

A model of an electroscope



Physics

Electricity & Magnetism

Electrostatics & electric field



Difficulty level

easy



Group size

-



Preparation time

10 minutes



Execution time

10 minutes

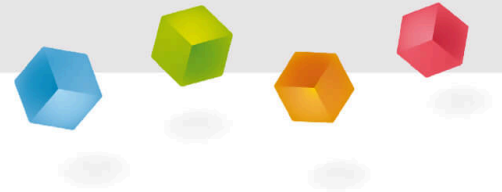
This content can also be found online at:



<http://localhost:1337/c/6425e384f60c9e000299f61f>

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Teacher information



Application

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As is known from previous experiments, opposing states take on different properties when they are electrically charged. A basic distinction is made between positive and negative charge.

This electrical charge can be detected with the help of an electroscope.

The functioning of the electroscope is based on the forces of repulsion acting between like-charged bodies, as can also occur in the electrostatic charge caused by friction in a slide or on a trampoline.

Source:

https://de.wikipedia.org/wiki/Elektrische_Char

Other teacher information (1/2)

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Prior knowledge



The students should ideally have already completed experiments on "Detection of charge types on foils and plates" and "Forces between charged bodies", as these provide a good basis of basic knowledge for carrying out this experiment.

Principle



With the help of the electroscope, electrical charges can be determined and additionally a statement can be made as to whether a body is negatively or positively charged.

Other teacher information (2/2)

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Learning objective



The students learn how an electroscope works on a simple model and are able to detect electrical charges with it.

Tasks



In this experiment, the students are to:

1. Build a model of an electroscope.
2. Examine electrically charged plastic rods with the generated electroscope.

Safety instructions

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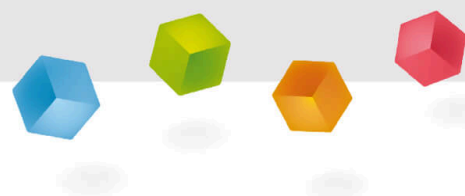
The general instructions for safe experimentation in science lessons apply to this experiment.

Notes on set-up and procedure:

If necessary, the acrylic rod must be charged and stripped several times during the third measurement in order to be able to observe the desired effect of recharging the electroscope.

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Student information



Motivation

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The phenomenon of electric charge is familiar to you from everyday phenomena, for example when your hair sticks out when you slide or jump on a trampoline. You have probably also rubbed a balloon against your hair until the hair sticks out or the balloon sticks to the ceiling.

Particularly in the case of the protruding hairs, you can observe not only the effect of the static charge, but also the repulsion of charges of the same name, since the hairs are distributed over as large a volume as possible. The electroscope, with which you will deal in this experiment, is based on the same principle.

Source:

https://de.wikipedia.org/wiki/Elektrische_Char

Tasks

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In this experiment you will investigate how to determine the electrical charge of different objects.

For this purpose you will work on the following task:

1. Build a model of an electroscope.
2. Examine electrically charged plastic rods with the generated electroscope.

Equipment

Position	Material	Item No.	Quantity
1	Polypropylene rod, l=175mm, d=10 mm	13027-09	1
2	Acrylic resin rod, l=175 mm, d=8 mm	13027-08	1
3	Support rod, stainless steel, d = 8 mm, l = 175 mm	02038-00	1
4	Rubber stopper, d=49/41mm, 1 hole	39263-01	1
5	CONDUCTING FOIL 2 CUTS, 3X60MM	326870	1

Additional Equipment

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Position	Equipment	Quantity
1	Dry, rough paper	DIN A4
1	Adhesive tape	

Set-up (1/2)

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Insert the stand rod into the rubber plug

- Insert the stand rod into the rubber plug with the side of the plug with the larger diameter facing up.
- Now take the guide foil strip and attach a piece of adhesive film to its upper end.



Adhesive film on the guide foil strip

Set-up (2/2)

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Attach the guide foil strip to the stand rod

Then attach the guide film strip to the top of the stand rod using the adhesive film.

