



Link to BBC
Bitesize

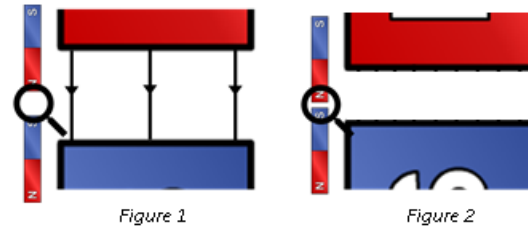


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Section B

Figure 1 shows the uniform magnetic field between the opposite ends of two bar magnets.

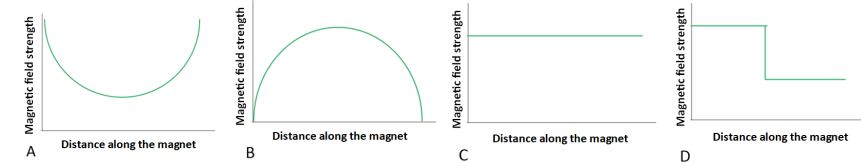
Add field lines to figure 2 to show how the magnetic field changed when the magnets were **closer** together ↓



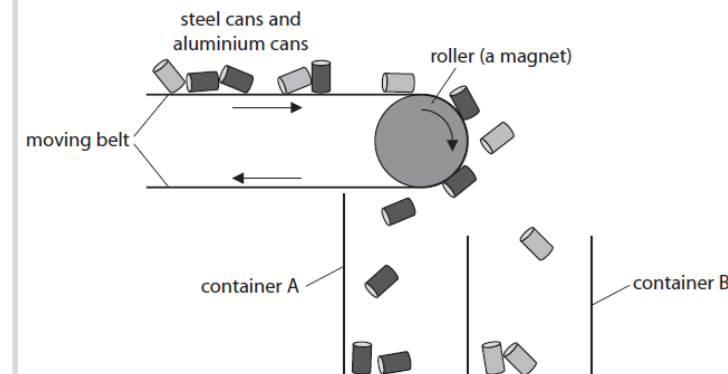
Draw the shape of the magnetic field around the bar magnet below and add an **X** to show where the field is strongest.



If we measured the strength of the magnetic field as we moved a sensor along a bar magnet from the north pole to the south pole which of these graphs would we get? →

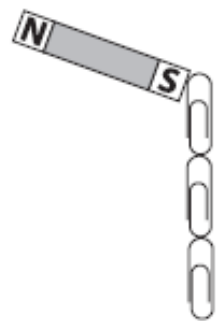


The image below shows a part of a machine used to separate steel cans from aluminium cans.



State and explain whether container A or container B fills with steel cans.

This image shows a magnet holding some paper clips.



a) Each of the paper clips have become magnets themselves. Add letters N and S to the diagram to indicate the magnetic poles of the paper clips.

b) Describe how a student could show that the paper clips are induced magnets.

Section A

1) Which of the following is **NOT** magnetic?

- ☐ A: aluminium
- ☐ B: iron
- ☐ C: cobalt
- ☐ D: nickel

2) Which of these will *always* produce a magnetic field regardless of its surroundings?

- ☐ A: a steel bar
- ☐ B: a permanent magnet
- ☐ C: a temporary magnet
- ☐ D: an induced magnet

3) Which word describes a magnetic field where the field lines are evenly spaced and all point in the same direction?

- ☐ A: solenoid
- ☐ B: magnetosphere
- ☐ C: uniform
- ☐ D: bar magnet

4) Which word describes a coil of wire with a current flowing through it (making it a type of electromagnet)?

- ☐ A: solenoid
- ☐ B: uniform magnet
- ☐ C: magnetron
- ☐ D: parallel circuit

5) Which **one** of these affects the strength of the magnetic field around a long, straight conductor?

