



PiXL KnowIT!

GCSE Physics

Edexcel Physics

Magnetism, the motor effect and electromagnetic induction

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Magnetism and the motor effect

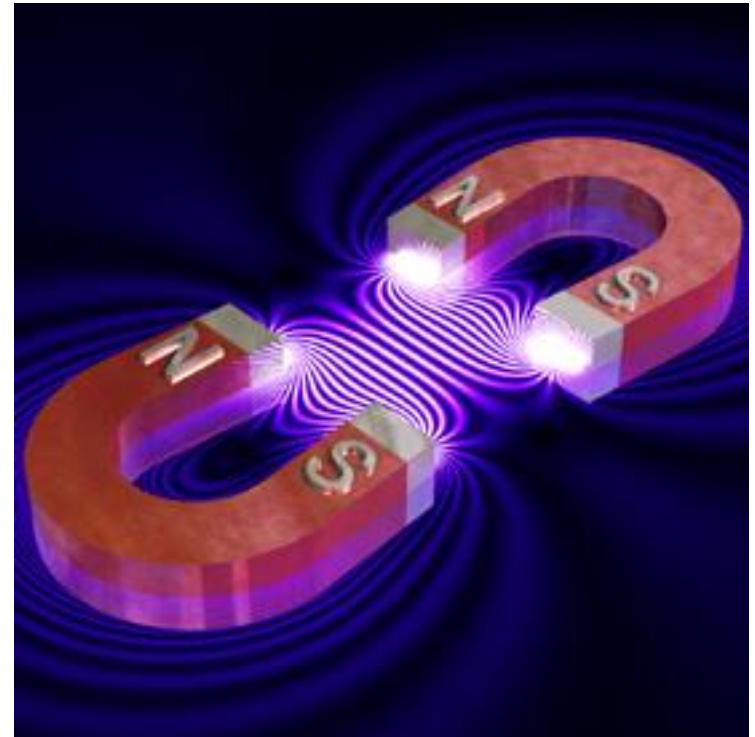
Part 1

- Magnets and magnetic fields
- Electromagnetism
- Magnetic forces (HT)

Electromagnetic induction

Part 2

- Electromagnetic induction (HT)
- The national grid
- Transformers



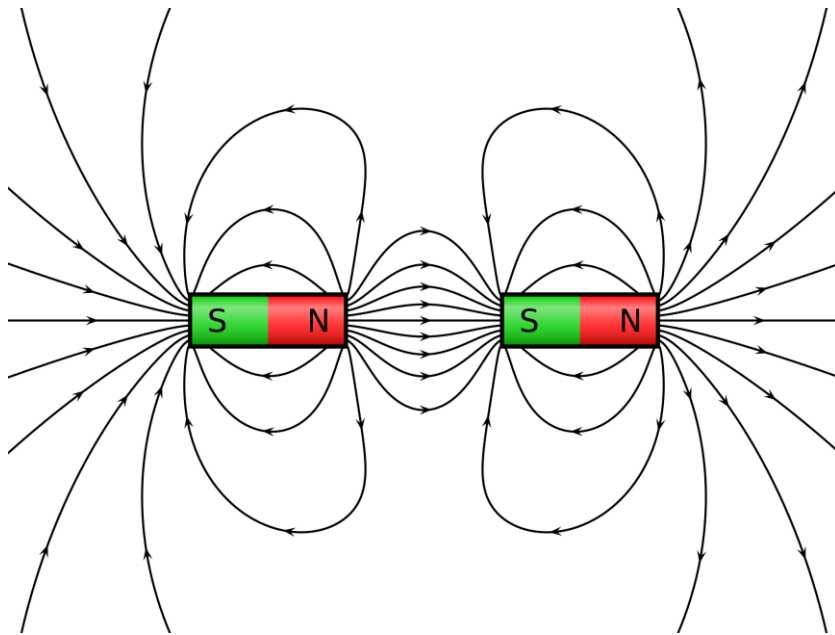
Poles of a Magnet

Object	Definition
Poles	Places where the magnetic forces are strongest.
Permanent Magnets	Produce their own magnetic fields. Permanent magnets can attract and repel.
Induced Magnets	Material that becomes magnetic when placed in a magnetic field. Induced magnets can only attract. When the magnetic field is removed an induced magnet will lose most/all of its magnetism quickly.

