1 **(a)** Two straight, vertical wires X and Y pass through holes in a horizontal card.

Fig. 8.1 shows the card viewed from above.

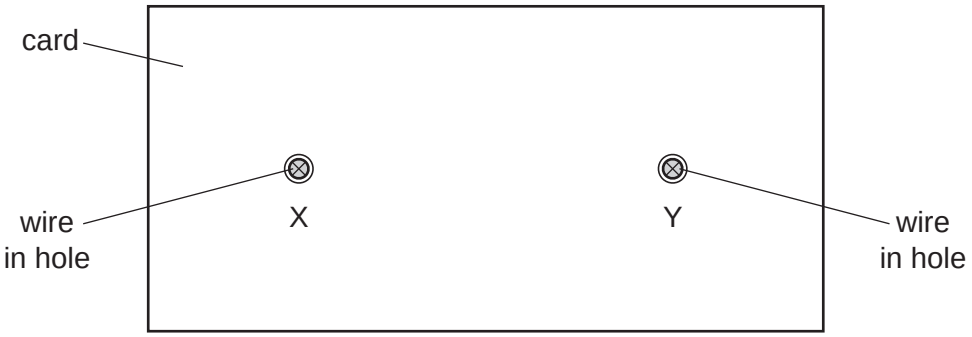


Fig. 8.1

There is a current in each wire in a downward direction (into the page).

(i) The magnetic field at Y due to the current in X produces a force on Y.

Place a tick in each blank column of the table to indicate the direction of this magnetic field and the direction of the force.

	magnetic field at Y	force on Y
towards the top of the page		
towards the bottom of the page		
to the left		
to the right		
into the page		
out of the page		

[2]

(ii) State and explain whether there is also a force on wire X.

.....

..... [1]

(b) Fig. 8.2 shows a d.c. supply connected to the input of a transformer.

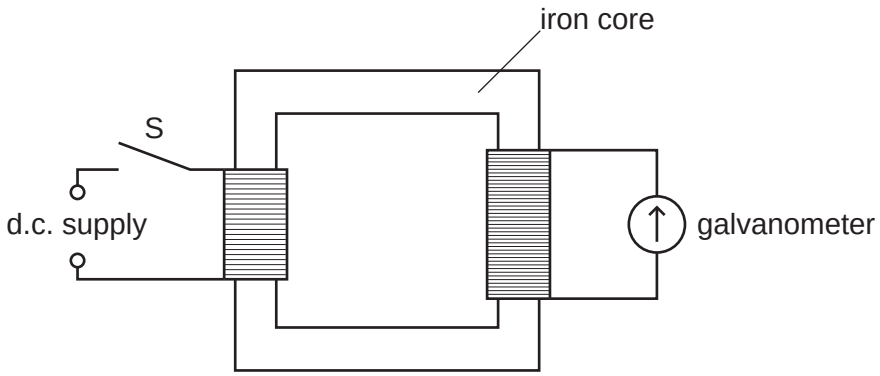


Fig. 8.2

When switch S is first closed, the needle of the galvanometer deflects briefly, then returns to zero.

Explain why the brief deflection occurs.

.....

.....

.....

.....

..... [3]

[Total: 6]

2 A remote ski lodge receives 18 kW of electric power from a 120 V supply.

(a) Calculate

(i) the current that the ski lodge draws from the supply,

current = ... [2]

(ii) the electrical energy supplied to the ski lodge in 30 minutes.

energy = ... [2]

(b) The power supply to the ski lodge is from a nearby transformer that is connected to long-distance transmission cables. The voltage of the transmission cables is very much larger than 120 V.

Explain why energy losses in the transmission cables are lower when the voltage is high.

.....

.....

.....

.....

..... [3]

[Total: 7]

3 **(a)** A very sensitive, centre-zero voltmeter is connected to the two terminals of a solenoid (long coil). Fig. 9.1 shows the S pole of a cylindrical magnet being inserted into the solenoid.