- ☐ A: the length of the conductor
- ☐ B: the strength of the Earth's magnetic field
- ☐ C: the resistance the conductor
- ☐ D: distance from the conductor

6) Which of the following could be used to detect the magnetic field around a bar magnet?

- ☐ A: plotting compasses
- ☐ B: lead shavings
- ☐ C: a 9V battery

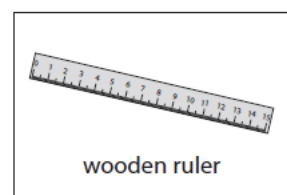
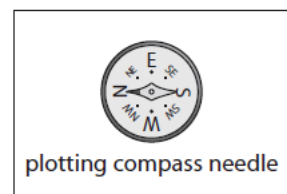
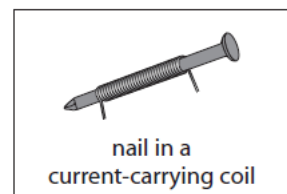
A teacher arranges magnets and pieces of iron in different configurations. Tick the box to show what happens in each configuration.

	Attract	Repel	Neither

Draw the shape of the magnetic field where the ends of the bar magnets meet.



Draw one line from each object to its description



non-magnetic

permanent magnet

temporary magnet

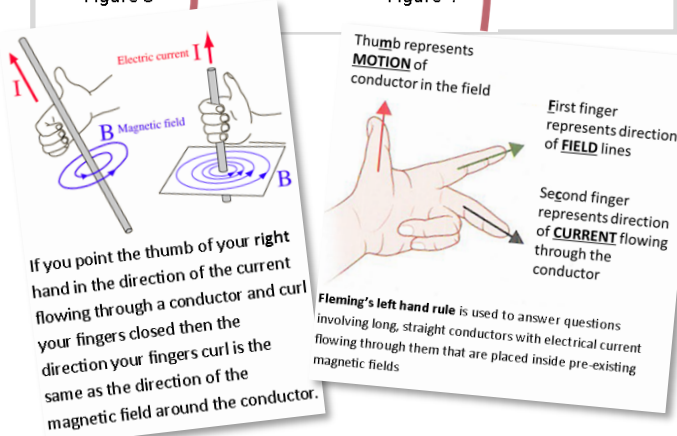
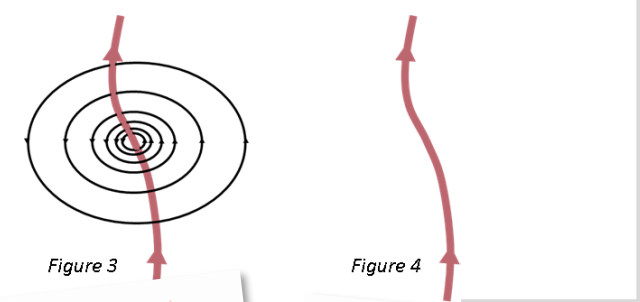
Draw the shape of the magnetic field where the ends of the bar magnets meet.



Section C

Figure 3 shows the magnetic field around a long, straight conductor.

Add field lines to figure 4 to show how the magnetic field changed when the **current** flowing through the conductor was **reduced**



If you point the thumb of your right hand in the direction of the current flowing through a conductor and curl your fingers closed then the direction your fingers curl is the same as the direction of the magnetic field around the conductor.

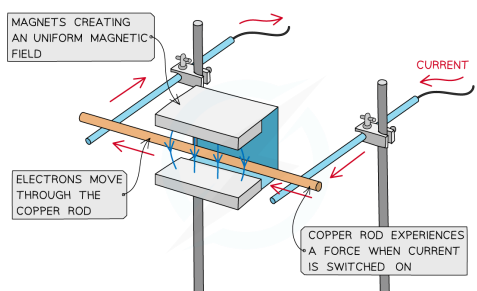
Thumb represents **MOTION** of conductor in the field

First finger represents direction of **FIELD** lines

Second finger represents direction of **CURRENT** flowing through the conductor

Fleming's left hand rule is used to answer questions involving long, straight conductors with electrical current flowing through them that are placed inside pre-existing magnetic fields

- Using Fleming's left hand rule, will the copper in the diagram below move...
- ☐ **A:** Upwards towards the top magnet
 - ☐ **B:** Backwards towards the stands
 - ☐ **C:** Downwards towards the other magnet
 - ☐ **D:** Forwards away from the stands



Show that the copper bar in the diagram above would experience a force of roughly 0.09 N if 0.18 m of it was in the magnetic field, the strength of the magnetic field was 0.4 T and the current flowing through it was 1.3 A?

