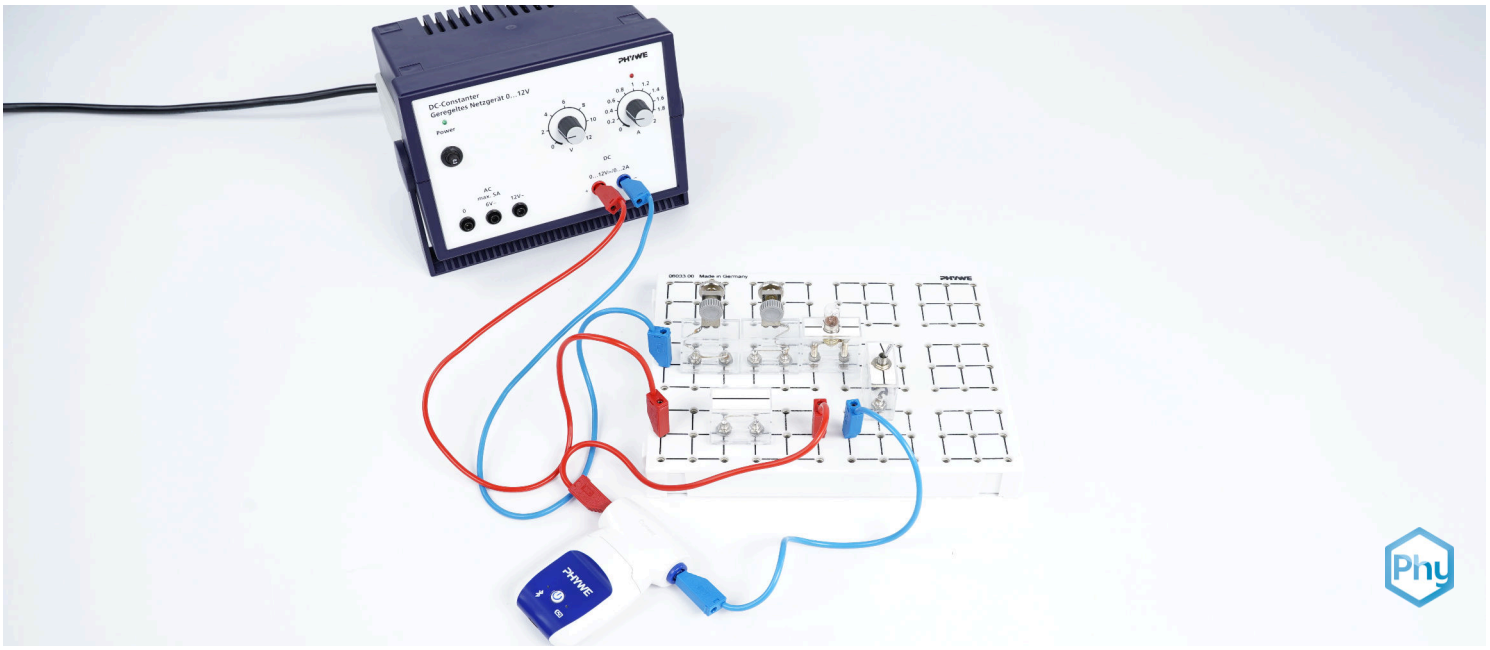
Conductors and non-conductors with Cobra SMARTsense



Physics > Electricity & Magnetism > Simple circuits, resistors & capacitors

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	20 minutes

This content can also be found online at:

https://www.curriculab.de/c/686e2a617a59aa0002d02113

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Teacher information

Application

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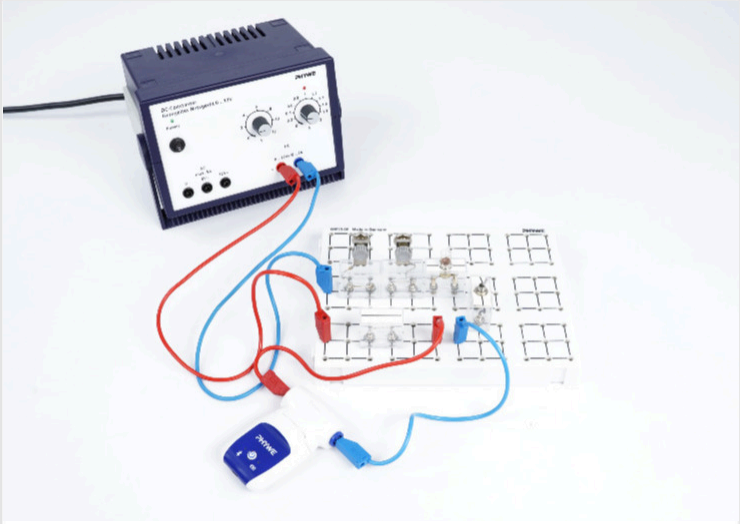