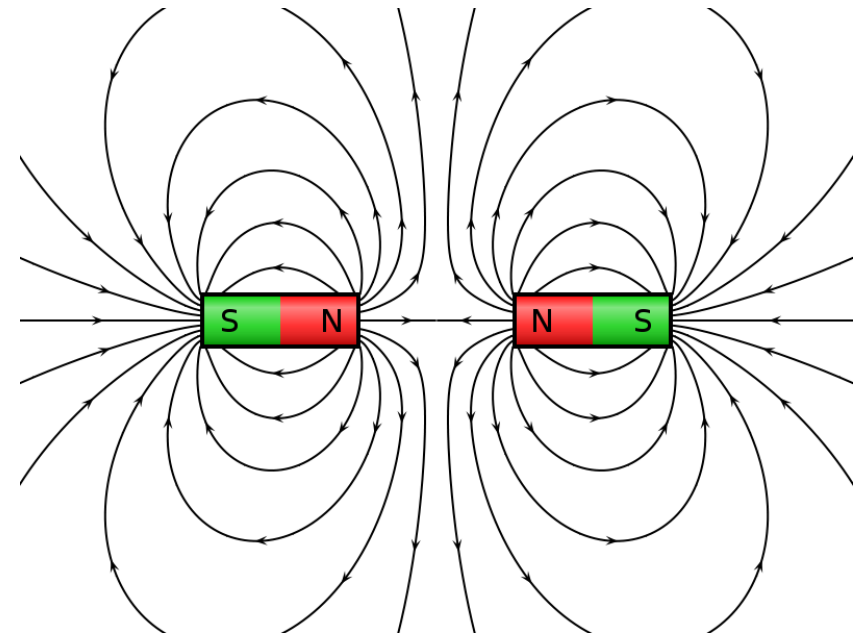
When two magnets are brought together they exert a force on each other. Two like poles **repel** each other, two unlike poles **attract** each other.

Attraction and repulsion are examples of **non-contact force**.

When two poles of two magnets are placed near each other they can either **attract** or **repel** each other. The combination of north and south poles determines whether they attract or repel.



Unlike poles **attract**



Like poles **repel**

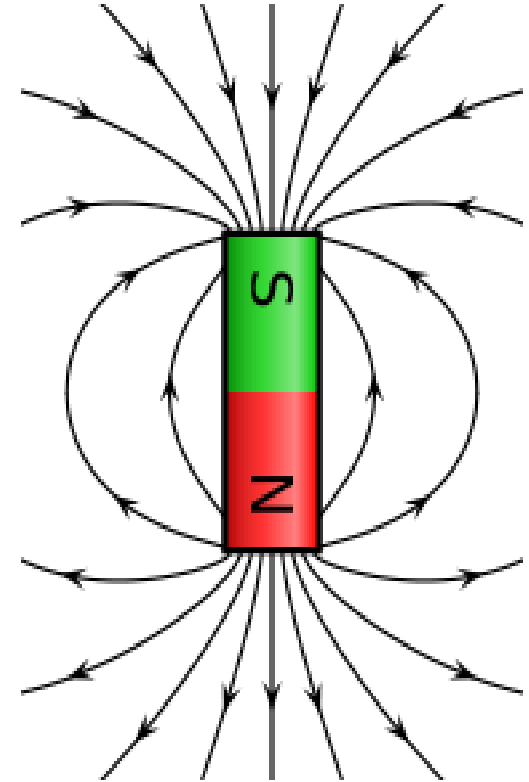
Magnetic Fields

There are four main magnetic materials that you need to know: **iron**, **steel** (because it is made from iron), **nickel** and **cobalt**. There is always a force of **attraction** between magnets and magnetic materials.

Magnetic field = The region around a magnet where a force acts on another magnet (or magnetic material).

The **strength** of a magnetic field depends on the **distance from the magnet**.

The field is **strongest at the poles**.



The direction of the magnetic field at any point is given by the direction of the force that would act on another north pole placed at that point.