What would the current need to be increased to for the copper bar to experience a force of 0.20 N? Give your answer to 2 significant figures

force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density $\times$ current $\times$ length

$$F = B \times I \times l$$

Figure 5 shows a solenoid. A solenoid is a series of coils of a wire stacked next to each other with an electrical current flowing through them.

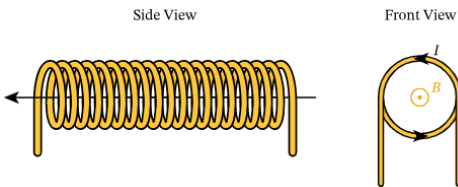


Figure 5

State whether each of the following statement about solenoids is true or false.

True or False?

A solenoid must be made from magnetic material.

The magnetic field around a solenoid is similar to that of a bar magnet,

The strength of the magnetic field around a solenoid depends on the current flowing through the wire.

The magnetic field around a solenoid gets stronger the further away you are.

There is a uniform magnetic field inside the centre of a solenoid.

The magnetic field is weakest in the centre of the solenoid

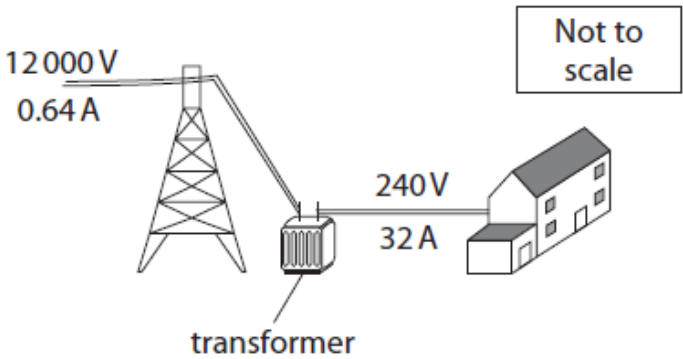
Inside the solenoid each small magnetic field created by each coil add together to make a stronger overall field.

Outside the solenoid each small magnetic field created by each coil cancel each other out to make a weaker overall field.

The overall strength of the magnetic field will increase if an iron core is added inside the solenoid

Section D

1) The image below shows part of the UK National Grid system for the supply of electricity to homes.

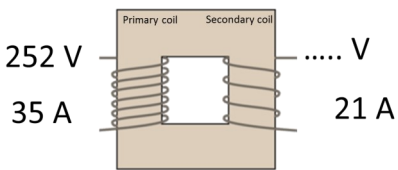


a) State and explain whether the transformer is a step-up transformer or a step-down transformer.

b) Calculate the power flowing into the house.

Power = Watts

3) The image below shows a transformer with an input current of 35 A and an output current of 21 A. Calculate the output voltage when the input voltage is 252 V.



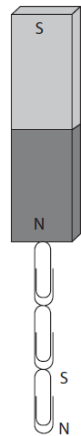
4) Why is it not possible to use a transformer to change the voltage of the electricity from a car battery?

2) Explain why the national grid uses high voltages to transfer electrical energy over long distances.

5) Use lines to link the labels to the parts of the diagram:

Induced magnet •

Permanent magnet •



6) A teacher wants to use the equipment to the right to pick up some iron filings when the switch is closed

a) Suggest a suitable metal for the rod.

b) Suggest a change to the equipment that would allow it to pick up more iron filings.