Experimental setup

Both in electrical engineering and in everyday life, the distinction between electrical conductors and non-conductors is essential. While conductors are necessary for building functioning circuits, non-conductors are required to insulate them and thus prevent damage or injury.

The aim of this experiment is to enable participants to experience which materials conduct electricity.

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Other teacher information (1/2)

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Prior knowledge

Pupils should be able to independently construct an electric circuit with the help of a circuit diagram and a photo. They should also know what an electric current is and how to measure it.

Principle

An interrupted, simple circuit is created. The interruption can be bridged by clamping different materials in between. For each of these materials, check whether the light bulb lights up and measure the current as a measure of conductivity.

Other teacher information (2/2)

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Learning objective

The students learn which objects are conductive and which are not.

Tasks

Firstly, the circuit is to be constructed according to the circuit diagram and photos. Then different materials are to be installed in the circuit, the respective current measured and the results noted.

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Safety instructions

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The general instructions for safe experimentation in science lessons apply.

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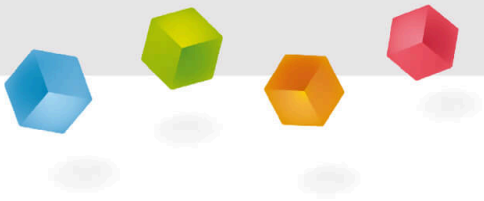

Student information

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Motivation

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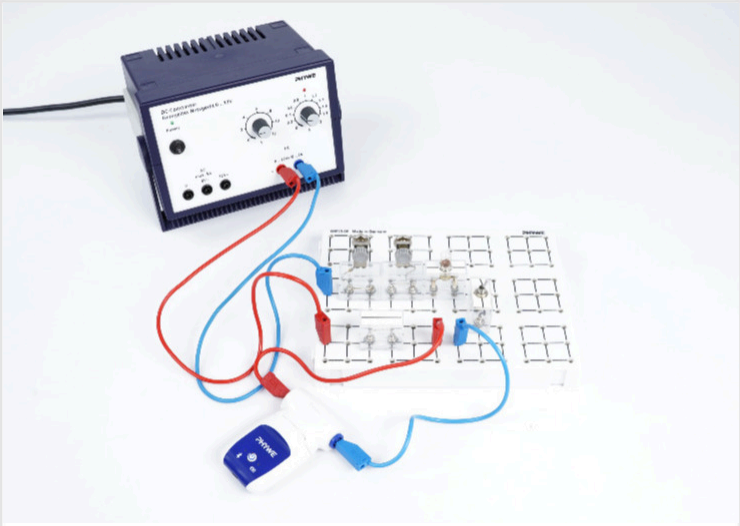

Experimental setup

Both in electrical engineering and everyday life, distinguishing between electrical conductors and non-conductors is essential. While conductors are required to build functioning circuits, non-conductors are necessary to insulate them and thus prevent damage or injury.

The aim of this experiment is to explore which materials conduct electricity.

Tasks

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Universal holder

1. Build the circuit according to the circuit diagram and photos
2. Insert different materials into the circuit by clamping them into the universal holder.
3. Note whether they conduct current and what current is measured

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Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense Current - Sensor for measuring electrical current ± 1 A (Bluetooth + USB)	12902-02	1
2	Plug-in board, for 4 mm plugs	06033-00	1
3	on-off switch, G1	39139-00	1
4	Lampholder E10, case G1	17049-00	1
5	Connecting cord,19 A,25cm, red	07313-01	2
6	Connecting cord,19 A,25cm, blue	07313-04	2
7	Conductors/non-conductors,l-50 mm	06107-01	1
8	Filament lamp 6 V/3 W, E10, 10 pcs.	35673-03	1
9	Universal holder, G1 housing	39115-02	2
10	PHYWE Power supply, 230 V,DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
11	Wire building block, housing G1	39120-00	1

