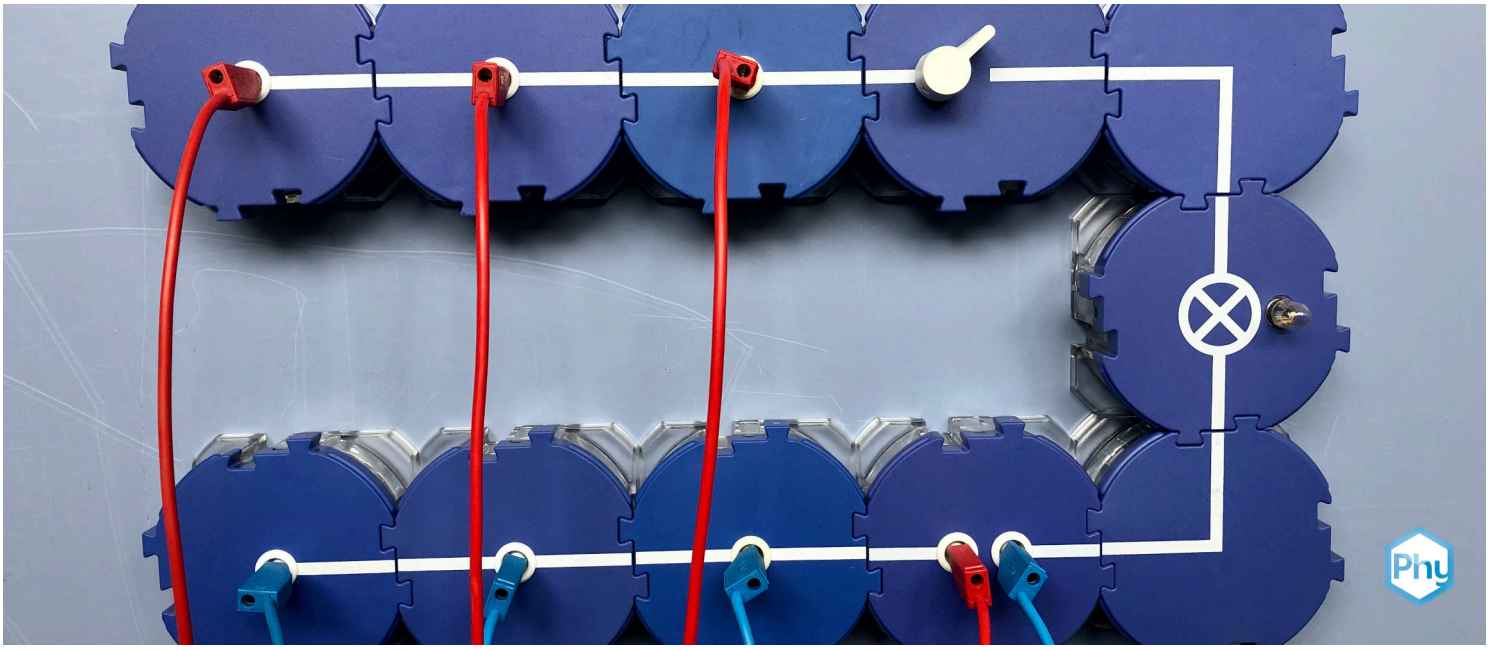
The safety fuse



The students should be familiarised with the functioning of a fuse. Special attention should be paid to the fuse in this experiment.

Physics > Electricity & Magnetism > Electric current & its effects

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

This content can also be found online at:

http://localhost:1337/c/6474bd2821530f000293d824

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General information

Application

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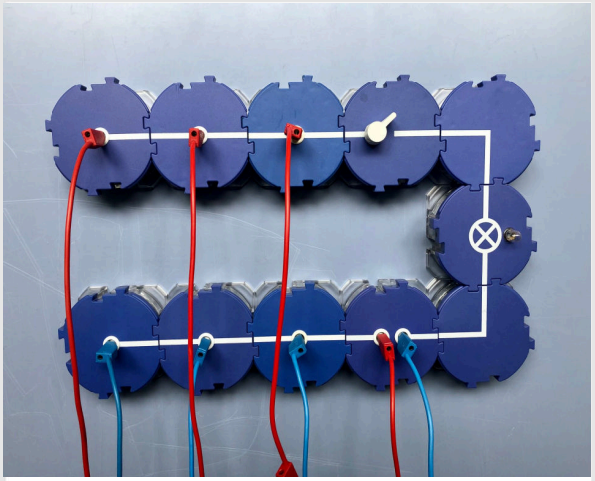

Experimental setup

A fuse is a protective device that interrupts the circuit if the current is too high. If, for example, too much current flows in a circuit in a household (e.g. when too many appliances are connected), this can lead to an overload and thus to the destruction of the electrical appliances. A fuse prevents this.

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Other information (1/2)

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Prior knowledge

The students should be familiar with the functioning of the simple electric circuit and know the terms current and voltage.

Principle

If too much current flows in a circuit, it is interrupted by a fuse, for example a fusible link.

Other information (2/2)

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Learning objective

The students should be familiarised with the functioning of a fuse. Special attention should be paid to the fuse in this experiment.