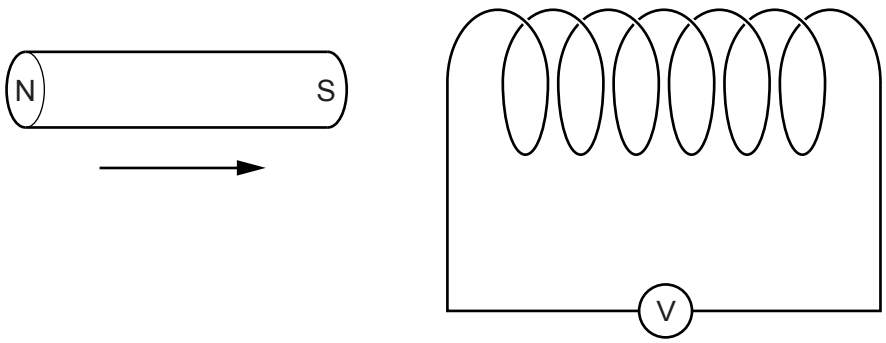


Fig. 9.1

As the magnet is inserted into the left-hand end of the solenoid, the needle of the voltmeter deflects.

(i) Explain why the needle deflects as the magnet is inserted.

.....

..... [2]

(ii) State and explain the effect of inserting the magnet more slowly.

.....

..... [2]

(iii) State what is observed when the magnet is withdrawn from the left-hand end of the solenoid.

..... [1]

(b) A transformer consists of a primary coil and a secondary coil on an iron core. An alternating voltage is connected to the primary coil.

Describe and explain the operation of the transformer.

.....

.....

.....

.....

.....

..... [4]

[Total: 9]

4 **(a)** Fig. 9.1 illustrates the left hand rule, which helps when describing the force on a current-carrying conductor in a magnetic field.

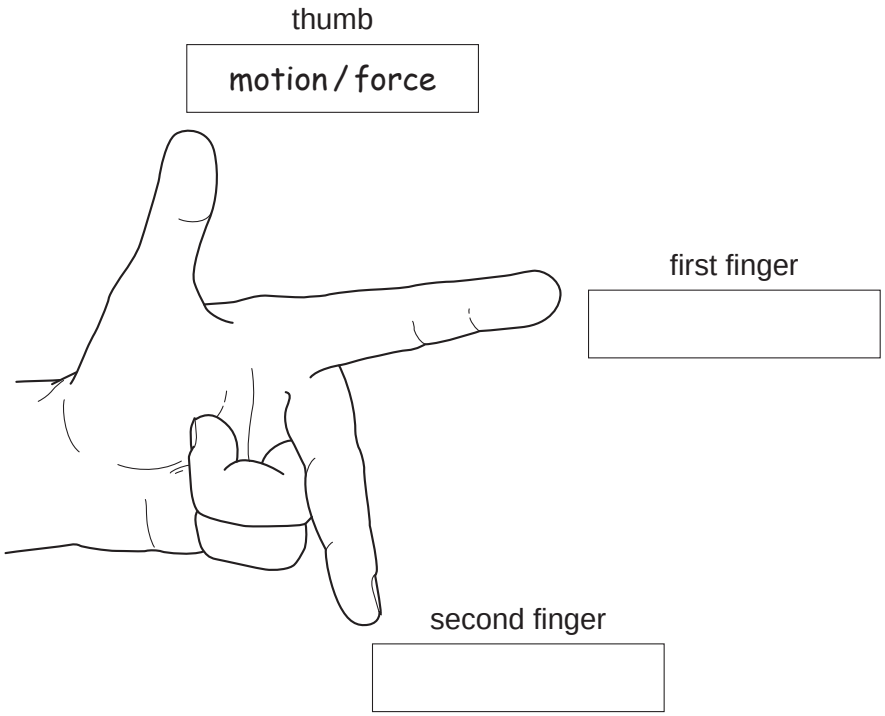


Fig. 9.1

One direction has been labelled for you.

In each of the other two boxes, write the name of the quantity that direction represents.

[1]

(b) Fig. 9.2 shows a simple d.c. motor connected to a battery and a switch.

