AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



EXAM QUESTION PACK

4.7.2 THE MOTOR EFFECT (PACK 2)

SCORE	PERCENTAGE
/72	%

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

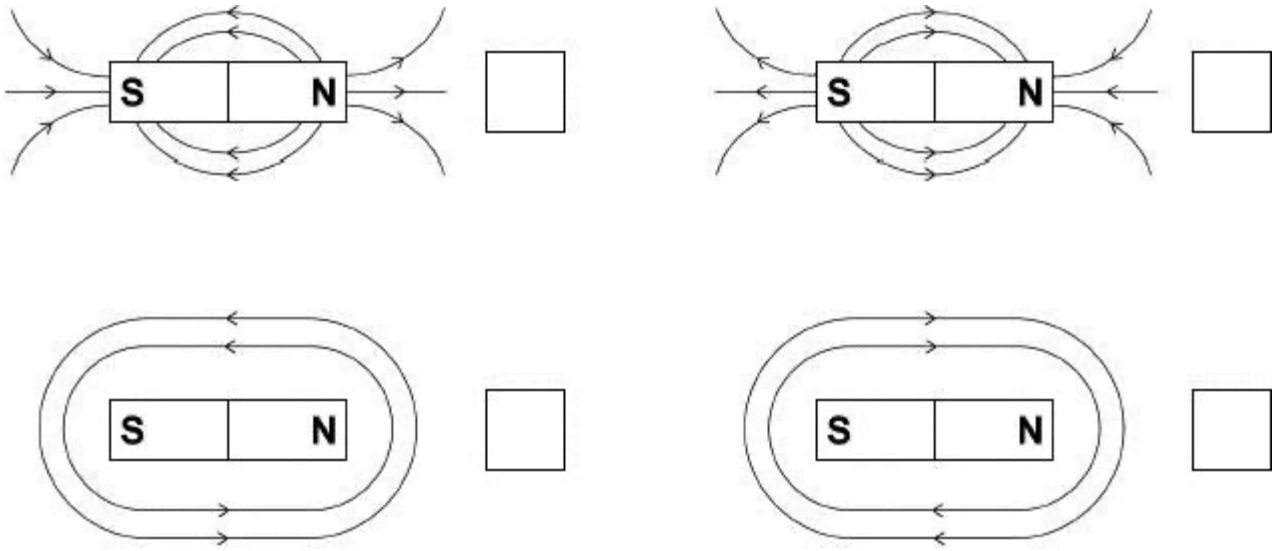
If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

A magnet produces a magnetic field.

(a) Which diagram shows the magnetic field pattern around a bar magnet?

Tick **one** box.



(1)

(b) **Figure 1** shows three metal blocks.

The blocks are not labelled.

One block is a permanent magnet, one is iron and one is aluminium.

Figure 1



Describe how another permanent magnet can be used to identify the blocks.

_____

_____

_____

_____

_____

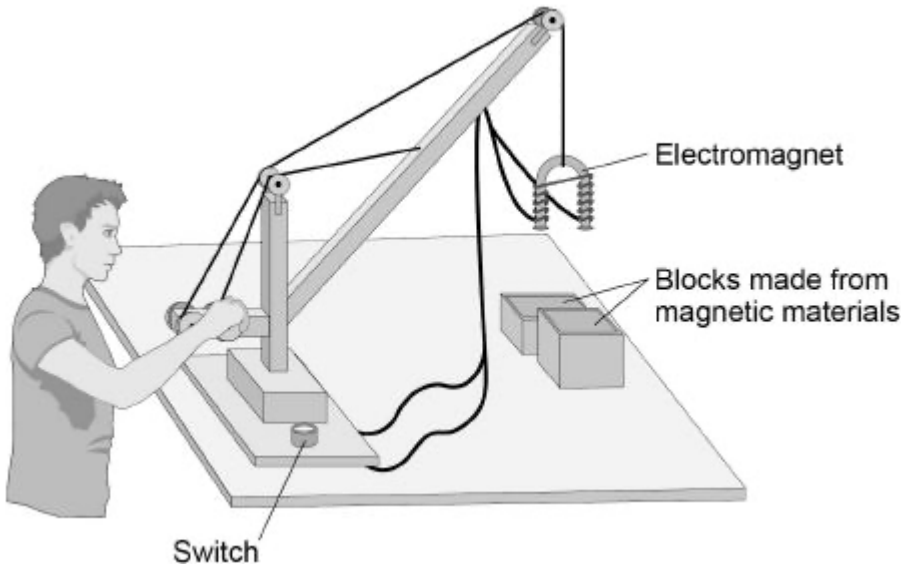
_____

(3)

(c) **Figure 2** shows a toy crane.