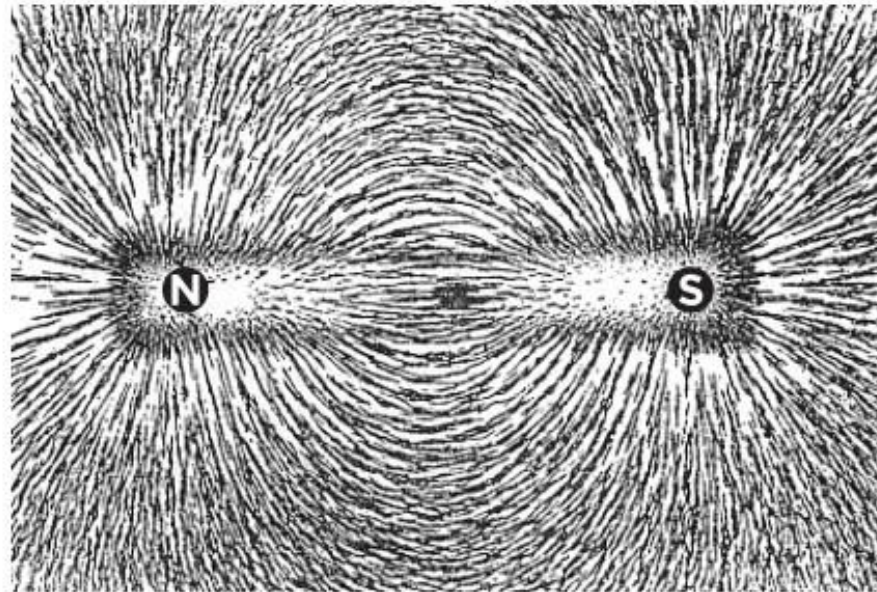
The direction of a magnetic field line is always from north (seeking) pole to south (seeking) pole.



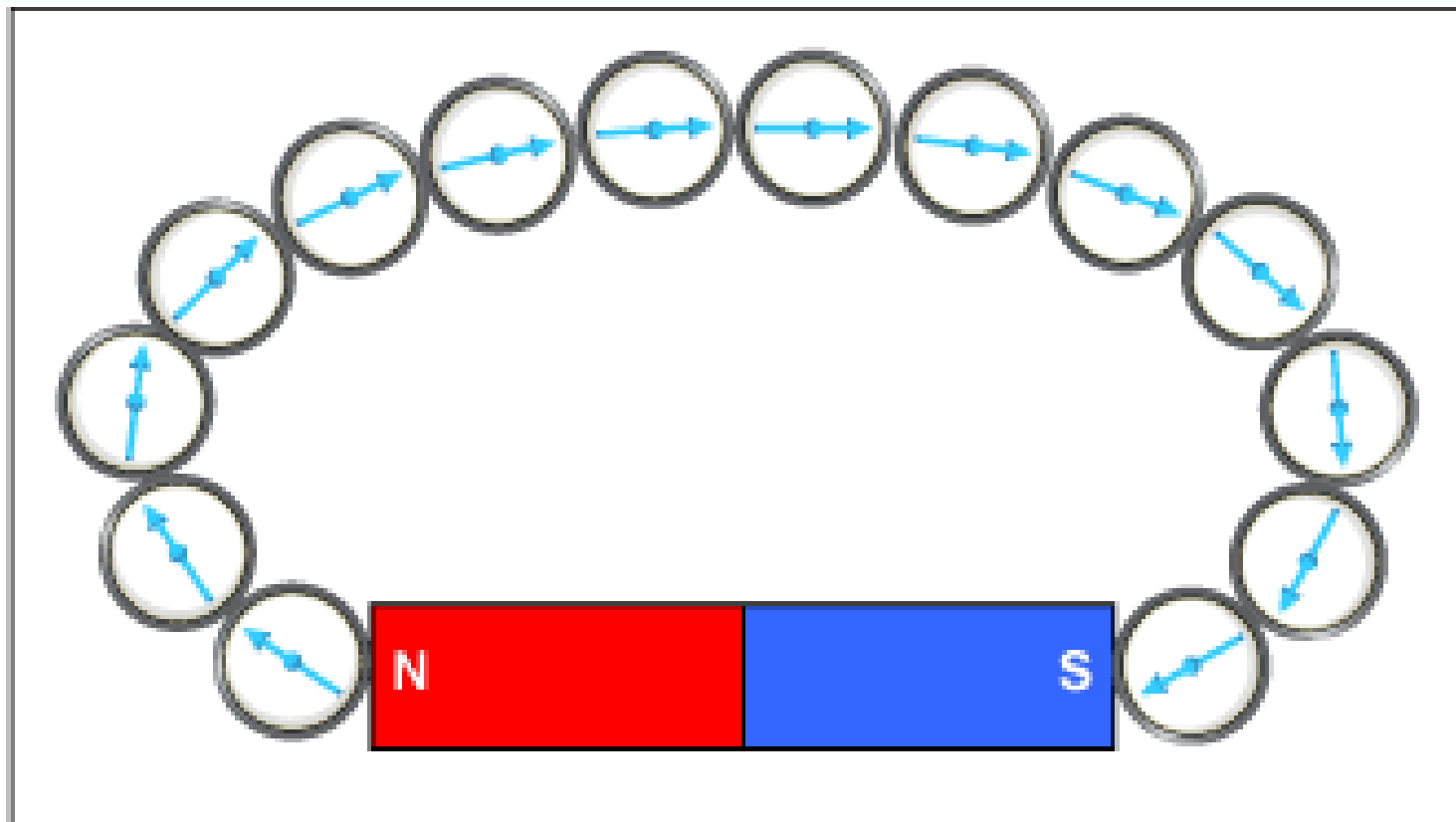
To find the direction of the magnetic field of a bar magnet there are two main techniques.