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Setup (1/3)

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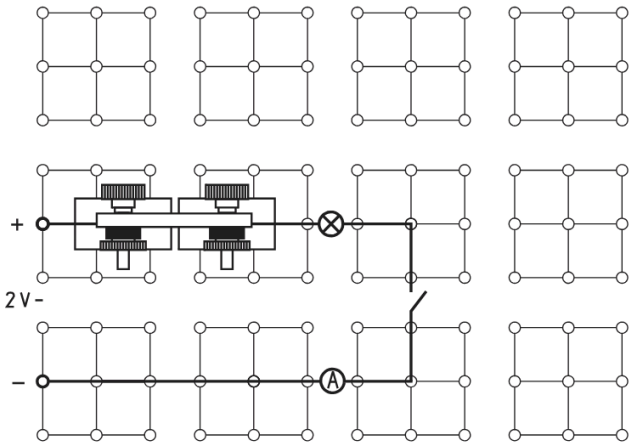

Circuit diagram of the assembly

- Set up the circuit as shown in the circuit diagram on the left.
- The circled "A" represents the Cobra SMARTsense Current sensor. The two large objects with screws are the universal holders.
- If you need help, press the blue button to display a photo of the assembled circuit.

Setup (2/3)

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To measure with the **Cobra SMARTsense sensors**, the **PHYWE measureAPP** is required. The app can be downloaded free of charge from the respective app store (QR codes below). Please check that **Bluetooth is enabled** on your device (smartphone, tablet, desktop PC) before starting the app.

Android

iOS

Windows

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Setup (3/3)

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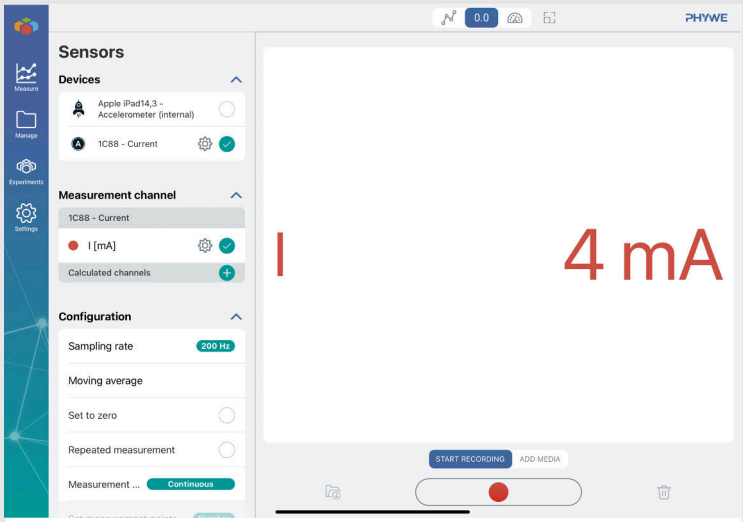

Example screenshot

- Now open the measureAPP and connect to the Cobra SMARTsense Current sensor by clicking on its name.
- Tap "0.0" at the top of the app to display the measured values in digital form.
- Even if the power supply unit has been switched off until now, you may still observe fluctuating readings. This is due to measurement errors of the device. Such fluctuations are normal and must be considered when precise measurements are required. However, for today's experiment, you can ignore them.

Procedure (1/3)

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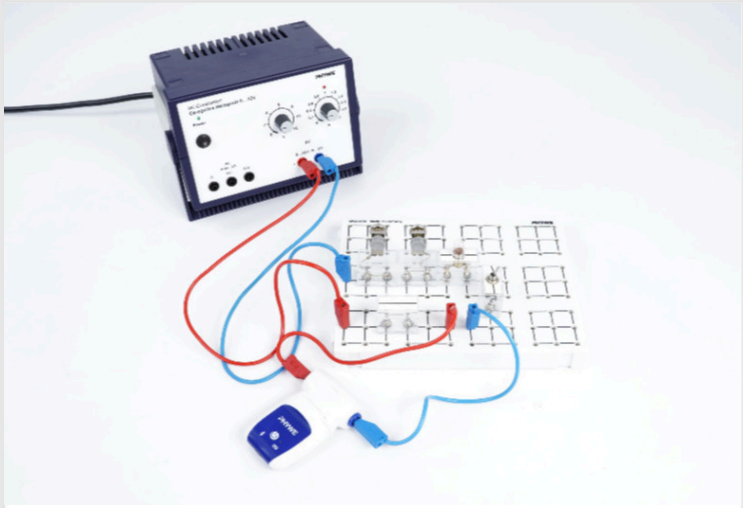

Setup

- Set the power supply unit to $0\ \mathrm{V}$ and switch it on.
- Close the switch and turn up the voltage on the power supply unit to $2\ \mathrm{V}$. Leave this setting for the duration of the trial.

