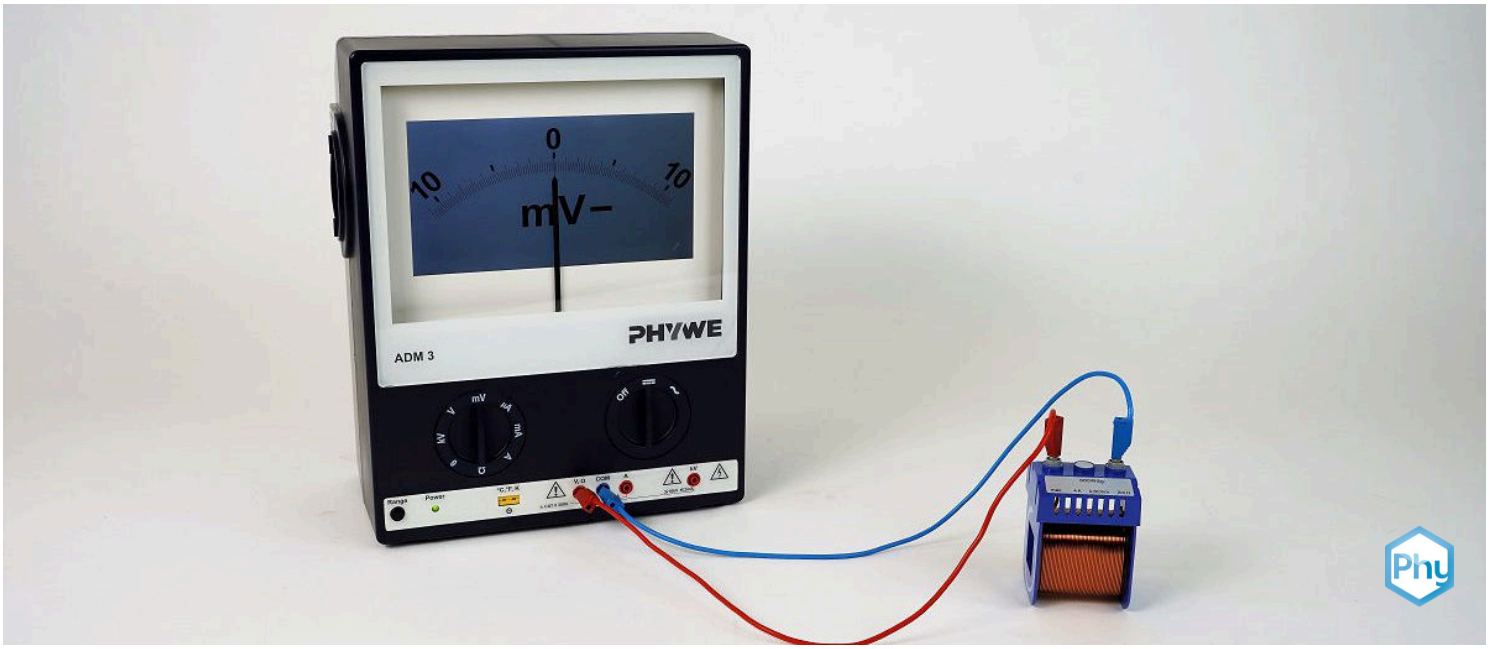
Generation of induced voltage with a permanent magnet (DEMO)



Physics	Electricity & Magnetism	Electromagnetism & Induction	
Physics	Electricity & Magnetism	Electric generator, motor, transformer	

Difficulty level	Group size	Preparation time	Execution time
medium	1	10 minutes	20 minutes

This content can also be found online at:

http://localhost:1337/c/617aac438e47ed0003a82b95

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Teacher information

Application

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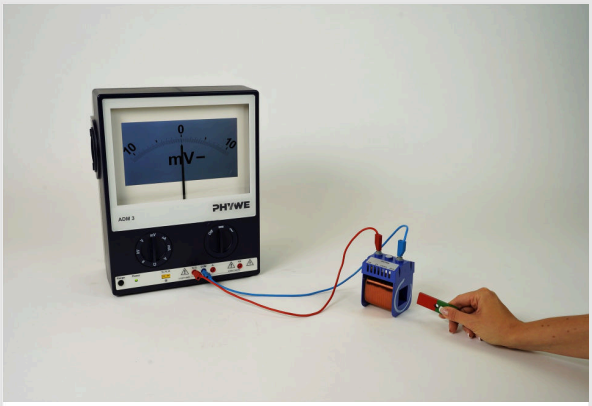

Test setup

Electromagnetic induction (also Faraday induction, after Michael Faraday, induction for short) refers to the creation of an electric field when the magnetic flux changes.

In many cases, the electric field can be detected directly by measuring an electric voltage.

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Other teacher information (1/2)

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Previous

No prior knowledge is required.

Principle

The change in magnetic flux acting on an electrical conductor induces an electrical voltage and thus an electrical current flow in that conductor.

