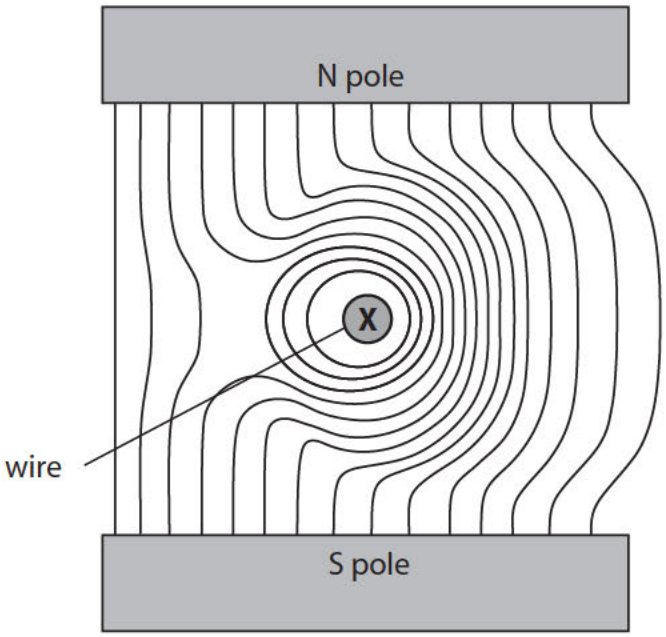
1 Magnetic field lines show the shape and direction of a magnetic field.

(a) The diagram shows a cross-section through a wire placed between two magnetic poles.

The wire carries electric current into the page at **X**.

The shape of the magnetic field is shown.



(i) Add arrows to two of the magnetic field lines to show the direction of the magnetic field.

(1)

(ii) Draw an arrow on the diagram to show the direction of the force on the wire.

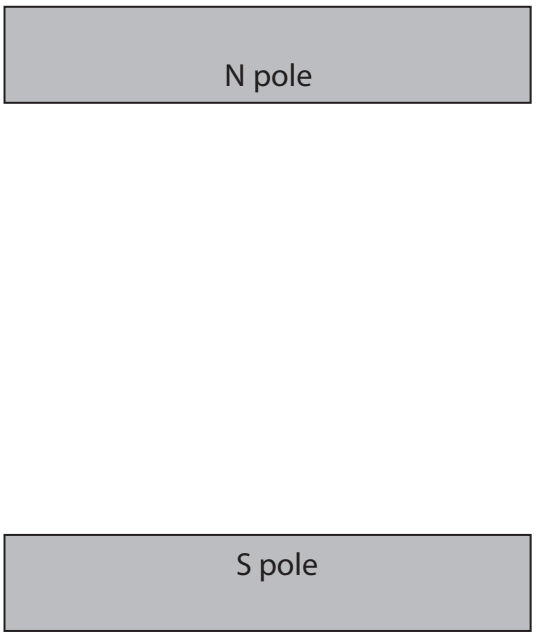
Label this arrow **F**.

(2)

(b) The wire is removed and the magnetic field between the poles changes.

Sketch the new magnetic field.

(2)



(c) Explain how you could use a plotting compass to investigate the magnetic field around a bar magnet.

You may draw a diagram to help your answer.

(3)

(Total for Question 1 = 8 marks)

2 This photograph shows an electromagnetic device used to keep a door open.



The electromagnet attracts the metal plate to hold the door open.

The electromagnet is connected to a fire alarm circuit.

When the fire alarm sounds, the door is released and it closes.

(a) State why the metal plate is made of iron.

(1)

.....

.....

(b) Describe the construction of an electromagnet.

You may draw a diagram to help your answer.

(3)

.....

.....

.....

.....

.....

.....

(c) Describe the changes that allow the electromagnet to release the door when the fire alarm sounds.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 2 = 6 marks)

3 (a) A direct current passes around a flat, circular coil as shown.

On the diagram, sketch the magnetic field caused by the current in the coil.

(3)

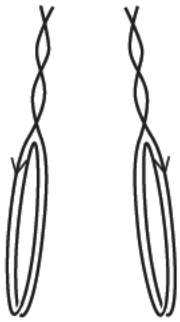


(b) The coil is suspended vertically so that it is free to swing.
A second, identical coil is placed beside it.

When direct currents pass, as shown, the two coils move together.



When the current in the right-hand coil is reversed, the two coils move apart.



Explain why the coils move in this way.

(3)

.....

.....

.....

.....

.....

.....

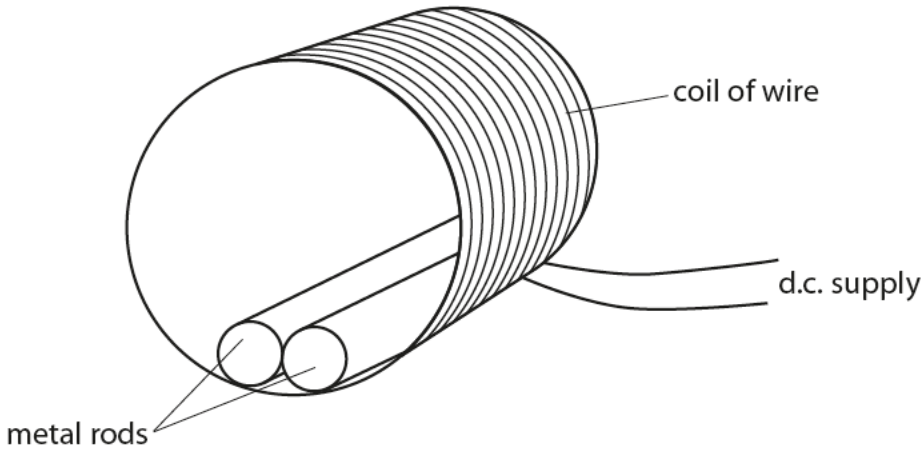
.....

.....

.....

(Total for Question 3 = 6 marks)

4 The diagram shows two identical metal rods placed inside a coil of wire.



(a) When a direct current is supplied to the coil, a magnetic field forms and the metal rods move apart.

Explain why the metal rods move apart.

(2)

.....

.....

.....

.....

(b) When the current is switched off, the metal rods return to their starting places.

Suggest what material the metal rods are made from.

Explain your answer.

(3)

.....

.....

.....

.....

.....

.....

(c) The direct current in the coil is replaced by an alternating current.

Explain what will happen to the magnetic field.

(2)

.....

.....

.....

.....

(Total for Question 4 = 7 marks)