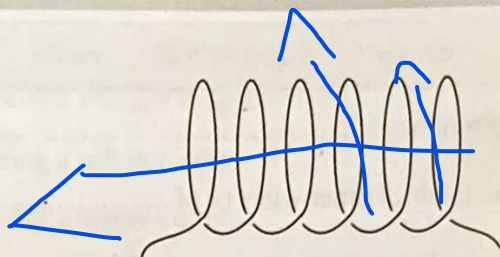


## Magnetic Fields

Q1 The diagram below shows a coil of wire (a solenoid) carrying a current.



a) Draw the shape of the magnetic field around the coil.

b) A soft iron core is placed in the middle of the coil. The core becomes magnetised when a current flows through the wire, and loses its magnetism when the current is switched off.

What is the name of this type of magnet?

.....

Q2 Electromagnets are often found in cranes used for lifting iron and steel.

Explain why electromagnets are **more useful** than ordinary magnets for this purpose.

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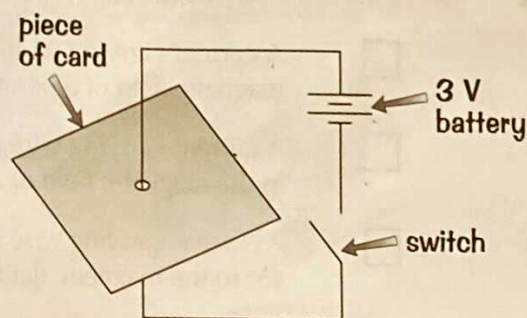
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Q3 The diagram below shows a wire carrying a current passing through a piece of flat card.

a) Some iron filings are sprinkled onto the card. When the current is switched on, a pattern develops in the iron filings because of the magnetic field around the wire.

On the diagram, sketch the pattern that the iron filings make when the current is switched on.



b) The coil of current-carrying wire shown on the right has a stronger magnetic field inside the loop than outside.

Explain why this is, including a sketch of the magnetic field.

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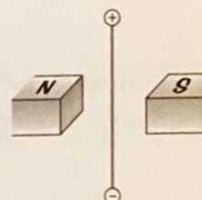
# The Motor Effect

Q1 Complete the passage below using the words supplied.

force    angle    stronger    current    magnetic field    motor    permanent magnets

A wire carrying an electric current has a ..... around it. This can interact with the magnetic fields of other wires or of ..... to produce a ..... and sometimes movement. A bigger ..... or a ..... magnet will produce a bigger force. The size of the force will also depend on the ..... at which the two magnetic fields meet each other. A force is experienced by a current-carrying wire in a magnetic field — this is known as the ..... effect.

Q2 The diagram shows an electrical wire between two magnetic poles. When the current is switched on, the wire moves at right angles to the magnetic field.



a) Using Fleming's Left-Hand Rule, state which way the wire will move.

.....

b) How could the wire be made to move in the opposite direction?

.....

Q3 Read the three statements below. Tick the box next to each statement that you think is **true**.

- ☐ A current-carrying wire will not experience a force if it is parallel to the magnetic field of a permanent magnet.
- ☐ A current-carrying wire will not experience a force if it is at right-angles to the magnetic field of a permanent magnet.
- ☐ A current-carrying wire will not experience a force if it is at an angle of  $45^\circ$  to the magnetic field of a permanent magnet.

Q4 The diagram shows an aerial view of a copper wire carrying a current down into the page.

Electrical wire with insulated copper core



State which way the wire will move.

.....

# The Simple Electric Motor

Q1 Which of the following will make an electric motor spin **faster**? Circle the relevant letter(s).

- A Having more turns on the coil.
- B Using a stronger magnetic field.
- C Using a soft iron core.
- D Using a bigger current.
- E Using a commutator.

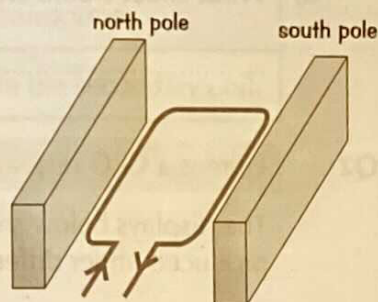


Q2 Read the three statements below. Tick the box next to each statement that you think is **true**.

- ☐ The split ring commutator makes the motor spin faster.
- ☐ The split ring commutator reverses the direction of the current every half turn by swapping the contacts to the DC supply.
- ☐ The split ring commutator reverses the polarity of the DC supply every half turn.

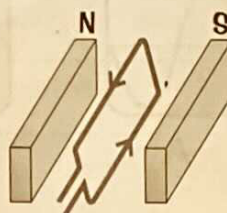
Q3 The diagram shows a current-carrying **coil** in a magnetic field.

- a) Draw an arrow on the diagram to show the **direction** of the magnetic field.
- b) Describe the direction of the force on the **left-hand arm** of the coil.



- c) In which direction will the coil **move** — **clockwise** or **anticlockwise**?

- d) This diagram shows the coil just after it has turned through 90°. Draw arrows to show the direction of the forces on **each arm** of the coil at this stage and describe how you would expect the coil to **move**.



- e) In a motor, the coil keeps rotating in the **same direction**. Explain how this is achieved.

- f) Give an example of a device which uses a simple electric motor.