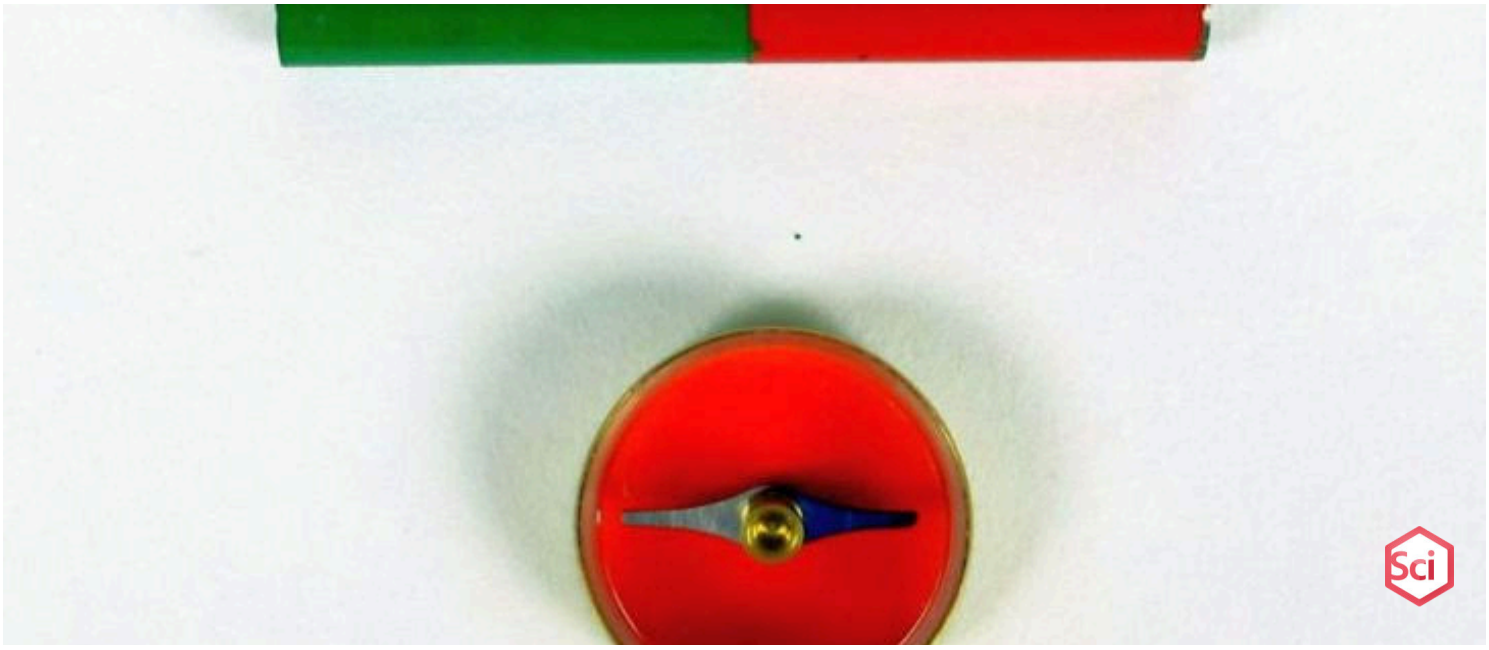
Observation of the magnetic field



Nature & technology > Devices & machines in everyday use

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

This content can also be found online at:

http://localhost:1337/c/6088f9c6c5d4ad0003790c0a

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Teacher information

Application

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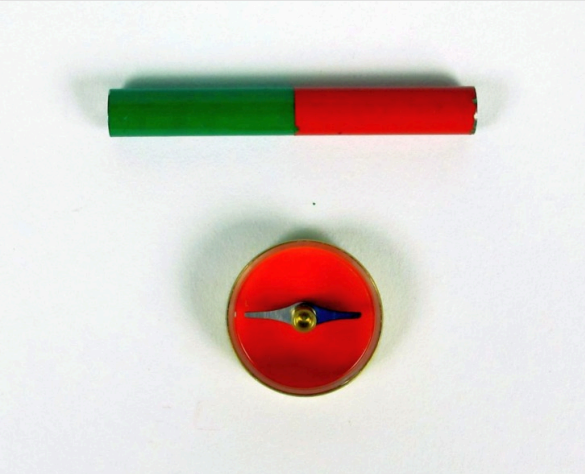

Test set-up

In this experiment, students use a compass to investigate the magnetic field of a bar magnet.

They observe that the needle is not always directed on a direct path to the poles of the magnet, but is oriented differently, especially in the vicinity of the magnet.

They then follow the course of the compass needle and recognize the magnetic field lines as closed paths running around the magnet between the north and south poles.

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Other teacher information (1/2)

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Previous knowledge

Students are familiar with the principle of the bar magnet and the compass and know that opposite poles of a maget attract each other. They should be aware that magnets, like the earth, have a magnetic field.

Principle

The students experiment independently with a bar magnet and a compass. They observe in which direction the compass needle is aligned when they move it around the magnet.

Notice: To better reproduce the field lines afterwards, it is helpful if the students take a photo at each position where they place the compass.

