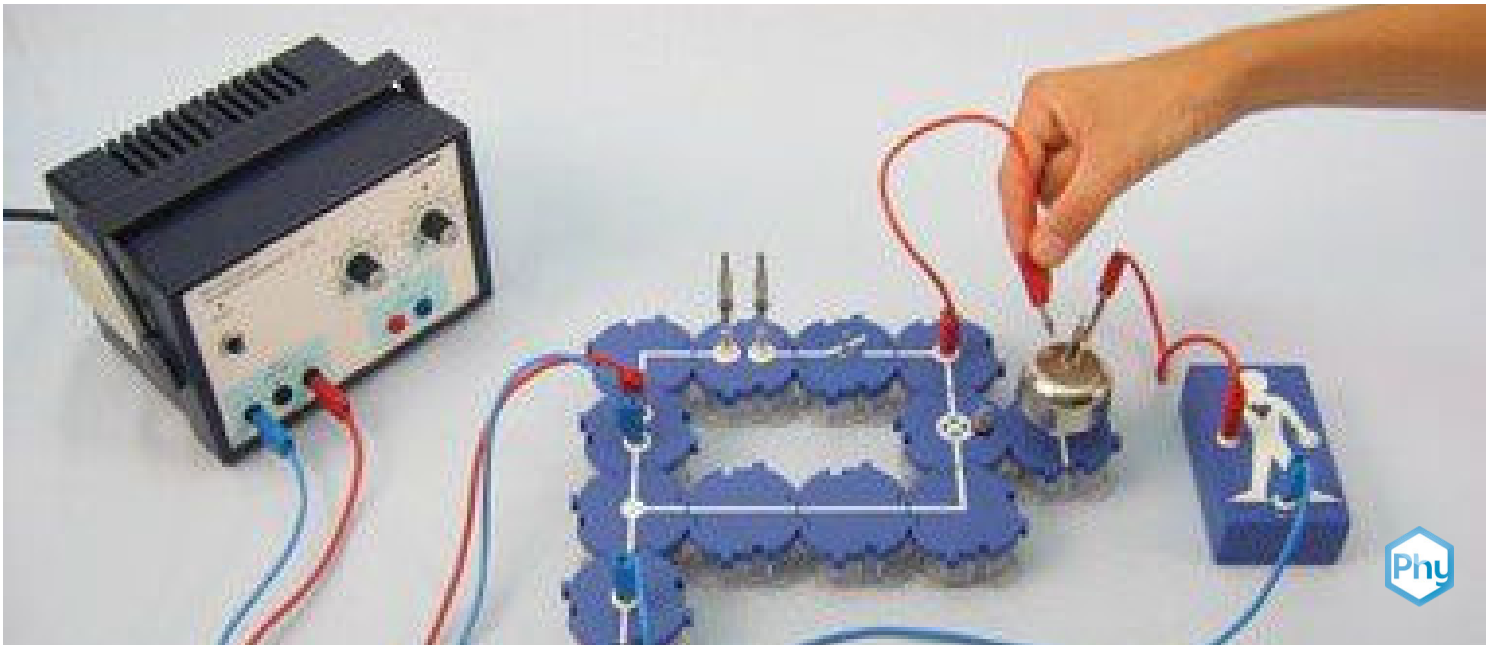
The protective conductor system



The students should use the experiment to learn how a protective conductor system works.

Physics > Electricity & Magnetism > Use of electrical energy, energy supply

Difficulty level	Group size	Preparation time	Execution time
medium	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/6310d2f05f9bef000386646d

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Teacher information

Application

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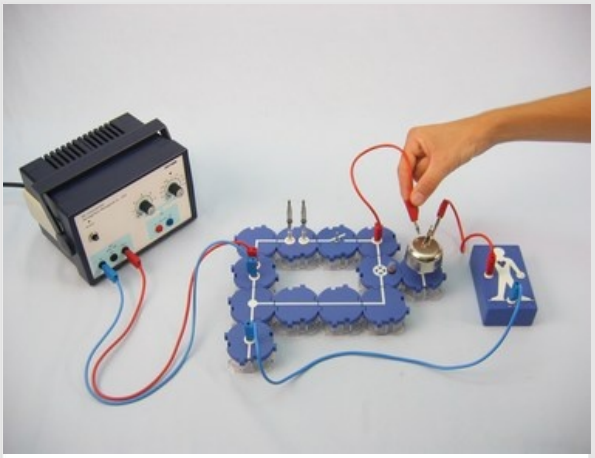

Experimental setup

Defective insulation can energise parts of the appliance that are not intended for power.

