Magnetic field of a coil

Task and equipment

Information for teachers

Additional information

Coils are important components of electric motors and generators. Their magnetic property is to be examined in this experiment.

This experiment is designed to show the magnetic property of a coil and so bring an understanding of the role it plays in an electric motor or generator.

Notes on procedure

The source of voltage can be a transformer or a battery. Do not allow the voltage to go above 4.5 volts, as higher voltages could cause damage to the coil.
To be able to best see the effect of the iron core on the magnetic field, take the compass readings with it at a distance of about 15 to 20 cm from the coil and observe the speed of the hunting for a steady state.

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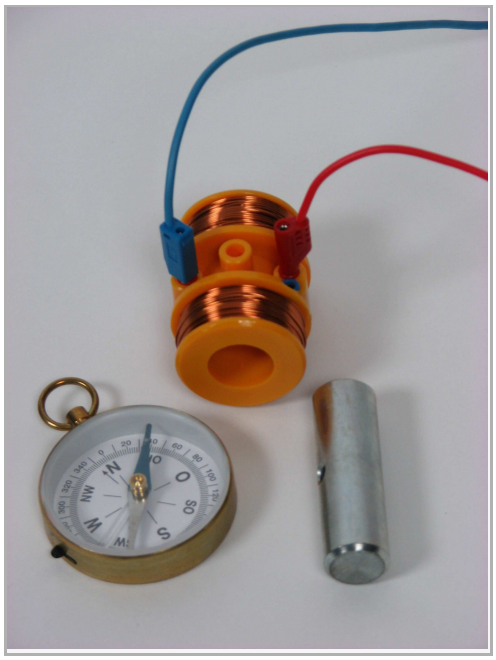
Task

A coil as magnet

Compare the magnetic field of a permanent magnet with that of a current-carrying coil.



Equipment

Position No.	Material	Order No.	Quantity
1	TESS advanced Physics set Electric motor/ Generator:	15221-88	1
	Bar magnet		1
	Pole shoes		2
	Coil		1
	Iron core		1
	Connecting cables		2
	Adapter plugs		2
2	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
3	Pocket compass	06350-00	1

Set-up and procedure

Examine the magnetic field around the bar magnet using the compass (Fig. 1). Make a sketch of the magnetic field in the report. (The compass needle always points along the magnetic field. Do you know why?)

Fig. 1: Bar magnet and compass.

Lay the bar magnet insdie the pole shoes and examine the magnetic field that is between the pole shoes (Fig. 2). Make a sketch of this magnetic field also.

Fig. 2: Pole shoe magnet and compass.

Connect a coil without iron core to a voltage of about 4 volts. Use the adapter plugs and the connecting cables here. Examine the magnetic field around the coil and again make a sketch of it. Fit the iron core in the coil and use the compass to examine the effect which the iron core has on the magnetic field (Fig. 3).
Switch off the current and repeat the last measurement. What do you observe?

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Fig. 3: Coil with iron core and compass.

Report: Magnetic field of a coil

Result - Observations 1

Make a sketch of the magnetic field of the bar magnet.

Result - Observations 2

Make a sketch of the magnetic field of the pole shoe magnet.

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Result - Observations 3

Make a sketch of the magnetic field of the coil.

Evaluation - Question 1

Compare the magnetic field around the permanent magnet with the one around the coil. Is there any difference?

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Evaluation - Question 2

Which effect does the iron core have on the magnetic field of the coil?

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Evaluation - Question 3

What differentiates a permanent magnet from a current-carrying coil, a so-called electromagnet?

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