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Procedure (2/3)

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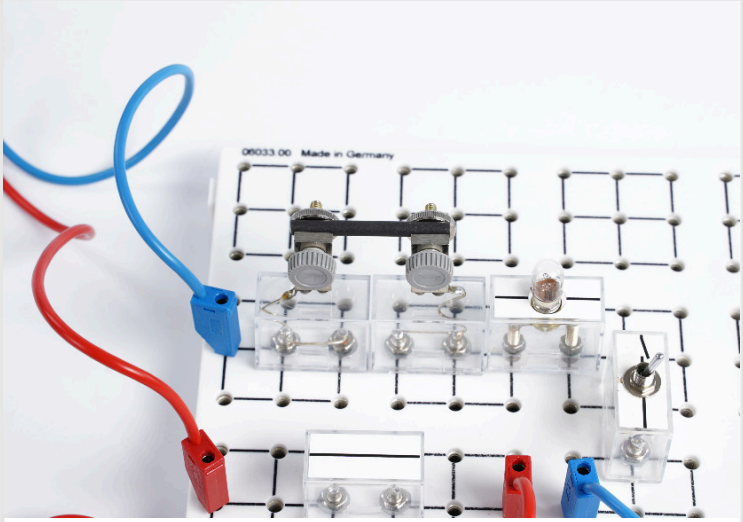

Universal holder with carbon rod

- Open the switch.
- Insert a rod from the set of conductors and non-conductors into the universal clamp. If the rod does not fit in directly, turn the screws to create more space.
- Close the switch.
- Note the current in Table 1 in the report section and observe the light bulb.
- Repeat these steps for all the sticks.

Procedure (3/3)

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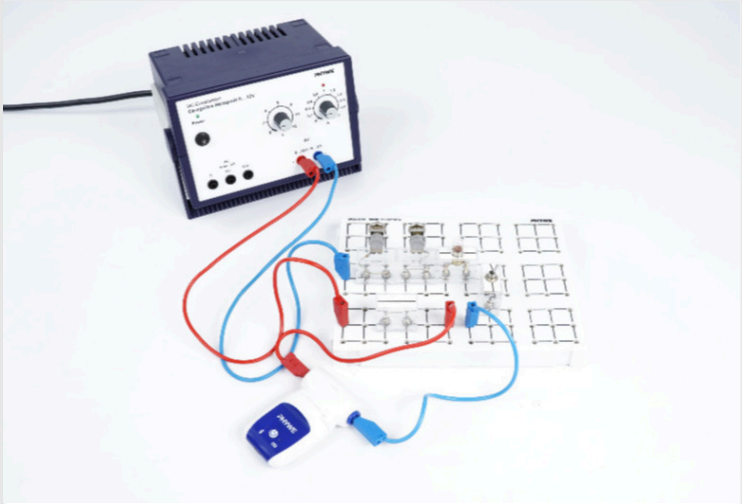

Setup

- Finally, turn the voltage of the power supply unit down to $0\ \mathrm{V}$ and switch it off.

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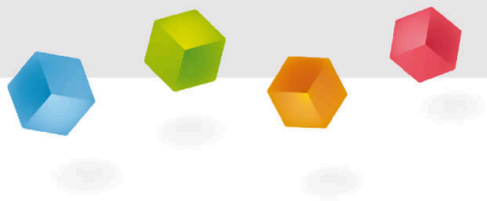

Report

Table 1

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Note the measured currents

Steel	Aluminium	PVC

Glass	Coal	Cord

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Task 1

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Which of the statements is correct?

- [ ] All metals conduct electricity
- [ ] Cotton conducts electricity
- [ ] Glass is a non-conductor
- [ ] All plastics conduct electricity

Check

Task 2

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Give examples of the use of insulators in technology and in the household

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Slide	Score / Total
Slide 18: Which material conducts electricity?	0/2

Total amount 0 / 2

Solutions Repeat Export text

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