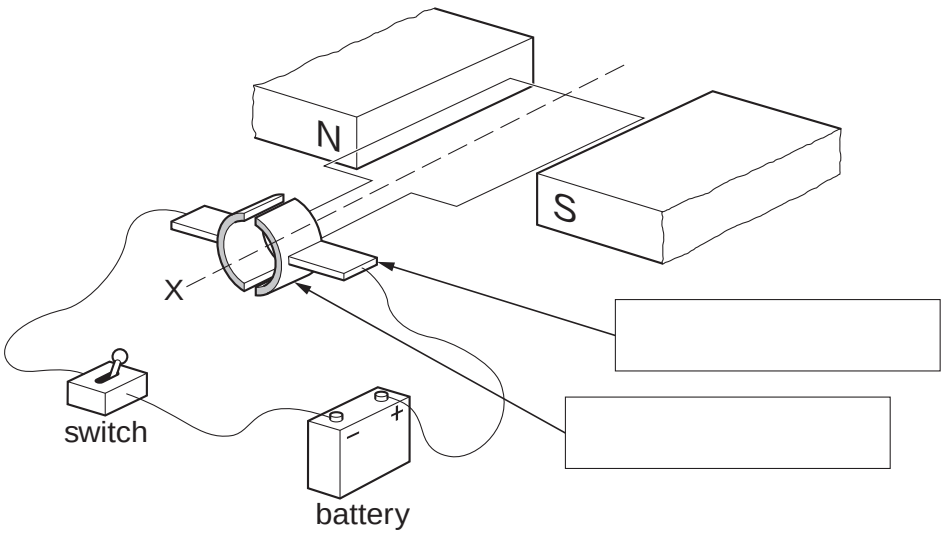


Fig. 9.2

(i) On Fig. 9.2, write in each of the boxes the name of the part of the motor to which the arrow is pointing. [2]

(ii) State which way the coil of the motor will rotate when the switch is closed, when viewed from the position X.

..... [1]

(iii) State two things which could be done to increase the speed of rotation of the coil.

1. .....

2. ..... [2]

[Total: 6]

5 Fig. 10.1 and Fig. 10.2 show two views of a vertical wire carrying a current up through a horizontal card. Points P and Q are marked on the card.

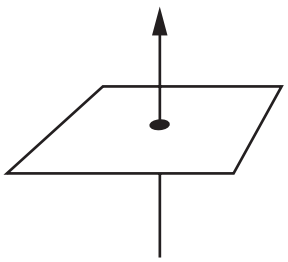
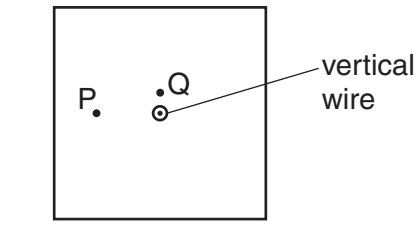


Fig. 10.1



view from above the card

Fig. 10.2

(a) On Fig. 10.2,

(i) draw a complete magnetic field line (line of force) through P and indicate its direction with an arrow,

(ii) draw an arrow through Q to indicate the direction in which a compass placed at Q would point.

[3]

(b) State the effect on the direction in which compass Q points of

(i) increasing the current in the wire,

.....

(ii) reversing the direction of the current in the wire.

.....

[2]

(c) Fig. 10.3 shows the view from above of another vertical wire carrying a current up through a horizontal card. A cm grid is marked on the card. Point W is 1 cm vertically above the top surface of the card.

