



GCSE Physics

Motor Effect

Question Paper

Time available: 54 minutes

Marks available: 49 marks

www.accesstuition.com

1. The circle in **Figure 1** represents a straight wire carrying a current. The cross shows that the current is into the plane of the paper.

Figure 1



- (a) Complete **Figure 1** to show the magnetic field pattern around the wire.

(2)

- (b) The magnetic flux density 10 cm from the wire is 4 microtesla.

Which of the following is the same as 4 microtesla?

Tick **one** box.

$4 \times 10^{-2} \text{ T}$

$4 \times 10^{-3} \text{ T}$

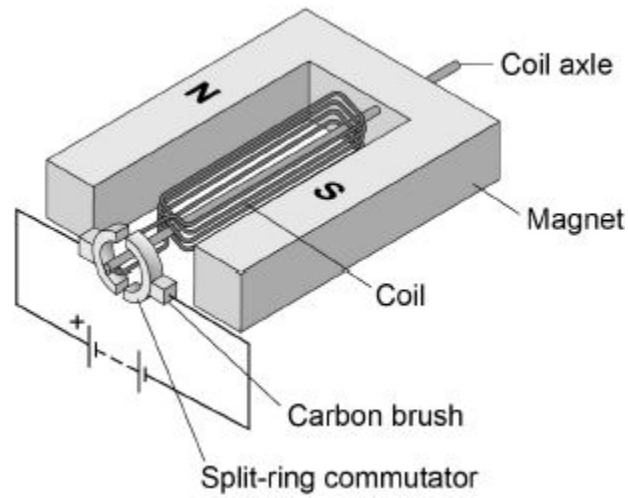
$4 \times 10^{-6} \text{ T}$

$4 \times 10^{-9} \text{ T}$

(1)

(c) **Figure 2** shows a simple electric motor.

Figure 2



When there is a current in the coil, the coil rotates continuously.

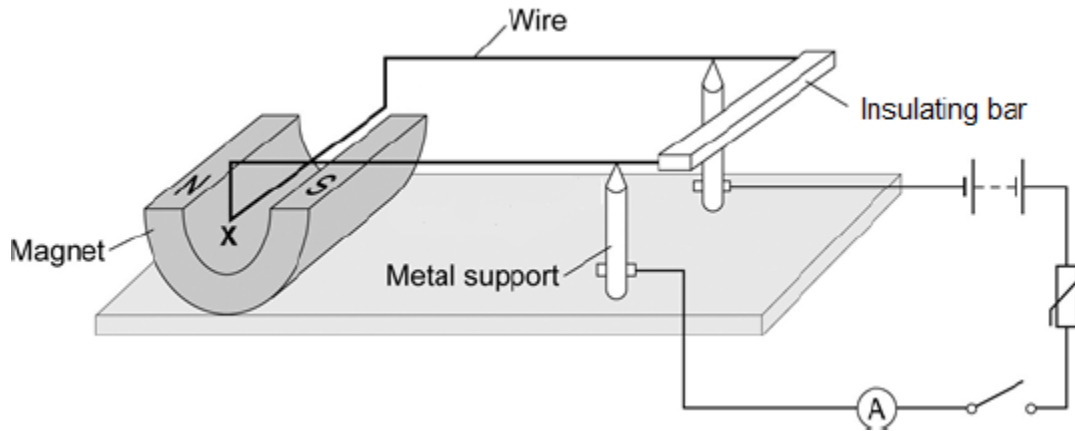
Explain why.

(4)
(Total 7 marks)

2.

Figure 1 shows a piece of apparatus called a current balance.

Figure 1



When the switch is closed, the part of the wire labelled **X** experiences a force and moves downwards.

- (a) What is the name of the effect that causes the wire **X** to move downwards?

