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P16 Magnetism

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P16.01 Permanent magnets

Forces between magnets

- like poles repel - **repulsive force**
- unlike poles attract - **attractive force**

1. Magnetic materials

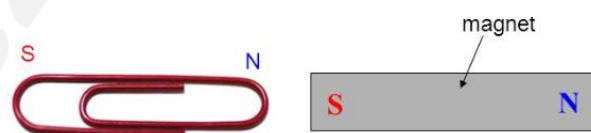
Types	Description	Examples	Uses
hard	retain magnetism well, but difficult to do at first	hard steel	permanent magnets, compress
soft	easy to magnetise, but loses its magnetism readily	soft iron	cores for electromagnets

2. Magnetisation

- a piece of material is stroked with a permanent magnet from one end to the other
- place the material in a strong magnetic field, and put it within a long coil of wire and pass the D.C through the coil
- place the material in strong magnetic field, and hammer it

3. Induced magnetism

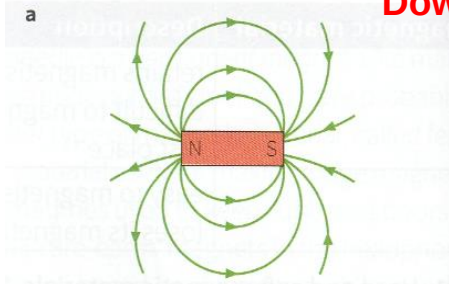
- permanent magnet - remain magnetised
- can attract or repel another permanent magnet
- can attract other unmagnetised magnetic materials
 - steel pins are made of magnetic material
 - when north pole is close to a pin, pin is attracted
 - → **induced magnetism**
 - when magnet is removed, it's unmagnetised



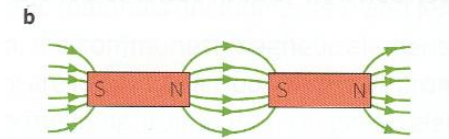
P16.02 Magnetic fields

- any piece of magnetic material has **magnetic field**
- Direction: **North poles to South poles**

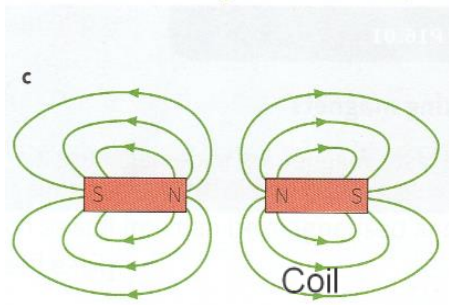
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a. Field lines are used to represent magnetic field



b. The attraction between two opposite magnetic poles



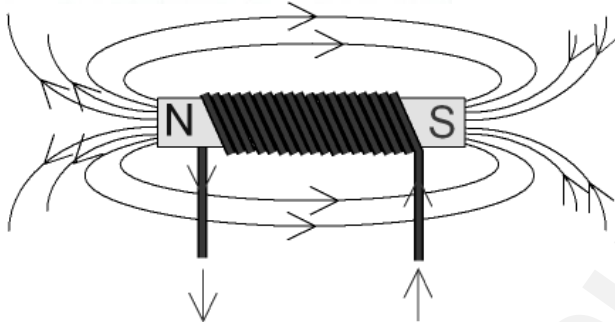
c. The field pattern for two like poles repelling each other

1. Electromagnets

- made from coil of copper wire → **solenoid**
- copper has low resistance
- can be switched on and off

Strength ↑

- current ↑
- number of turns of wire ↑ - concentrate the field
- add a soft iron core - make magnetic field stronger



2. The field around a solenoid

magnetic field is produced inside and outside the coil

- It has south and north pole - field lines emerge from the north pole and go in to the south pole
- field lines are closest together at the poles - magnetic field strongest
- lines are spread out from the poles - magnetic field weaker