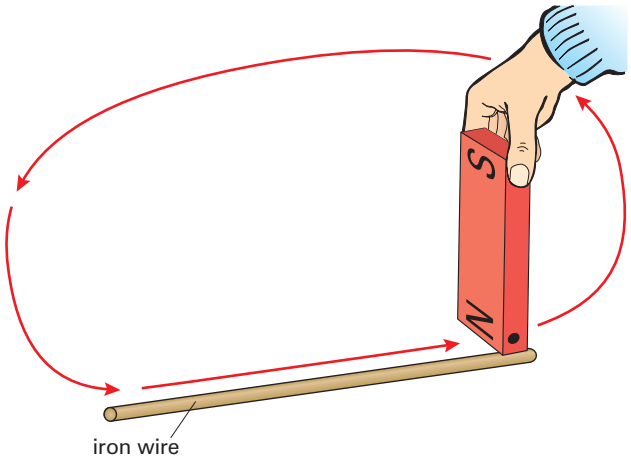
Self-assessment practice test questions Block 4

1 A student uses a bar magnet to magnetise an iron wire, as shown in the diagram. She strokes the N pole of the magnet along the length of the wire, and repeats this several times.



a When the wire is magnetised, what type of pole (N or S) will there be at the left-hand end?

b What type of pole will there be at the right-hand end?

c Describe how you could use a small compass to test your answers.

d State **one** way in which you could demagnetise the wire. How could you check that it was no longer magnetised?

2 Two bar magnets are placed end-to-end, with a small gap between them. The north (N) pole of one magnet faces the south (S) pole of the other.

a Draw a diagram to show this situation. Add magnetic field lines to represent the field around the two magnets.

b Will the magnets attract or repel each other?

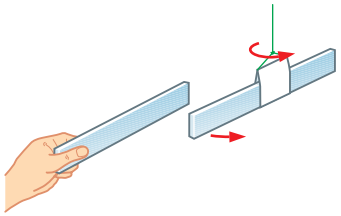
3 An electromagnet is made of a coil of wire with an iron core in the centre of the coil. When there is an electric current in the wire, the electromagnet becomes magnetised. State the effect on the magnetic field of each of the following:

a increasing the current

b removing the iron core

c switching off the current.

4 The diagram shows two plastic rods. Each rod has been given a static electric charge. One is hanging so that it is free to turn.



a Describe how a plastic rod can be given a static electric charge.

b When one rod is brought close to the other, the hanging rod turns as shown in the diagram. What does this tell you about the electric charges on the two rods?

c If the hanging rod moved towards the other rod, what would this tell you about their charges?

d Describe how you could discover whether the charge on the hanging rod was positive or negative.

S **5** A proton and an electron are placed close to one another (but not touching).

a What type of charge (positive or negative) does each of these particles have?

b Draw a diagram to show the two particles. Add electric field lines to represent the electric field close to the particles.

6 Metals conduct electricity but some are better conductors than others.

a You are provided with three wires made of different materials. Draw a circuit diagram to show how you would find out which was the best conductor of electricity.

b Explain how you would decide which was the best conductor.

c How would you ensure that your method was a fair test of the different materials?

7 A current flows when a metal wire is connected to the two terminals (positive and negative) of a cell.

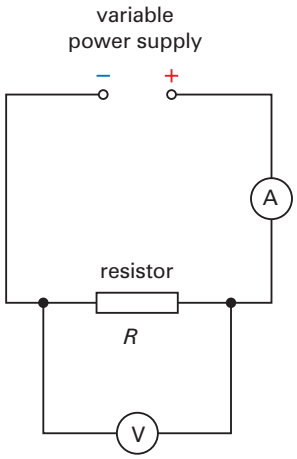
S **a** Name the charged particles which move in the wire to form the current.

b In which direction do these particles move?

c If a current of 4.5 A flows in a wire for 40 s, how much charge flows past a point in the circuit in this time?

d What meter would you use to measure the flow of current in the circuit?

8 The diagram shows a circuit used to measure the resistance R of a resistor.



a Copy the diagram and add an arrow to show the direction of the current in the resistor.

b How will the current in the circuit change if the voltage of the supply is increased?

c How will the current in the circuit change if the resistor is replaced with one of a greater resistance?

d The meters show that the current in the resistor is 0.40 A when the potential difference across it is 2.8 V. Calculate the resistance R.

S **9** A 50 Ω resistor has a current of 0.80 A flowing through it.

a Calculate the potential difference (p.d.) across the resistor.

b Calculate the current that will flow if the p.d. across the resistor is 20.0 V.

c When the p.d. across the resistor is 10.0 V, the current through it is 0.20 A. Calculate the power transferred to the resistor.

d Calculate the amount of energy transferred to the resistor in 300 s.

10 Which type of electrical component is described by each of the following? Name each, and draw its circuit symbol:

a a resistor whose resistance changes rapidly over a narrow range of temperatures

b a resistor whose resistance changes according to the brightness of light shining on it

c a component which 'blows' (melts) when the current reaches a certain level.

11 A circuit includes two resistors of values 30 Ω and 60 Ω, connected together in series.

a Calculate the combined resistance of the two resistors.