Place the bar magnet under a piece of paper and sprinkle **iron filings** over the paper.

Tapping the paper will produce the magnetic field pattern of the bar magnet.

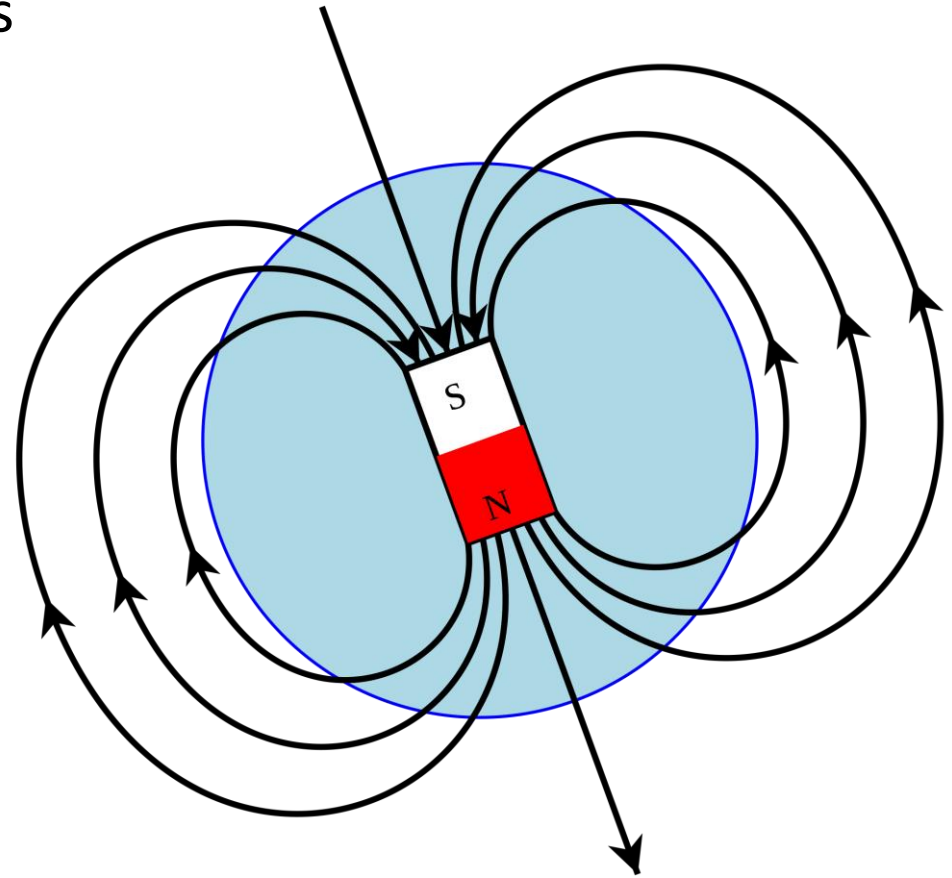


Placing a **magnetic compass** (which contains a small bar magnet) in the magnetic field of a bar magnet causes the compass needle to point in the direction of the magnetic field.



A **magnetic compass** contains a small **bar magnet**. The Earth has a magnetic field. The compass points in the **direction of the Earth's magnetic field**.

The magnetic field pattern produced by compass needles leads us to conclude that the **Earth's core is magnetic**. The origin of the Earth's magnetic field is thought to be the movement of **molten iron** in the core.



QuestionIT!