Hazardous voltages occur most frequently on metallic housings of electrical appliances. In order to exclude a hazard to humans, a protective earth conductor is installed, which is connected to the N conductor in the household circuit. This causes a short circuit as soon as voltage is applied to the metal housing of the appliance, for example. The fuse responds.

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Other teacher information (1/2)

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Prior knowledge

No prior knowledge is necessary.

Principle

A fuse responds as soon as a short circuit occurs. In this experiment, this is made possible by the glowing of a wire due to the high current flow.

Other teacher information (2/2)

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Learning objective

The students should use the experiment to recognise how a protective conductor system works.

Tasks

Set up a circuit with a fuse, switch, light bulb and housing. Investigate the function of a protective conductor with the help of a model human.

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Safety instructions

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

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Student information

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Motivation

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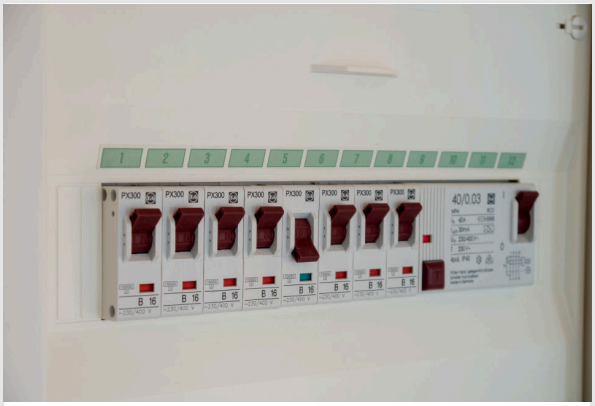
Defective insulation can energise parts of the appliance that are not intended for power.

Hazardous voltages occur most frequently on metallic housings of electrical appliances. In order to exclude a hazard to humans, a protective earth conductor is installed, which is connected to the N conductor in the household circuit. This causes a short circuit as soon as voltage is applied to the metal housing of the appliance. The fuse responds.



Fuse box

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Equipment

Position	Material	Item No.	Quantity
1	Straight connector module, SB	05601-01	3
2	Angled connector module, SB	05601-02	4
3	T-shaped connector module, SB	05601-03	2
4	Interrupted connector module with sockets, SB	05601-04	2
5	Junction module, SB	05601-10	2
6	Angled connector module with socket, SB	05601-12	1
7	On-off switch module, SB	05602-01	1
8	Socket module for incandescent lamp E10, SB	05604-00	1
9	Bell gong on 4-mm-plug	05673-02	1
10	Model person for electrical safety	05680-00	1
11	Alligator clips, bare, 10 pcs	07274-03	1
12	Connecting plug, 2 pcs.	07278-05	1
13	Connecting cord, 32 A, 250 mm, red	07360-01	1
14	Connecting cord, 32 A, 250 mm, blue	07360-04	1
15	Connecting cord, 32 A, 500 mm, red	07361-01	1
16	Connecting cord, 32 A, 500 mm, blue	07361-04	2
17	Filament lamps 12V/0.1A, E10, 10 pieces	07505-03	1
18	Iron wire, d = 0.2 mm, l = 100 m	06104-00	1
19	PHYWE Power supply, 230 V, DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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Set-up

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- Set up the experiment according to Fig. 1 and Fig. 2. Tighten the iron wire (fuse) with the help of alligator clips on the double plugs. The alligator clips must not touch each other.
- Insert the lamp socket so that the socket thread is connected to the upper pipe.
- Place the bell cup (metal housing of an electrical appliance) on a connection module.
- Attach one hand of the model man to the screw of the bell bowl via connecting cord and an alligator clip.