STEMUP.CO.UK

Figure 2



The toy crane uses an electromagnet to pick up and move the blocks.

Explain how this electromagnet is able to pick up and move the blocks.

(6)
(Total 10 marks)

Q2.

When a conductor carrying a current is placed in a magnetic field a force is exerted on the conductor.

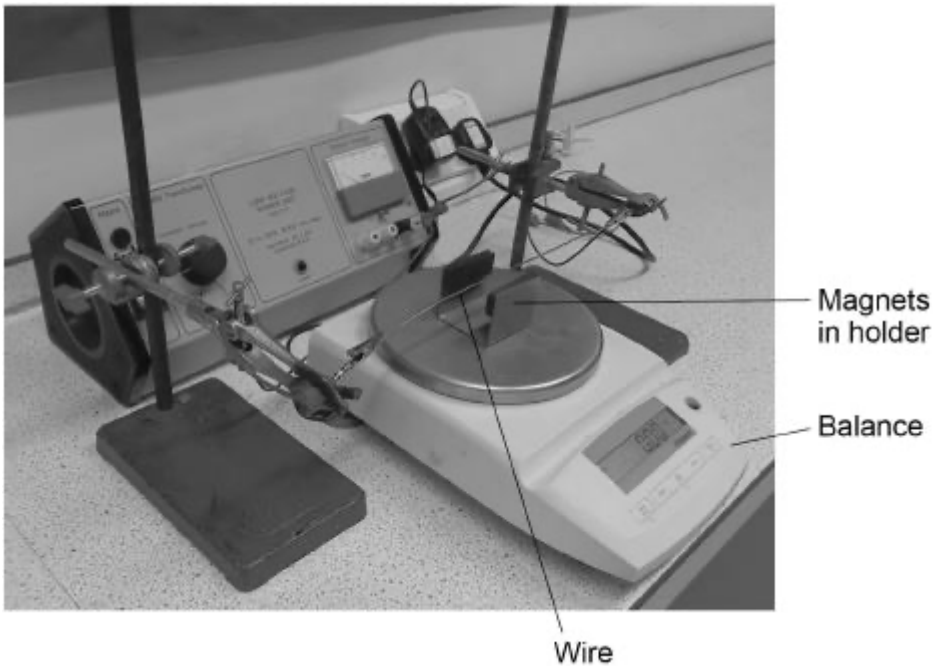
This is called the motor effect.

STEMUP.CO.UK

(a) Describe how the direction of the force can be determined using Fleming's Left Hand Rule.

(4)

The photograph below shows apparatus to demonstrate the motor effect.



The piece of wire is fixed so that it cannot move.

This is the method used.

1. Place the pair of magnets in their holder on the balance.
2. Set the reading on the balance to zero.
3. Pass a current through the wire.
4. Record the new reading on the balance.

(b) When there is a current in the wire, the reading on the balance increases.

Explain in terms of forces why the reading increases.

STEMUP.CO.UK

(3)

(c) In one experiment, the teacher determined that the force on the wire was 2.14 mN

The current in the wire was 0.32 A

The length of wire within the magnetic field was 0.048 m

Calculate the magnetic flux density between the two magnets.

Use the Physics Equations Sheet.

Give your answer to 2 significant figures.