Tasks

First, the experiment is set up according to the circuit diagram and then a short circuit is created.

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Safety instructions

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

Theory

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Fuses prevent impermissibly high currents and thus serve to protect electrical devices and systems. In the worst case, supply lines could heat up to such an extent that a fire could occur. To prevent this, fuses are installed in the circuit as "predetermined breaking points".

In this experiment, the functioning of a fuse is explicitly examined. Here, the interruption of the circuit is caused by a fuse wire melting through due to the high current strength and the resulting high temperature, thus interrupting the current flow.

The power supply unit limits the current intensity to the set maximum value $2A$. In order for the iron wire to melt, the current intensity must not be less than $2A$. Even a current meter can reduce the amperage so much that the experiment is unsuccessful.

Suitable precautions must be taken so that falling glowing parts of the melted fuse wire do not cause any damage: A piece of cardboard - placed under the wire on the experiment table - is sufficient.

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Equipment

Position	Material	Item No.	Quantity
1	PHYWE Demo Physics board with stand	02150-00	1
2	Connector, straight, module DB	09401-01	1
3	Connector, angled, module DB	09401-02	2
4	Connector interrupted, module DB	09401-04	1
5	Junction, module DB	09401-10	2
6	Connector, angled with socket, module DB	09401-12	2
7	Switch on/off, module DB	09402-01	1
8	Socket for incandescent lamp E10 ,module DB	09404-00	1
9	Alligator clips, bare, 10 pcs	07274-03	1
10	Connecting plug, 2 pcs.	07278-05	1
11	Connecting cord, 32 A, 250 mm, red	07360-01	1
12	Connecting cord, 32 A, 1000 mm, red	07363-01	1
13	Connecting cord, 32 A, 1000 mm, blue	07363-04	1
14	PHYWE Power supply, universal, analog display DC: 18 V, 5 A / AC: 15 V, 5 A	13503-93	1
15	Filament lamp 6 V/3 W, E10, 10 pcs.	35673-03	1
16	Iron wire, d = 0.2 mm, l = 100 m	06104-00	1
17	Electr.symbols f.demo-board,12pcs	02154-03	1
18	G-clamp	02014-01	2

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Set-up and Procedure

Setup

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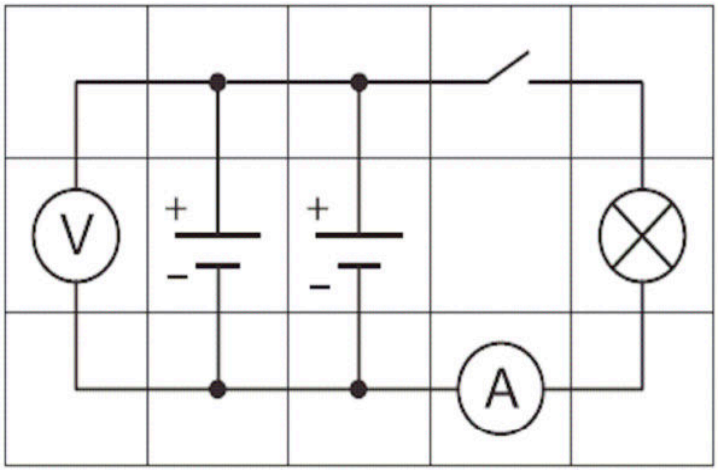

Experimental setup

- Set up the experiment according to the circuit diagram on the left.
- Place the two alligator clips on the connecting plugs and clamp the iron wire between them very briefly.
- The switch is open at the beginning.

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Procedure

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- Switch on the power supply unit, set the voltage to $6V$ and maximum current.
- Close the switch and observe the bulb.
- Use the short connecting lead to bridge the bulb, i.e. create a short circuit.
- Observe bulb and (fuse) wire.

Evaluation (1/3)

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What happens first in a closed circuit?

- The light bulb flickers.
- The bulb does not light up.
- The light bulb shines brightly.

What happens when the terminals of the bulb are short-circuited?

- The lamp starts to flicker and shortly afterwards the wire is melted through.
- The lamp goes out, otherwise nothing happens.
- The lamp goes out and shortly afterwards the wire is melted through.
- Nothing happens.

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Evaluation (2/3)

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Complete the paragraph:

If a _____ occurs in a circuit containing a _____, the circuit is interrupted by the _____.
In the case of the _____, the interruption of the circuit is caused by a fuse wire melting through due to the high _____ and the resulting high _____.

temperature
current
fuse
fuse
short-circuit
fuse

Check

Evaluation (3/3)

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Which statements are correct?

- [ ] Without a fuse, no current can flow.
- [ ] Fuses are so-called "breaking points" in an electrical circuit.
- [ ] Fuses can reduce the amperage in a circuit.
- [ ] Fuses prevent impermissibly high currents.
- [ ] A fuse is a specific type of fuse.

Check

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Slide	Score / Total
Slide 11: Multiple tasks	0/2
Slide 12: Functionality of the fuse	0/6
Slide 13: Features fuse	0/3

Total score 0 / 11

Show solutions Repeat

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