Procedure (1/3)

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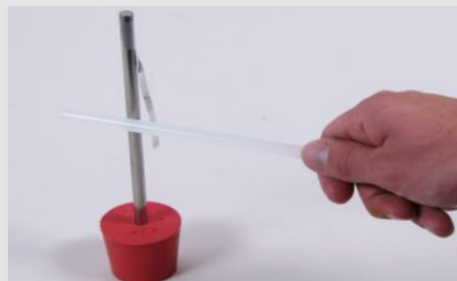
1st experiment: Charge the polypropylene rod electrically by rubbing it vigorously with paper.

Streak along the tripod rod with the rod almost full length and observe the guiding film strip.

Touch the tripod rod with your hand while continuing to watch the guiding film strip.



Rub polypropylene rod and paper together



Stripping the rod from the stand rod



Touching the stand rod with the hand

Procedure (2/3)

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2nd try:

- Repeat the process in the same way but using the acrylic stick.



Rub acrylic stick and paper together



Strip the rod past the stand rod



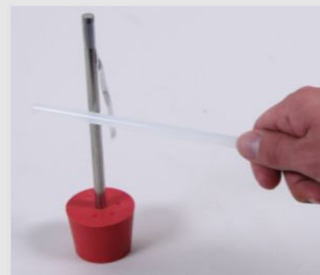
Touching the stand rod with the hand

Procedure (3/3)

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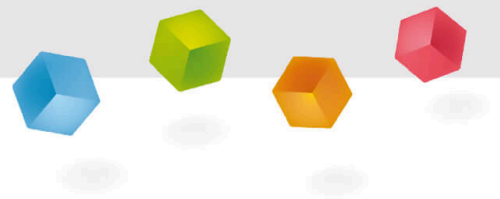
Third try:

- Now rub first the polypropylene and then the acrylic rod with the paper to charge them.
- Then swipe the two loaded rods one immediately after the other on the stand rod.
- In both cases, again observe the guiding strip both as it approaches and as it comes off.



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Report



Task 1

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What were your observations during the 1st experiment (polypropylene rod)?

- ☐ Nothing worth mentioning has happened.
- ☐ The guiding foil strip approaches the stand rod when the rod is rubbed.
- ☐ The guiding foil strip spreads away from the stand rod when the rod is rubbed.
- ☐ When touched with the hand, it returns to its original position.

[✓ Check](#)

Task 2

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What were your observations during the 2nd experiment (acrylic rod)?

- ☐ When touched with the hand, it returns to its original position.
- ☐ The guiding foil strip spreads away from the stand rod when the rod is rubbed.
- ☐ Nothing worth mentioning has happened.
- ☐ The guiding foil strip approaches the stand rod when the rod is rubbed.

✓ Check

Task 3

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What were your observations during the 3rd trial?

- ☐ When approaching the acrylic rod, the deflection of the guiding foil strip decreases.
- ☐ When approaching the acrylic rod, the deflection of the guiding foil strip goes unchanged.
- ☐ When you strip the acrylic rod, the rash increases again.
- ☐ When you strip the acrylic rod, the overall rash decreases.

✓ Check

Task 4

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What do you see from measurements 1 and 2 about the way the model electroscope works? Drag the words into the correct boxes to justify your observations!

If you wipe an body on the stand rod, the rod and the conductive foil strip are charged . Since the stand rod and the strip are connected to each other, occurs. This happens whether the body is negatively or positively charged. Not needed: (adjective), (noun).

attraction

conductively

electrically charged

repulsion

similarly

insulating

☒ Check

Task 5

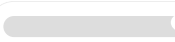
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How can we explain the movement of the guiding foil strip in the individual sections of the last measurement?

- ☐ No general statements can be made regarding the movement of the guiding foil strip.
- ☐ If the charged electroscope is approached by a body that carries opposite charges, the pointer deflection initially decreases due to induction and, when touched, due to charge equalisation. If these opposite charges are added again, the electroscope is charged with them and the pointer deflection increases again.

☒ Check

Slide	Score / Total
Slide 17: Observation: Experiment 1	0/2
Slide 18: Observation: Experiment 2	0/2
Slide 19: Observation: Experiment 3	0/2
Slide 20: Mode of action of the electroscope	0/6
Slide 21: Explanation experiment 3	0/1

Total  0/13



Solutions



Repeat