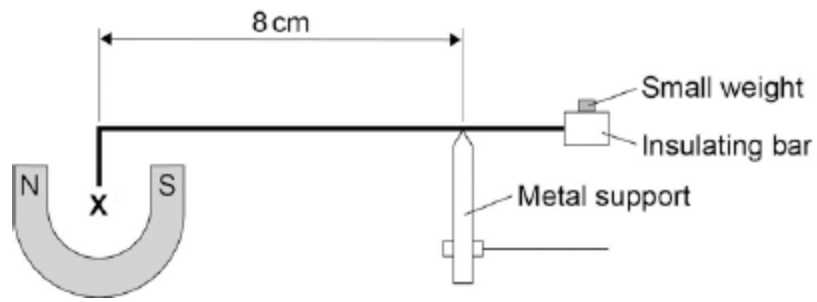
(1)

- (b) Suggest one change you could make to the apparatus in **Figure 1** that would increase the size of the force that wire **X** experiences.

(1)

- (c) **Figure 2** shows how a small weight placed on the insulating bar makes the wire **X** go back and balance in its original position.

Figure 2



The wire **X** is 5 cm long and carries a current of 1.5 A.

The small weight causes a clockwise moment of 4.8×10^{-4} Nm.

Calculate the magnetic flux density where the wire **X** is positioned

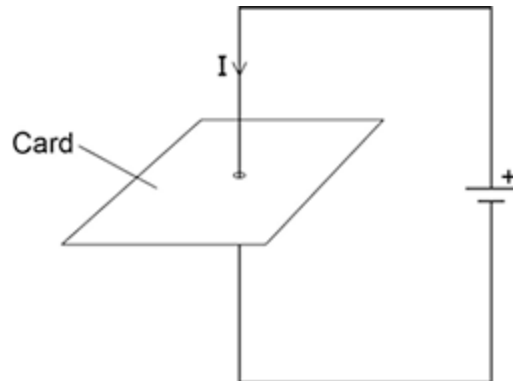
Give the unit.

Magnetic flux density = _____ Unit _____

(6)
(Total 8 marks)

3. **Figure 1** shows a straight wire passing through a piece of card.
A current (I) is passing down through the wire.

Figure 1



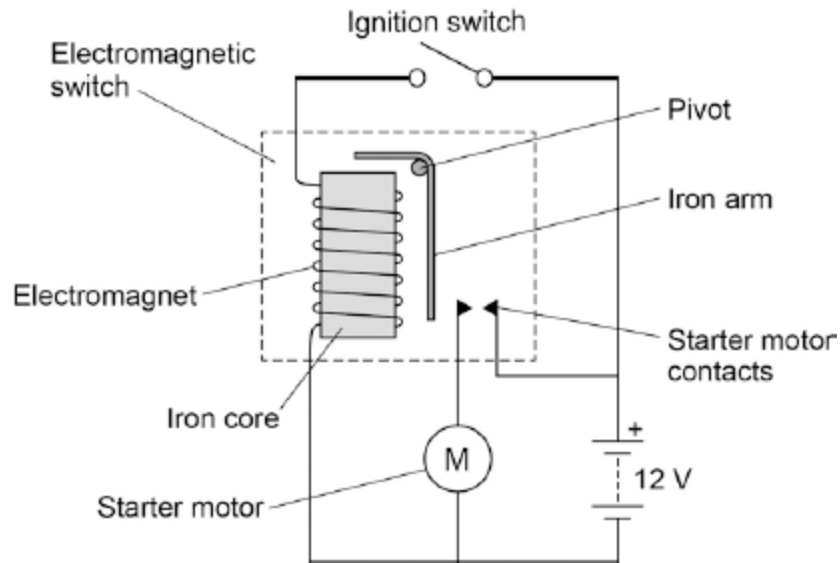
- (a) Describe how you could show that a magnetic field has been produced around the wire.

(2)

(b) **Figure 2** shows the ignition circuit used to switch the starter motor in a car on.

The circuit includes an electromagnetic switch.