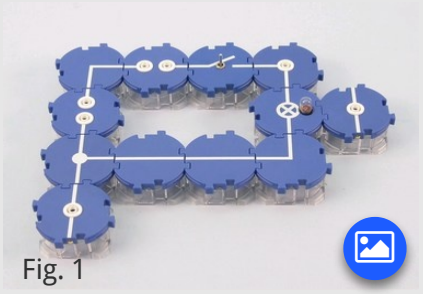

Fig. 1

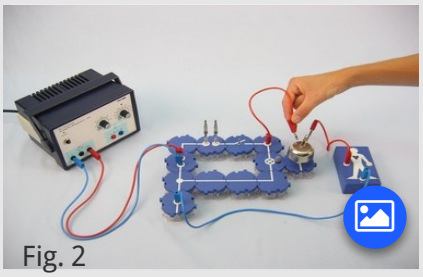

Fig. 2

Procedure (1/2)

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- Close the switch.
- Briefly establish a connection (short-circuit) between the lamp socket and the metal housing with the help of a wire.
- Observe the model man and the light bulb and write down your observations in the report.
- Also note the change in the iron wire in the report.
- Modify the experiment according to Fig. 3 and Fig. 4 and repeat the experiment.

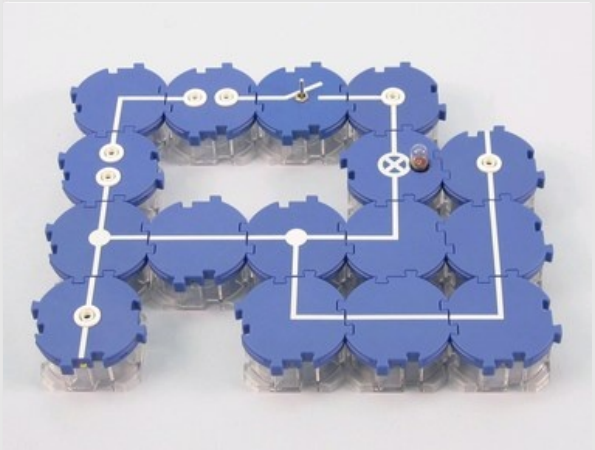

Fig. 3

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Procedure (2/2)

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Caution. Do not touch the iron wire when making the short circuit!

- Record the observation of the model man and the lamp in the report.
- Also note the change in the iron wire in the report.

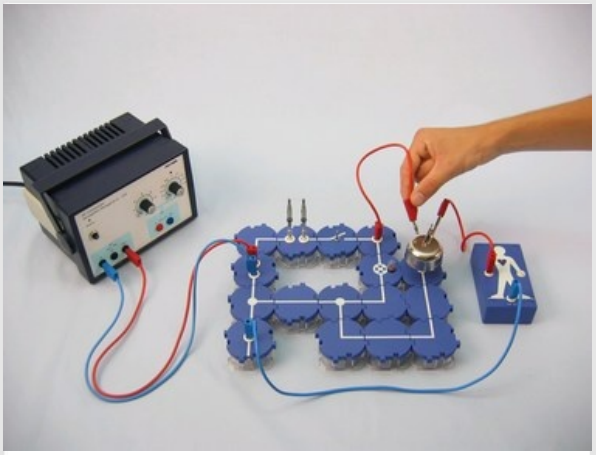

Fig. 4

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Report

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Observation (1/2)

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Write down your observation:

a) model man, b) iron wire

Observation (2/2)

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Write down your observations about the second part of the experiment:

a) model man, b) iron wire

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Task (1/4)

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What is the significance of the connection between the model man and the bell bowl in this experiment?

Task (2/4)

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What does the momentary connection between the lamp socket and the bell cup mean?

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Task (3/4)

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Drag the words into the correct boxes!

Without the use of the _____, the _____ is not interrupted when the _____ occurs. As a result, the _____ is unprotected against the _____ of the electric current.

- protective conductor
- circuit
- short-circuit
- model human
- dangers

Check

Task (4/4)

PHYWE

Drag the words into the correct boxes!

With the use of the _____, the _____ is immediately interrupted when the _____ occurs. As a result, the _____ is not exposed to the _____ of the electric current for an excessively long time.

- dangers
- protective conductor
- model person
- circuit
- short-circuit

Check

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Slide	Score / Total
Slide 17: Explanation without protective conductor	0/5
Slide 18: Explanation with protective conductor	0/5

Total score 0 / 10

Show solutions | Repeat | Export text

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