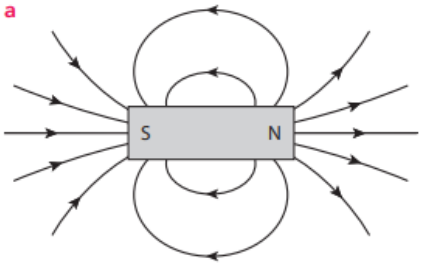
Unit 9 Magnetism

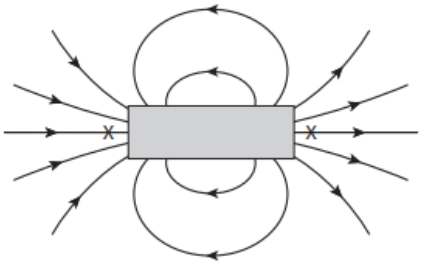
Topic 9.1 Magnetic fields

Exercise 9.1A Magnetic field patterns

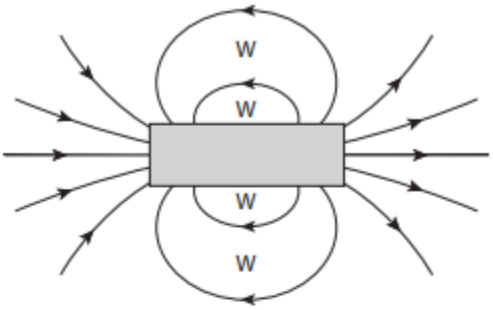
1 a



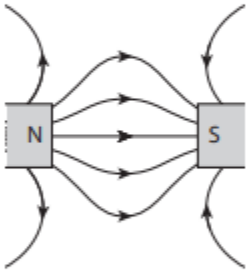
b X in either of the positions shown.



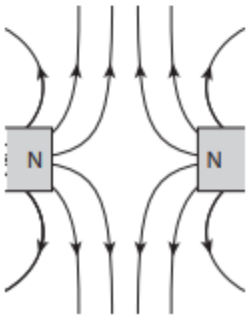
c W in any of the positions shown.



2 a



b



Exercise 9.1B Magnetic fields

1 a The area around a magnet where the effect of the magnet can be detected.

b A magnetic compass will turn according to the position of a magnetic object; the needle will point in the direction of magnetic field lines.

2 a gets weaker

b gets weaker (to the middle of the magnet) then gets stronger again

Exercise 9.1C Interaction of magnetic fields

1 The magnetic field lines between the two poles are in opposite directions; **repel**.

The magnetic field lines between the two poles are in the same directions; **attract**.

2 Place two magnets on a surface with the two south poles facing; place a piece of paper over both magnets; sprinkle iron filings on the paper.

Topic 9.2 The Earth as a giant magnet

Exercise 9.2A The Earth's magnetic field

1 The Earth's magnetic poles have not always been in the same positions.
The Earth's magnetic poles are similar to the poles of a bar magnet.

2 The Earth's magnetic field occurs all around the Earth.

3 a core

b iron and nickel

Exercise 9.2B Direction of the Earth's magnetic field

1 toward geographic north

2 south

3 a Stroke the needle with the magnet; use the same pole of the magnet; stroke several times; stroke in the same direction each time.

b Any method that will allow the needle to rotate freely, such as float on a cork in water or suspend horizontally using a thread.

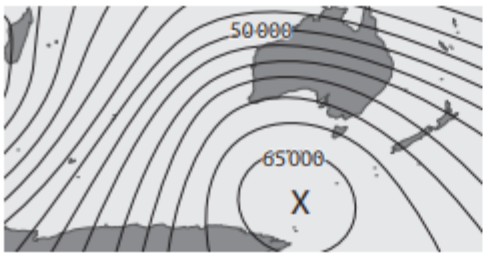
4 Attach the string to the middle of the magnet using the adhesive tape; hang the bar magnet so it is horizontal and supported from the wooden clamp stand; allow the magnet to turn. The magnet will align close to the geographic north-south direction; the north pole of the magnet will point closely to geographic north.

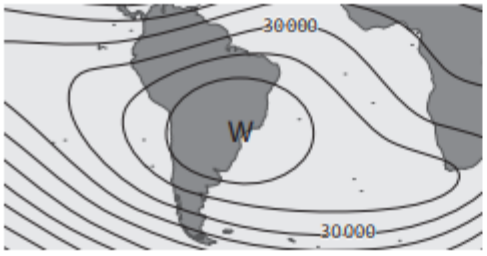
Exercise 9.2C Strength of the Earth's magnetic field

1 The strength of the magnetic field 1 cm from the end of a bar magnet. Reason: the Earth's magnetic field will not make a paperclip move, but when 1 cm from the end of a bar magnet, a paperclip will move.

2 a 4

b 2500

c 

d 

e The learner's position should be correctly identified; if the learner's location is between two lines then any value between the values of those lines can be given.

Topic 9.3 Electromagnets

Exercise 9.3A Electromagnets 1

1 a wire to make the coil; iron or steel rod/nail for the core

b steel paperclips

2 steel and iron

3 The electromagnet uses electricity/current to work; the electromagnet can be switched on and off.

Exercise 9.3B Electromagnets 2

1 Any two from: lifting/sorting scrap metal; toaster; electric bell; electric motor; holding doors open.

2 a When current flows, the nail is magnetised; the pins are magnetic and will be attracted to the nail.

b When current stops flowing, the nail is no longer magnetised; the pins will no longer be attracted to the nail.

c Either: bring a magnetic compass close to the end; if the compass points towards the end of the nail, it is south; if the compass points away from the end of the nail, it is north; OR bring the north pole of a bar magnet to the end of the nail; if it attracts it is south; if it repels, it is north.

Exercise 9.3C Electromagnets 3

1 a It could be a south pole.

b Bring the north pole of a bar magnet toward the end of the nail; if they repel, then the end of the nail is a north; if they attract, then the end of the nail is a south (accept explanation using south pole with opposite effects).

c Reverse the current in the coil/reverse the cell in the circuit; remove the nail from the coil and insert the other way round / wind the coil in the opposite direction.

Topic 9.4 Investigating electromagnets

Exercise 9.4A Strength of electromagnets 1

1 a As the number of turns on the coil increases, the number of paperclips lifted **increases**. This means the electromagnet gets **stronger** as the number of turns on the coil **increases**.

b 20 turns/5 paperclips

c repeat it/do it again (**not** check it)

d size of the paperclips; current in the coil; material in the core

Exercise 9.4B Strength of electromagnets 2

1 a material in the core; number of turns in the coil; same size paper clips

b i Cells can run out/run low, whereas the power supply will not/power supply is more reliable; easier to change the current with the power supply than connecting/disconnecting cells.

ii The wire in the coil gets too hot.

c i 50 pins

ii 12 or 13 pins (not 12.5)

Exercise 9.4C Strength of electromagnets 3

1 a current in the coil and material in the core

b small paperclips; a better range of values can be measured/measurement is in smaller intervals/can detect smaller changes in electromagnetic strength

2 a The reading on the balance will decrease; the iron block will be attracted up to the electromagnet; the force of attraction on the block is in the opposite direction to the weight of the block; the force down on the balance is less.

b As the current in the electromagnet increases, the reading on the balance will get smaller/decrease.

c No, this is not correct; if the connection is reversed, then the current will be reversed; the poles on the electromagnet will be reversed; whichever pole is close to the iron block will still attract the block equally.