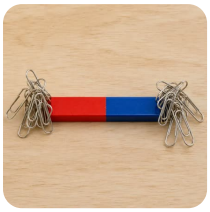
KS3 SCIENCE · PHYSICS

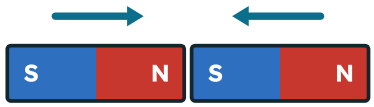
Magnets and electromagnets revision sheet

Name _____



1. Magnetic poles

- Every magnet has two poles: a **north pole** (N) and a **south pole** (S). Its pull is strongest at the poles.
- **Unlike poles attract. Like poles repel.** Magnetic force is a non-contact force: it acts across a gap.
- A magnet attracts **magnetic materials**: iron, steel, nickel and cobalt. Copper, aluminium, plastic and wood are not magnetic.
- Either pole attracts a magnetic material. Only another magnet can be repelled.

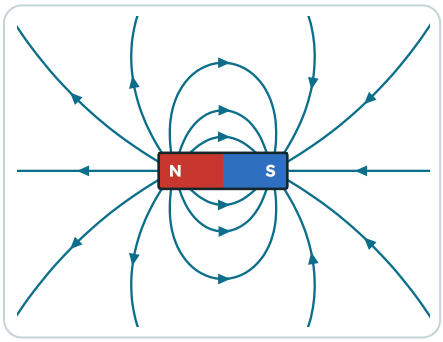


Unlike poles attract



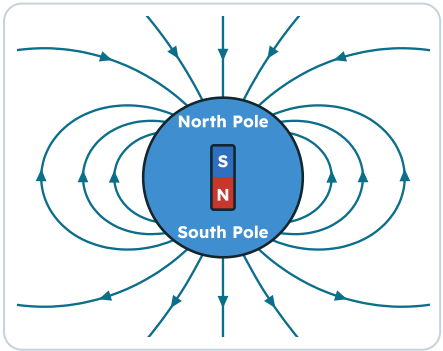
Like poles repel

2. Magnetic fields



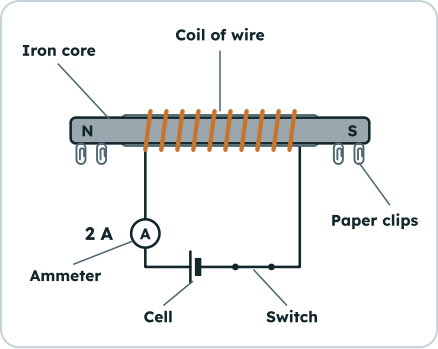
- A **magnetic field** is the space around a magnet where its magnetic force acts.
- **Field lines** show the field. Their arrows point **from the north pole to the south pole**.
- The field is **strongest where the lines are closest together**. For a bar magnet that is at the poles.
- Field lines never cross. They spread out as the field gets weaker, further from the magnet.
- To find the shape of a field, sprinkle **iron filings** round the magnet, or use a **plotting compass**: mark which way its needle points, move it on, mark again, then join the marks.

3. The Earth's magnetism



- The Earth has a **magnetic field**. It acts as if there were a giant bar magnet inside it: the Earth's core acts as a magnet.
- A **compass needle** is a small magnet that can turn freely. It lines up with the Earth's field, so its north pole points north.
- Unlike poles attract. So the pole of the Earth's magnet that lies in the north is a south pole.
- A compass is used to **navigate**. Keep it away from magnets: close to one, the needle lines up with that magnet's field.

4. Electromagnets



- A current in a wire makes a **magnetic field** around the wire.
- An **electromagnet** is a coil of insulated wire (a **solenoid**) wound round an iron **core**, with a current in the coil.
- Its field has the same shape as the field of a bar magnet: one end is a north pole and the other is a south pole.
- The iron core makes the field much stronger.
- Switch the current off and the field goes, so the paper clips fall. An electromagnet is a magnet that you can turn on and off.

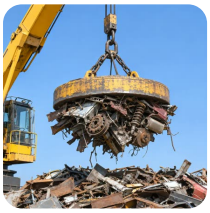


5. Stronger electromagnets

- Three things make an electromagnet stronger: **more turns** on the coil, **a bigger current**, and **an iron core**.
- To test its strength, count the paper clips it holds. Make it a **fair test**: change one thing and keep the others the same.

NUMBER OF TURNS (CURRENT 2 A, IRON CORE)	5	10	15	20
Paper clips held	2	4	6	8

More turns hold more paper clips. On a graph these results make a straight line that slopes upwards.



6. Using electromagnets

An electromagnet can be **switched on and off**, and its **strength can be changed**. A **permanent magnet** is magnetic all the time and needs no current.

DEVICE	HOW IT USES AN ELECTROMAGNET
Scrapyard crane	Lifts steel while the current is on. Drops it when the current is switched off.
Electric bell	The electromagnet pulls a hammer onto the gong, again and again.
Loudspeaker	A changing current makes a coil move in and out, which shakes a cone.
Electric motor	A coil with a current in it is pushed round by the magnet on each side of it, so it spins.

Key words

Magnetic force: a non-contact force from a magnet on a magnetic material
North pole: the end of a magnet that points north when the magnet can turn freely
Attract: pull towards each other
Like poles: two poles of the same kind, which repel
Magnetic field: the space around a magnet where its magnetic force acts
Plotting compass: a small compass used to find the direction of a magnetic field
Permanent magnet: an object that is magnetic all the time
Solenoid: wire wound into a tight coil
Motor: a machine in which a coil with a current in it spins between the poles of a magnet
Magnetic material: a material that a magnet attracts, such as iron, steel, nickel or cobalt
South pole: the end of a magnet that points south when the magnet can turn freely
Repel: push away from each other
Unlike poles: two different poles, which attract
Field lines: lines with arrows that show the direction and strength of a magnetic field
Compass needle: a small magnet that can turn freely and lines up with the Earth's field
Electromagnet: a magnet that is turned on and off by the current through it
Core: the piece of soft iron that a coil is wound round

Pictures are illustrations made for this sheet, not real photographs.