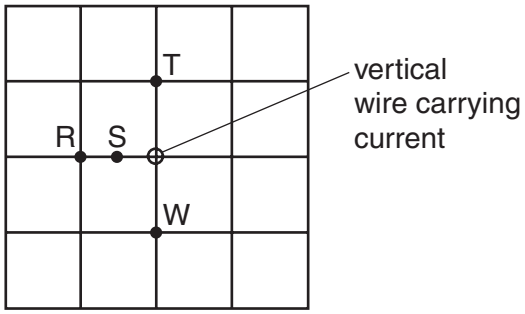


Fig. 10.3

State the magnetic field strength at S, T and W in terms of the magnetic field strength at R. Use one of the alternatives, **weaker**, **same strength** or **stronger** for each answer.

at S .....

at T .....

at W..... [3]

[Total : 8]

6 Fig. 7.1 shows an arrangement that could be used for making an electromagnet or a permanent magnet.

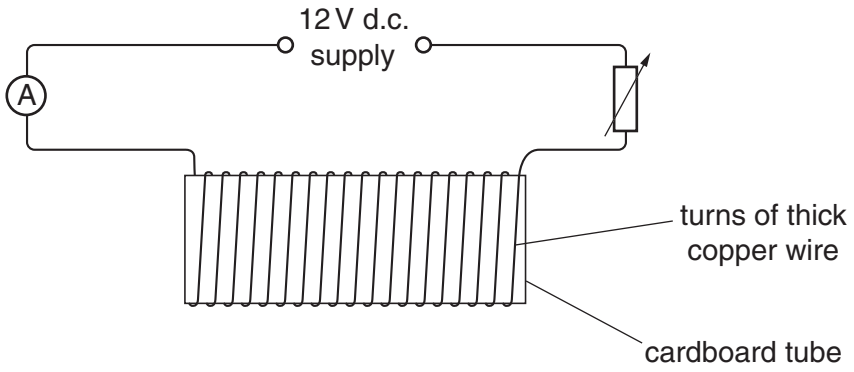


Fig. 7.1

Two bars of the same size are also available, one made of iron and the other of steel.

(a) (i) State which bar should be used to make a permanent magnet.

.....

(ii) Describe how the apparatus would be used to make a permanent magnet.

.....

.....

.....

(iii) Suggest one reason why the circuit contains an ammeter and a variable resistor.

.....

.....

[3]

(b) During the making of a permanent magnet, the ammeter reads a steady current of 4.0 A throughout the 5.0 s that the current is switched on. The voltage of the supply is 12 V.

Calculate

(i) the total circuit resistance,

resistance = ...

(ii) the power of the supply,

power = ...

(iii) the energy supplied during the 5.0 s.

energy = ...
[6]

(c) The potential difference across the variable resistor is 7.0 V and that across the ammeter is zero.

(i) Calculate the potential difference across the magnetising coil.

potential difference = ...

(ii) State the general principle used in making this calculation.

.....

.....
[3]

[Total :12]

7 Fig. 8.1 shows a long straight wire between the poles of a permanent magnet.
It is connected through a switch to a battery so that, when the switch is closed, there is a steady current in the wire.

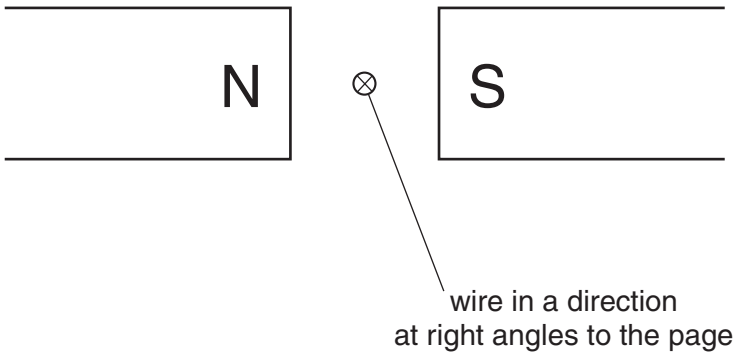


Fig. 8.1

(a) State the direction of the magnetic field between the poles of the magnet.

.....[1]

(b) The wire is free to move. The current is switched on so that its direction is into the page.

(i) State the direction of movement of the wire.

.....

.....

(ii) Explain how you reached your answer to **(b)(i)**.

.....

.....

.....

[4]

(c) This experiment is the basis of an electric motor.
Describe two changes to the arrangement shown in Fig. 8.1 that would enable continuous rotation to take place.

change 1 .....

.....

change 2 .....

.....[2]