Figure 2

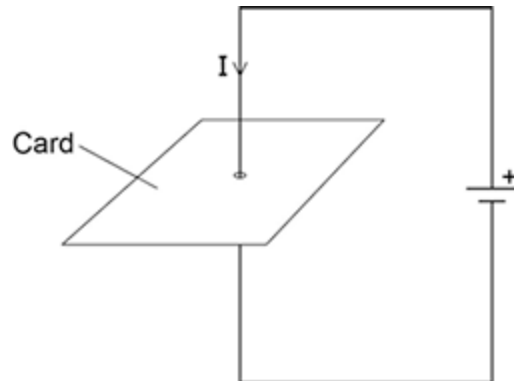


Explain how the ignition circuit works.

(4)
(Total 6 marks)

4. **Figure 1** shows a straight wire passing through a piece of card.
A current (I) is passing down through the wire.

Figure 1



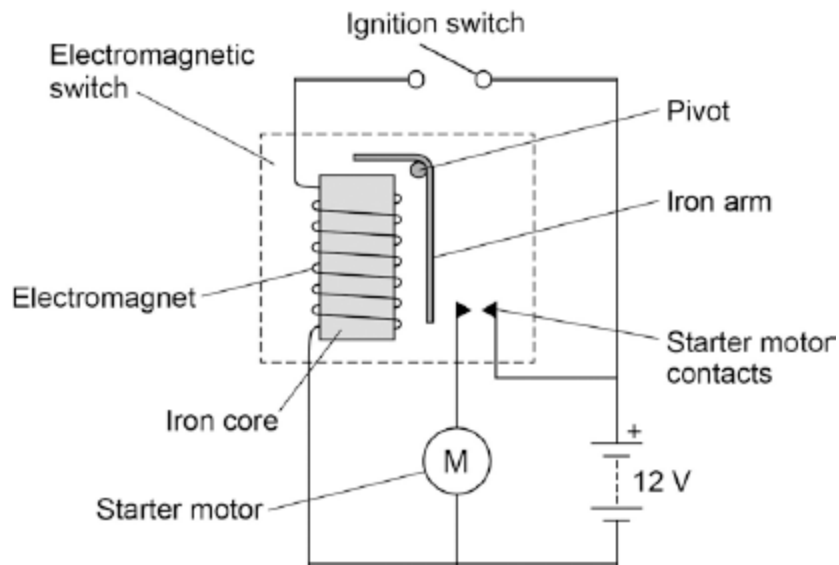
- (a) Describe how you could show that a magnetic field has been produced around the wire.

(2)

(b) **Figure 2** shows the ignition circuit used to switch the starter motor in a car on.

The circuit includes an electromagnetic switch.