Other teacher information (2/2)

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Learning objective

The magnetic field of the bar magnet causes the compass needle to follow its field lines. This is how a compass can be used to determine the orientation of a magnetic field.

Tasks

- Students observe the alignment of a compass needle near a bar magnet at different positions.
- They realize that this allows them to determine the course of the magnetic field lines

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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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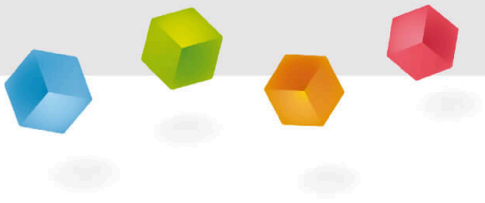

Student Information

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Motivation

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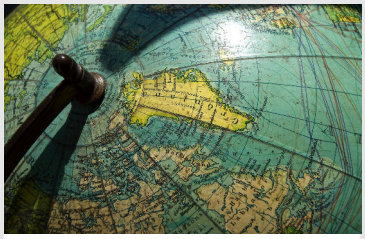
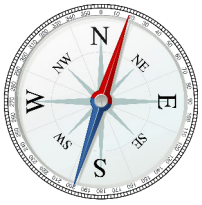


Globe



Compass

You must have heard that migratory birds spend the winter in the south and only return to us in the north in the spring. The reason they can find their way over such long distances is that they have a magnetic sense, a kind of "built-in compass".

But how does this actually work? This is because magnets can influence other magnets over long distances without touching or even "seeing" each other. Depending on where the magnet is in the environment of the other, it changes its orientation.

This behaviour is caused by the so-called "magnetic field", which every magnet has. Not only for us, but also for migratory birds it is important to know what this magnetic field looks like in order to find their way around the earth.

Tasks

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Could you use a compass to find the poles of a magnet that runs through the whole earth?

No, if you are far away from the poles, the compass would show nothing.

Yes, the north and south poles of the earth are like the north and south poles of a magnet.

What does the magnetic field of a bar magnet look like?

- Place a bar magnet on the table and watch the needle of a compass as you place it next to the magnet in different places
- Try to trace the course of the magnetic field lines in this way
- Go to the protocol and answer there the questions about the experiment

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Equipment

Position	Material	Item No.	Quantity
1	Magnet, d=8 mm, l=60 mm	06317-00	1
2	Drawing compass , 1 units	06350-03	1

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Procedure (1/2)

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Step 1

- Place the magnet in front of you in the middle of the table and leave it there.
- Take the compass and place it somewhere near the magnet (Fig. 1).
- Watch where the needle of the compass points.
- Now move the compass slightly to another position and observe the direction of the compass needle again (Fig. 2).

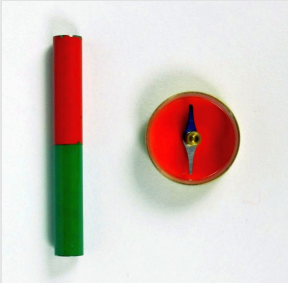

Fig. 1

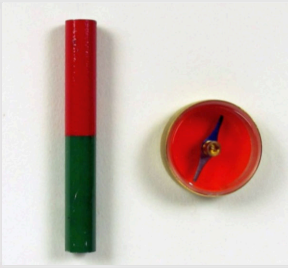

Fig. 2

Procedure (2/2)

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Fig. 3

Step 2

- Now move the compass slowly along the direction in which the needle points
- Does the direction of the needle change? Then also change the direction of movement. Always follow the needle
- Repeat the movement several times. At the beginning, however, always place the compass slightly offset next to the north pole of the magnet so that the needle gives you a new direction.
- Go to the protocol and answer the questions about the experiment

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Report

Task 1

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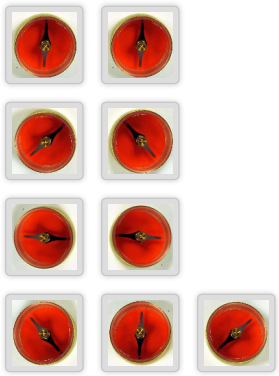
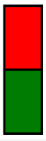
Move the compass needles to the right places. Watch the direction of the black tip!





Check

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Task 2

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The magnetic field lines of the bar magnet....

- ☐ start in the air.
- ☐ end up in mid air
- ☐ start at one pole of the magnet.
- ☐ end at one pole of the magnet.

Check

Task 3

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The magnetic field lines of the bar magnet are therefore...

- closed lines.
- open lines.

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Task 4

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Summarize what you learned in this experiment.

A bar magnet has a [ ] consisting of [ ]. These are [ ] lines pointing from the south pole to the north pole of the magnet. Another magnet is [ ] by these field lines when it is free to move. This is how a [ ] works on Earth, because the compass needle is a small magnet that aligns itself with the field lines of the [ ] magnetic field.

closed
aligned
Earth's
compass
magnetic field
field lines

Check

Slide	Score / Total
Slide 8: Find poles with compass	0/1
Slide 13: Move the compass needles to the right places. Watch the d...	0/9
Slide 14: Field lines	0/2
Slide 15: Compass needle and bar magnet	0/3
Slide 16: Summary compass, magnet, magnetic field	0/6

Total 0 / 21

Solutions Repeat

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