- Extraction is a separation process that is frequently used both in everyday life and in industry.

Tasks

- Search for suitable plant material or select some of the provided material.
- Dissolve the dye from the plant material.
- Filter the solution.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
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info@phywe.de
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Safety instructions

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- Wear protective goggles!
- Sterno:

  H225: Do not breathe liquid and vapour.

  P210: Keep away from heat/ open flames/ hot surfaces. No smoking.
- The general instructions for safe experimentation in science lessons apply to this experiment.

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Student Information

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Motivation

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Dyed fabric

Colours play a major role in our lives. Most things that are produced are dyed, for example to make them more attractive. With food colouring you can colour cake dough, for example. But many other things are also dyed, for example clothes or paper. How are these dyes obtained?

Many dyes can be obtained from plants. Plants that have a very intensive colouring, such as beetroot or carrot, are particularly suitable for this purpose.

You can look at the plant as a natural mixture of substances from which dye is obtained by a separation process. This process is called extraction.

Tasks

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- Look for some dark green leaves or some grass in the schoolyard or take some of the plant material provided.
- Dissolve the dye out of the plant material.
- Filter the solution.

Decomposition of a natural mixture

What material properties do you use to extract the dye from the plant material?

- Boiling point
- Solubility
- Magnetizability

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Robert-Bosch-Breite 10
37079 Göttingen

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Equipment

Position	Material	Item No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Rubber gloves, size M (8), one pair	39323-00	1
3	Spatula, powder, steel, l=150mm	47560-00	1
4	Support base, variable	02001-00	1
5	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
6	Boss head	02043-00	1
7	Universal clamp	37715-01	1
8	Circular filter,d 150 mm,100 pcs	32977-06	1
9	Funnel, diameter = 60 mm, plastic (PP)	47318-00	1
10	Denaturated alcohol (spirit for burning), 1000 ml	31150-70	1
11	Erlenmeyer flask, stopper bed, 100 mlSB 29	MAU-EK17082301	1
12	Mortar w. pestle, 70ml, porcelain	32603-00	1
13	Graduated cylinder, 25 ml, transparent, PP	36635-00	1
14	Rubber stopper 26/32 , without hole	39258-00	1
15	Scissors, l = 110 mm, straight, point blunt	64616-00	1
16	Quartz sand, coarse, 1000 g	CHE-881318041	1

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Robert-Bosch-Breite 10
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Set-up (1/2)

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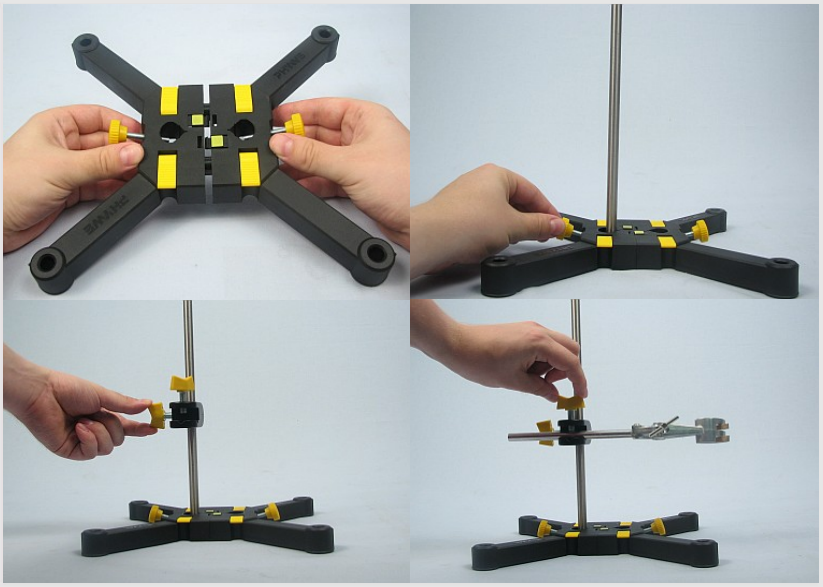
- Assemble the tripod from the tripod base and the tripod rod.
- Attach the double sleeve to the stand rod and fix the universal clamp to it.