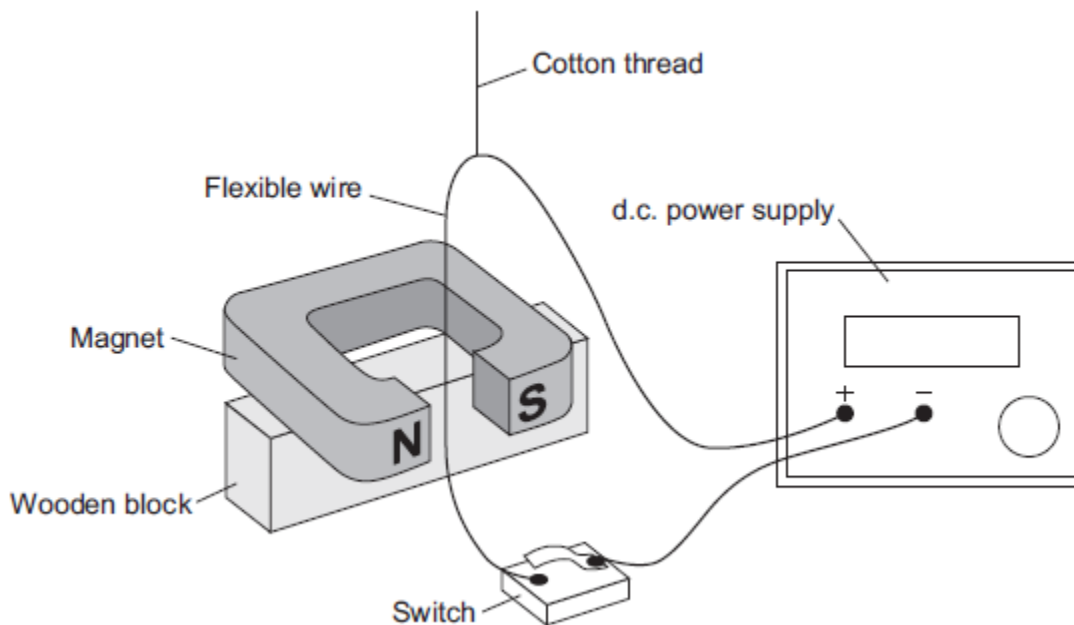
Figure 2



Explain how the ignition circuit works.

(4)
(Total 6 marks)

5. The diagram shows a demonstration carried out by a teacher.



When the switch is closed, there is a current of 2 A through the wire. The wire experiences a force and moves.

(a) Use the correct word from the box to complete the sentence.

generator	motor	transformer
------------------	--------------	--------------------

The demonstration shows the _____ effect.

(1)

(b) State **two** changes that the teacher could make to the demonstration, each of which would increase the force on the wire. The teacher does not touch the wire.

1. _____

2. _____

(2)

(c) State **one** change that the teacher could make to the demonstration to change the direction of the force on the wire.

(1)

- (d) With the switch closed, the teacher changes the position of the wire so that the force on the wire is zero.

What is the position of the wire?

Tick (✓) **one** box.

The wire is at 90° to the direction of the magnetic field.

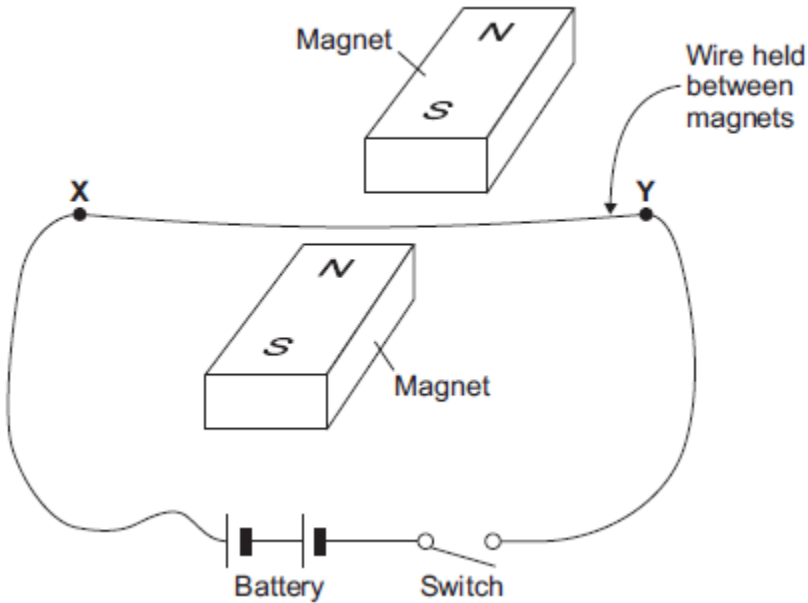
The wire is at 45° to the direction of the magnetic field.

The wire is parallel to the direction of the magnetic field.

(1)
(Total 5 marks)

6.

The diagram shows apparatus set up by a student.



Closing the switch creates a force that acts on the wire **XY**.

(a) (i) Explain why a force acts on the wire **XY** when the switch is closed.

(3)

(ii) The force causes the wire **XY** to move.
Draw an arrow on the diagram above to show the direction in which the wire **XY** will move.