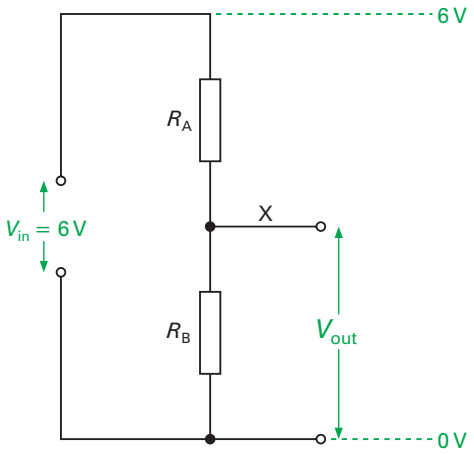
b If the potential difference across the 30 Ω resistor is 6.0 V, what current will flow through it? What current will flow through the 60 Ω resistor?

S The two resistors are now connected together in parallel.

c Calculate their combined resistance.

d What p.d. is needed to make a current of 1.0 A flow through the resistors?

12 The diagram shows a potential divider circuit.



a If the p.d. across R_A is 2.4 V, what will be the p.d. across R_B?

The resistors are now changed so that $R_A = 20\,\Omega$ and $R_B = 10\,\Omega$.

b Calculate the p.d. across R_B.

c Calculate the current in R_B.

S **13** Name the logic gates whose functions are described here, and draw up a truth table for each one:

a its output is OFF unless both its inputs are ON

b its output is OFF only when both its inputs are OFF.

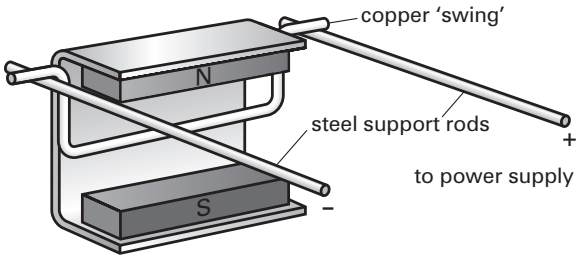
14 A current of 2.4 A flows in a hairdryer in normal use. Its plug is fitted with a fuse.

a Explain why a 2 A fuse would be unsuitable.

b Explain why a 13 A fuse would be unsuitable.

c Suggest a suitable fuse value for the hairdryer.

S **15** The diagram shows a 'swing' made of copper wire. It hangs between the opposite poles of a pair of magnets.



a Explain how the electric current reaches the swing.

b Explain why the swing is made of copper wire, rather than iron or steel wire.

c In which direction is the magnetic field between the magnets?

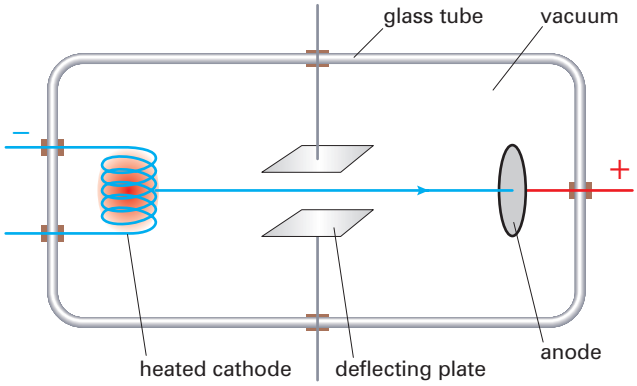
d Which rule is used to determine the direction of the force on the swing?

e Use the rule to determine the direction of the force on the swing.

f State **two** changes you could make, each of which would cause the direction of the force on the swing to be reversed.

g State **two** changes you could make which would increase the force on the swing.

16 The diagram shows a vacuum tube in which a beam of electrons can be produced.

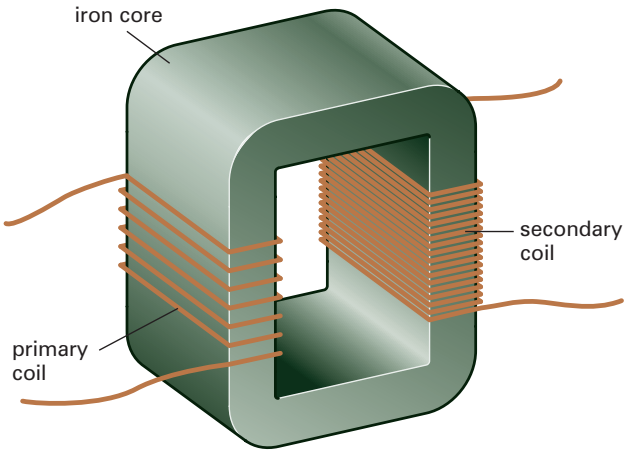


a Explain why the electrons are attracted towards the anode.

b If the upper deflecting plate was given a positive charge, how would the beam of electrons be affected?

c How would the beam of electrons be affected if the North pole of a bar magnet was brought downwards from above, towards the beam?

17 The diagram shows a simple transformer.



a Draw the circuit diagram for a transformer and label the three parts to show what they represent.

b Which type of current is required for a transformer to operate – direct or alternating?

c Is the transformer shown a step-up or step-down transformer? Explain how you can tell.

d The transformer has three turns on its secondary coil for each turn on its primary coil. If a voltage of 20 V is connected across the primary coil, what will be the voltage across the secondary coil?

S **e** A 20 V supply provides power at a rate of 100 W to the primary coil. Calculate the current in this coil.

f If all of this power is transferred to the secondary coil, what will be the current in the secondary coil?