



## 9.2 Oersted's experiment

**Aim:** To reproduce Oersted's experiment which demonstrated that currents produce magnetic fields. To study what factors affect this magnetic field and to find out how an electromagnet works.

### Equipment:

- 2 clamp stands and bosses
- 50 cm long insulated stiff copper wire with the insulation stripped 1cm from the ends.
- 2 crocodile clips
- 9 V DC source (6 × 1.5 V cells)
- Switch
- Plotting compass
- Connecting wires
- 5 cm long iron nail
- 100 small iron nails

### Theory

Hans Christian Oersted discovered that an electrical current produces a magnetic field. This led to the unification of the fields of electricity and magnetism to what is now known as electromagnetism.

### Experiment 1

- 1 Assemble a simple series circuit with a power source, a switch, and the 50cm long wire hanging vertically between the two clamps. Use the crocodile clips to make electrical connections from the power source to the copper wire.
- 2 Close the switch and observe the changes in the plotting compass as you bring it close to the vertical wire.
- 3 Using a rule, draw a diagram of the circuit, taking particular notice of the direction of the cells.
- 4 Plot the shape and direction of the field around the wire, using the plotting compass.

### Experiment 2

- 1 Wrap the copper wire around a cell to form a coil. Make sure that the loops do not overlap each other.
- 2 Assemble a simple series circuit with a power source, a switch, and the coil.
- 3 Close the switch and observe the changes in the plotting compass as you bring it close to the coil.

- 4 Using a rule, draw a diagram of the circuit, taking particular notice of the direction of the cells.
- 5 Plot the shape and direction of the field around the wire using the plotting compass.

### Experiment 3

- 1 Wrap the copper wire around the iron nail to form an electromagnet. Make sure that the loops do not overlap each other.
- 2 Assemble a simple series circuit with a power source, a switch, and the electromagnet.
- 3 Sprinkle the small iron nails on to the table surface.
- 4 Close the switch and pick up the nails with the electromagnet.
- 5 Count the number of nails attached to the electromagnet by opening the switch and letting the nails fall onto the table surface where they can be counted.
- 6 Reduce the voltage of the power supply and record the number of nails that it can lift.
- 7 Increase the voltage again and now reduce the number of turns in your coil. Record the number of nails it can lift.

See if you can think of any other ways to change the strength of the electromagnet.