



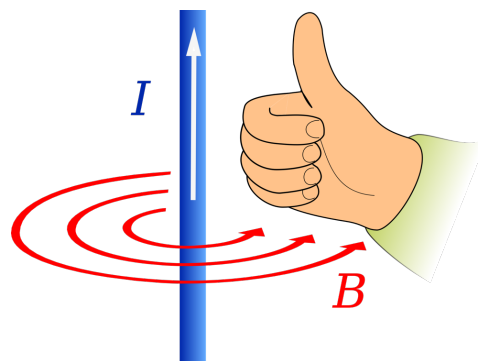
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7.2.1 Electromagnetism

Magnetic fields can be produced by the flow of charge (current) through a conductor. This link between electricity and magnetism is known as 'electromagnetism'.

When we pass an electric current through a conducting wire a magnetic field is produced in the space around the wire.

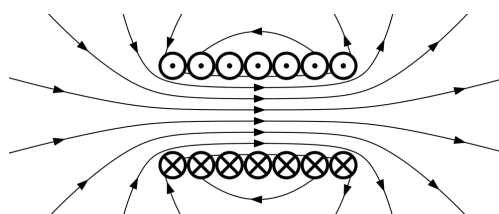
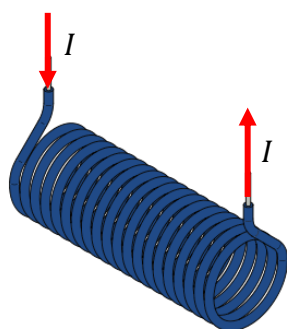
The magnetic field lines wrap around the wire in a circle. You can determine the direction they point by using the right-hand thumb rule. The thumb points in the direction that the current (I) flows, and the fingers wrap around in the direction of the lines of magnetic flux.



(1) *What would happen to the magnetic field if the current direction was reversed?*
(Hint: Use the right-hand thumb rule.)

(2) *What would happen to the magnetic field if the current was increased?*

If we wrap the wire into a coil (called a solenoid) we can produce a magnetic field similar to that of a bar magnet.



In the diagram, above, the dots show current flowing upwards (out of the page) and the crosses show current flowing downwards.

(3) *On the diagram, mark on the north pole and south pole of the solenoid. (Hint: The S pole is where field lines go in. A compass always points towards a S pole.)*

(4) *How would you describe the magnetic field down the middle of the solenoid?*
(Hint: the spacing of field lines indicates the strength of the magnetic field.)

We can increase the strength of the magnetic field produced by a solenoid in a number of ways:

- increase the current
- increase the number of coils (called 'turns')
- place a soft magnetic material down the middle (called a 'soft magnetic core')

A solenoid with a soft magnetic material in the core is often referred to as an 'electromagnet'.

Electromagnets are widely used in devices, such as loud speakers, circuit breakers and doorbells.

(5) *What is the key advantage of an electromagnet compared to a permanent magnet?*

