

A Guide to Exploring Magnetism

Teaching Approach

Magnetism is a difficult topic for learners to grasp as the concept is so abstract. It is very important to help learners understand this concept, especially because learners struggle with the diagrams and further explanations. The series consist of three videos, but before the field lines and diagrams are introduced, the basics of magnetic materials are explained in lesson one. Demonstrating the invisible attraction or repulsion that exist between magnetic materials helps learners to conceptualise the idea of magnetic fields. Lesson two focuses on diagrams of magnetic fields and, lastly, lesson three investigates the link between the Earth's magnetic field and the magnetic field of a bar magnet and the effect it has on our lives. The videos can be watched in any order, but it is suggested that it is watched in sequence as this will better the learner's understanding.

Video Summaries

Some videos have a 'PAUSE' moment, at which point the teacher or learner can choose to pause the video and try to answer the question posed or calculate the answer to the problem under discussion. Once the video starts again, the answer to the question or the right answer to the calculation is given

Mindset suggests a number of ways to use the video lessons. These include:

- Watch or show a lesson as an introduction to a lesson
- Watch or show a lesson after a lesson, as a summary or as a way of adding in some interesting real-life applications or practical aspects
- Design a worksheet or set of questions about one video lesson. Then ask learners to watch a video related to the lesson and to complete the worksheet or questions, either in groups or individually
- Worksheets and questions based on video lessons can be used as short assessments or exercises
- Ask learners to watch a particular video lesson for homework (in the school library or on the website, depending on how the material is available) as preparation for the next days lesson; if desired, learners can be given specific questions to answer in preparation for the next day's lesson

1. Magnetic Materials and their Properties

In the first video we describe a magnet as an object that has opposite poles and explore some common uses of magnets. We investigate elements that have magnetic properties and how magnetic materials interact with each other.

2. Magnetic Fields

Magnetic field lines are investigated and a magnetic field is demonstrated as a region in space where another magnet experiences a force. The direction of the magnetic field lines are investigated and indicated with the help of a diagram.

3. Magnetic Field of Earth

We investigate the direction, position and shape of the Earth's magnetic field. We compare the magnetic field of the Earth to the magnetic field of a bar magnet. The geographical North Pole of the Earth is explained.

Resource Material

Resource materials are a list of links available to teachers and learners to enhance their experience of the subject matter. They are not necessarily CAPS aligned and need to be used with discretion.

1. Magnetic Materials and their Properties	https://phet.colorado.edu/en/contributions/view/2826	Introduction to magnets with files to download (Introduction to magnets, lesson plans etc).
	http://www.cyberphysics.co.uk/topics/magnetsm/Magtism.htm	Experiments with magnets.
	http://www.s-cool.co.uk/gcse/physics/magnetism-and-electromagnetism/revise-it/electromagnetism	Simulations and revision.
2. Magnetic Fields	https://phet.colorado.edu/en/contributions/view/3123	Magnetic field investigation.
	https://www.khanacademy.org/science/discoveries-projects/discoveries/magnetic-fields/v/tracing-magnetic-field	Tracing the field lines of a magnet.
	https://www.khanacademy.org/science/discoveries-projects/discoveries/magnetic-fields/v/discovery-of-magnetic-fields	Discovery of magnetic field lines.
3. Magnetic Field of Earth	https://phet.colorado.edu/en/simulation/magnet-and-compass	Magnets and compass simulation.
	https://www.khanacademy.org/science/discoveries-projects/discoveries/magnetic-fields/v/magnet-near-compass	Exploring the effect of a permanent magnet on a compass.
	https://www.khanacademy.org/science/discoveries-projects/discoveries/measure-magnets/v/earth-s-magnetic-field	Measuring the Earth's magnetic field.

Task

Question 1

Two identical magnets are placed close together, with the north pole of the first magnet facing the south pole of the second one. Draw the magnetic field between the poles.

Question 2

Two identical magnets are placed close together, with their north poles facing each other. Draw the magnetic field between the poles.

Question 3

Geographical north and magnetic north differ. Is a compass needle attracted to the geographical North? Explain your answer briefly.

Question 4

Explain how you would store a permanent magnet to ensure its magnetism for a long period of time.

Question 5

Define a magnetic field.

Question 6

Which of the following is **TRUE**?

- a) Soft iron makes a good permanent magnet
- b) Copper is a good magnetic shield
- c) Steel makes a good temporary magnet
- d) Iron is a good magnetic shield

Question 7

Which of the following is **TRUE**?