Other teacher information (2/2)

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Learning

Students should understand the principle behind electromagnetic induction.

Tasks

Investigate how a permanent magnet can be used to generate induction voltages and what conditions affect their magnitude.

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Student Information

Motivation

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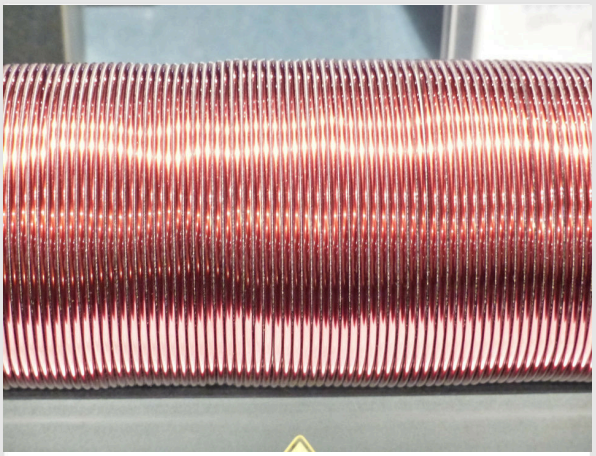

One coil

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Equipment

Position	Material	Item No.	Quantity
1	PHYWE Demo Multimeter ADM 3: current, voltage, resistance, temperature	13840-00	1
2	Coil, 300 turns	06513-01	1
3	Coil, 1200 turns	06515-01	1
4	magnet, l = 72mm, rodshaped, colored poles	07823-00	1
5	Connecting cord, 32 A, 750 mm, red	07362-01	1
6	Connecting cord, 32 A, 750 mm, blue	07362-04	1

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Set-up

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- Set up the experiment according to Fig. 1.
- Select the measuring range from -10 mV to +10 mV.
- Carry out the following experimental steps one after the other and observe the deflection of the pointer of the voltmeter in each case.
- Enter your observation in the prepared table in the evaluation.

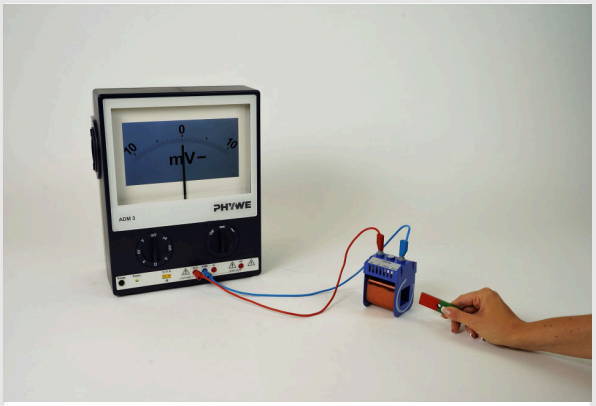

Fig. 1

Procedure

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1. Move the magnet with the north pole first into the coil.
2. Move the magnet out of the coil again.
3. Move the magnet with the south pole first into the coil.
4. Move the magnet back out of the coil.
5. Move the magnet in and out of the coil faster.
6. Let the magnet rest in the coil.
7. Rotate the magnet in the coil around its longitudinal axis.
8. Replace the coil with 400 Wdg. by a coil with 1600 Wdg. You may have to choose the measuring range 100 mV- and the appropriate direction of movement of the magnet.

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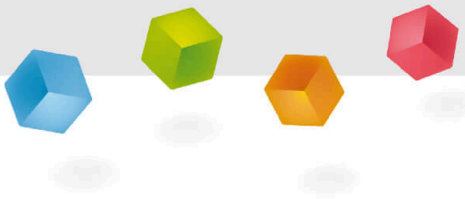

Report

Evaluation (1/3)

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Move	needle deflection	Move	needle deflection
North pole into coil		Faster movement of the magnet	
North pole out of coil		Magnet rests in the coil	
South pole into coil		Rotation of the magnet around the longitudinal	
South pole out of coil		As 1. to 4. for coil with 1600 Wdg.	

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Evaluation (2/3)

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Drag the words into the correct boxes!

From the results at steps 1 to 6, it is clear that a _____ is generated as long as the _____ and the _____ move relative to each other. However, as step 7 shows, the movement must be such that the _____ encompassed by the coil changes in the process. Thus, a voltage is _____ in a coil as long as the magnetic field encompassed by the coil changes.

voltage
induced
magnet
coil
magnetic field

Check

Evaluation (3/3)

PHYWE

Drag the words into the correct boxes!

The _____ of the induced voltage depends on whether the magnet is moving into or out of the coil, and which _____ of the magnet is facing the coil. The _____ is higher the _____ the movement and the higher the number of turns of the induction coil.

faster
pole
direction
induction voltage

Check

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Slide	Score / Total
Slide 12: Influence of the movement of the magnet	0/5
Slide 13: Induction voltage	0/4

Total score 0 / 9

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