(1)

(iii) State the effect that this experiment demonstrates.

(1)

- (b) The student replaced the battery with a low frequency alternating current (a.c.) power supply.

The student closed the switch.

- (i) Describe the movement of the wire.

(1)

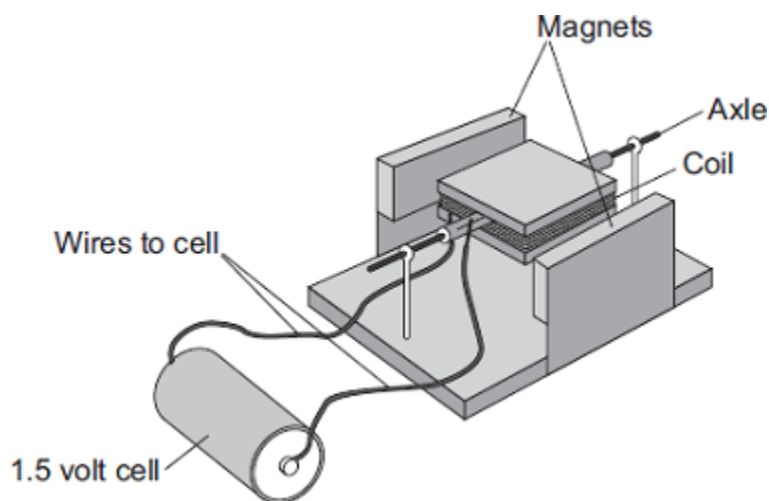
- (ii) Give a reason for your answer to part (i).

(1)

(Total 7 marks)

7.

A student has made a simple electric motor. The diagram shows the electric motor.



- (a) Complete the following sentence by drawing a ring around the correct line in the box.

Once the coil is spinning, one side of the coil is pushed by

the cell
the coil
a force

and

the other side is pulled, so the coil continues to spin.

(1)

(b) Suggest **two** changes to the electric motor, each one of which would make the coil spin faster.

1. _____

2. _____

(2)

(c) Suggest **two** changes to the electric motor, each one of which would make the coil spin in the opposite direction.

1. _____

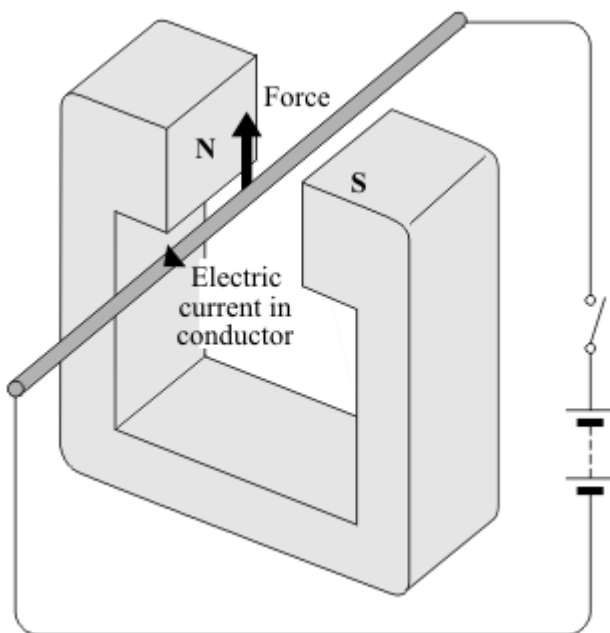
2. _____

(2)

(Total 5 marks)

8.

When a conductor carrying an electric current is placed in a magnetic field a force may act on it.



(a) State **two** ways in which this force can be increased.

1. _____

2. _____

(2)

(b) State **two** ways in which this force can be made to act in the opposite direction.

1. _____

2. _____

(2)

(c) In what circumstance will **no** force act on a conductor carrying an electric current and in a magnetic field?

(1)

(Total 5 marks)