- a) Unlike poles have no effect on each other
- b) If object x is repelled by a magnet, x cannot be a magnet
- c) Magnetic forces cannot act through magnetic materials
- d) If object x is attracted by a magnet, x must be a magnet

Question 8

Which of the following is **TRUE**?

- a) The Earth's geographic north pole is actually the south pole of the Earth's magnetic field
- b) Magnetic forces can act through magnetic materials
- c) Unlike poles have no effect on each other
- d) A freely moving magnet comes to rest pointing in an east-west direction

Question 9

Which of the following is **TRUE**?

- a) Aluminium is a good magnetic shield
- b) Iron in contact with a magnet cannot become a magnet
- c) Only iron, and not steel, can be magnetised inside wire coils of an electric circuit

d) Steel is a good magnetic shield

Question 10

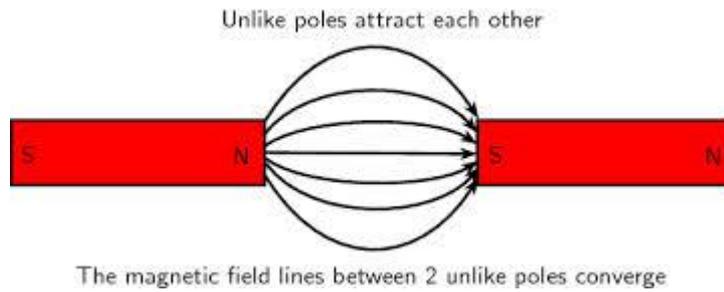
What is the difference between the north pole of a bar magnet and geographical North Pole?

Question 11

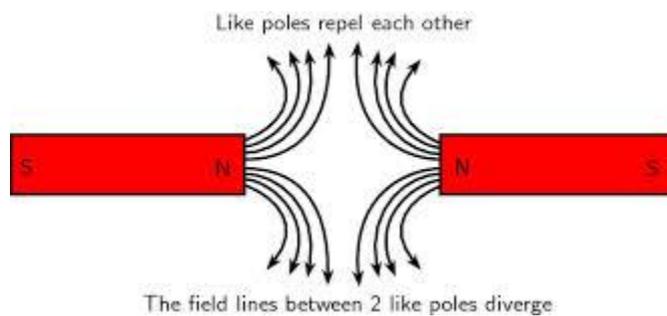
Describe how you can magnetise a piece of iron if you had a bar magnet available.

Task Answers

Question 1



Question 2



Question 3

A compass needle is attracted by the magnetic north pole which is $11,5^\circ$ away from the geographical north pole. The geographical north is determined by the position of the sun in relation to the earth. The magnetic north pole is determined by the earth's magnetic field.

Question 4

Store the magnet at room temperature, store the magnet in pairs with their opposite poles next to each other and prevent dropping the magnets.

Question 5

A magnetic field is the region around the magnet where magnetic materials experience a non-contact force.

Question 6

d) Iron is a good magnetic shield

Question 7

c) Magnetic forces cannot act through magnetic materials

Question 8

None of them are true. The Earth's geographic north pole is *near* the south pole of the Earth's magnetic field. The Earth's magnetic north pole is the south pole of the Earth's magnetic field.

Question 9

d) Steel is a good magnetic shield

Question 10

The north pole of a bar magnet is actually seeking the magnetic north pole of the Earth. Geographical north is not related to the north pole of the magnet, but is determined by the position of the sun relative to the earth.

Question 11

You can stroke the iron repeatedly in one direction with the same pole of a bar magnet. This action will cause the magnetic domains of the magnet to align themselves with the magnetic field of the bar magnet.

Acknowledgements

Mindset Learn Executive Head	Dylan Busa
Content Manager Classroom Resources	Jenny Lamont
Content Coordinator Classroom Resources	Helen Robertson
Content Administrator	Agness Munthali
Content Developer	M Moolman
Content Reviewers	R Moore
	Duncan Chiriga

Produced for Mindset Learn by Traffic

Facilities Coordinator	Cezanne Scheepers
Production Manager	Belinda Renney
Director	Alriette Gibbs
Editor	Nonhlanhla Nxumalo
Presenter	Niki Montgomery
Studio Crew	Abram Tjale
	James Tselapedi
	Wilson Mthembu
Graphics	Wayne Sanderson

Credits



This resource is licensed under a [Attribution-Share Alike 2.5 South Africa licence](http://creativecommons.org/licenses/by-sa/2.5/za/). When using this resource please attribute Mindset as indicated at <http://www.mindset.co.za/creativecommons>