Part 1

- Magnets and magnetic fields
- Electromagnetism
- Magnetic forces



- 1. What are the poles of a magnet?**
- 2. When two magnets are brought together what do they do?**
- 3. When a magnet and a magnetic material are brought together what do they do?**
- 4. What is a permanent magnet?**
- 5. What is an induced magnet?**

- 6. Describe the difference between permanent and induced magnets.**

- 7. Which part of a magnet has the strongest magnetic field?**

- 8. Two magnets are placed close together, north seeking pole to north seeking pole. Describe the forces acting on the two magnets.**

- 9. Name three magnetic elements.**

- 10. Describe two methods for finding the magnetic field pattern of a bar magnet.**
- 11. Draw the magnetic field pattern of a bar magnet.**
- 12. How would you describe the direction of a magnetic field line?**
- 13. What does a magnetic compass contain?**
- 14. Which way does the compass needle point?**
- 15. What do scientists think is the cause of the Earth's magnetic field?**

AnswerIT!

Part 1

- Magnets and magnetic fields
- Electromagnetism
- Magnetic forces



1. What are the poles of a magnet?

- **Places where the magnetic forces are strongest.**

2. When two magnets are brought together what do they do?

- **Exert a force on each other; attraction or repulsion.**

3. When a magnet and a magnetic material are brought together what do they do?

- **Attract.**

4. What is a permanent magnet?

- **Material that produces its own magnetic field.**

5. What is an induced magnet?

- **Material that becomes a magnet when it is placed in a magnetic field.**

6. Describe the difference between permanent and induced magnets.

- **Permanent produces its own field/ induced becomes magnetic when placed in a field.**
- **Permanent can attract or repel/ induced always attracts.**
- **Induced magnet loses most/all of its magnetism quickly when removed from magnetic field.**

7. Which part of a magnet has the strongest magnetic field?

- **Poles.**

8. Two magnets are placed close together, north seeking pole to north seeking pole. Describe the forces acting on the two magnets.

- **Repulsion.**

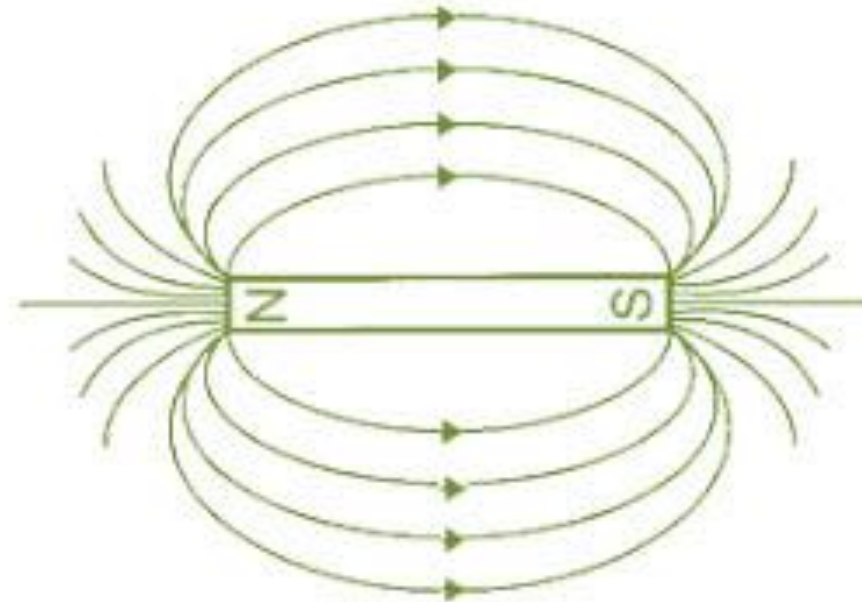
9. Name three magnetic elements.

- **Iron, steel, cobalt, nickel.**

10. Describe two methods for finding the magnetic field pattern of a bar magnet.

- **Sprinkle iron filings onto paper, tap paper.**
- **Use small compasses to follow field from poles; mark paper at the compass needle end.**

11. Draw the magnetic field pattern of a bar magnet.



12. How would you describe the direction of a magnetic field line?

- **Given by the direction of the force that would act on another north pole placed at that point/ from the north (seeking) pole to the south (seeking) pole.**

13. What does a magnetic compass contain?

- **Small bar magnet.**

14. Which way does the compass needle point?

- **In the direction of the Earth's magnetic field.**

15. What do scientists think is the cause of the Earth's magnetic field?

- **Molten iron core.**