Set-up (2/2)

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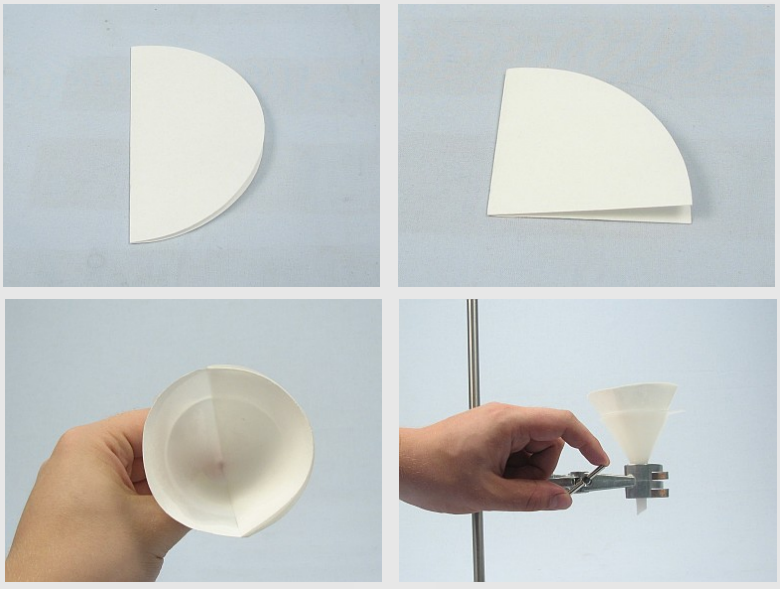
- Fold the round filter as shown in the pictures
- Put the pleated filter into the funnel and moisten it with methylated spirit. Then clamp the funnel into the stand.



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Robert-Bosch-Breite 10
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info@phywe.de
www.phywe.de

Procedure (1/3)

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- Cut the leaves or blades of grass with scissors.
- Fill the mortar about one third full with the cut leaf material.
- Add 3 spatulas of sand and rub once vigorously with the pestle.

Procedure (2/3)

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- Add the measured 10 ml of methylated spirits and grate the mixture vigorously for 5 minutes.
- As soon as the material is almost homogeneous, add another 5 ml of methylated spirits and homogenize for another 2 minutes.

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Procedure (3/3)

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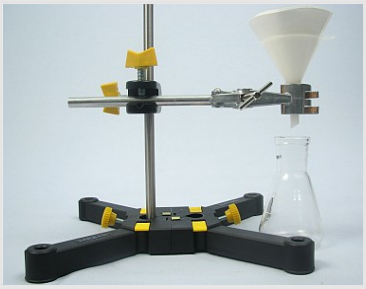

- Place the Erlenmeyer flask under the funnel and filter the mortar mixture. Repeat the procedure at least twice until about 15 ml of liquid has collected in the Erlenmeyer flask.
- Seal the Erlenmeyer flask with the stopper and keep it in the dark until the next hour.

Disposal

- To clean the mortar and pestle, put some sand, scouring powder and a few drops of water in the mortar and rub the substances vigorously with the pestle. Then rinse vigorously with tap water and if necessary with detergent.

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Report

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

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Task 1

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What do you observe when homogenizing the mass?

What do you observe when filtering?

Task 2

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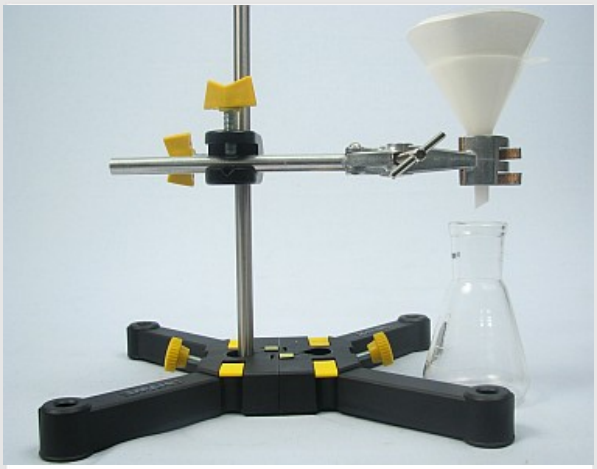

Experiment set-up

What material properties do you use for extraction?

- Magnetizability
- Solubility
- Boiling point

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Robert-Bosch-Breite 10
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info@phywe.de
www.phywe.de

Task 3

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Drag the words to the right place

The _____ helps to crush the plant material so that the dyes can dissolve in the _____. During filtration, the _____ and the _____ remain in the filter, while the _____ and the _____ dissolved in it seep through.

dye
sand
spirit
spirit
sand
plant remains

Check

Slide	Score / Total
Slide 8: Dye from plants	0/1
Slide 17: Material property during extraction	0/1
Slide 18: Filtering	0/6

Total amount 0 / 8

Solutions Repeat Exporting text

PHYWE
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