Magnetic flux density = _____ T

(4)

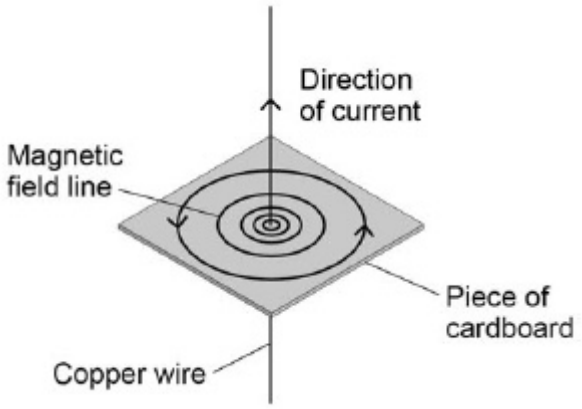
(Total 11 marks)

Q3.

Figure 1 shows the magnetic field around a copper wire carrying a current.

Figure 1

STEMUP.CO.UK



(a) What do the arrows on the magnetic field line represent?

_____

_____

(1)

(b) Complete the sentence.

Choose the answer from the box.

decreases	**increases**	**stays the same**

As the distance from the copper wire increases, the

magnetic field strength _____ .

(1)

(c) Suggest how the field lines on **Figure 1** show the variation in field strength.

_____

_____

_____

_____

(2)

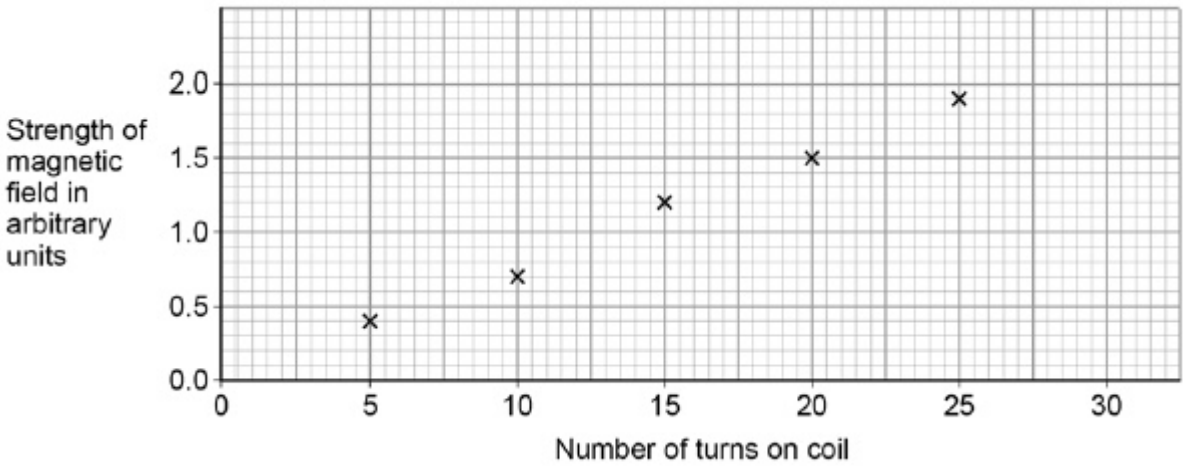
A student coiled the copper wire a different number of times to form a solenoid.

Each time the student measured the strength of the magnetic field inside the solenoid.

Figure 2 shows the results.

Figure 2

STEMUP.CO.UK



(d) Draw a line of best fit on **Figure 2**.

(1)

(e) Determine the increase in strength of magnetic field when the number of turns on the coil is changed from 12 to 18

_____

_____

_____

Increase in strength of magnetic field = _____ arbitrary units

(2)

(f) How could the strength of the magnetic field be increased?

Tick **two** boxes.

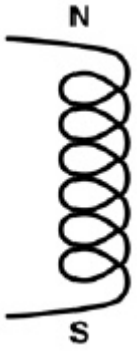
Increase the current through the solenoid.	☐
Increase the potential difference across the solenoid.	☐
Increase the temperature of the solenoid.	☐
Spread the turns of wire on the solenoid further apart.	☐
Use wire with a higher resistance to make the solenoid.	☐

(2)

(g) **Figure 3** shows the north and south poles of a solenoid.

Figure 3

STEMUP.CO.UK



Draw field lines to show the magnetic field around the solenoid.

(2)

(h) How can the solenoid be made into an electromagnet?

_____

_____

(1)

(Total 12 marks)

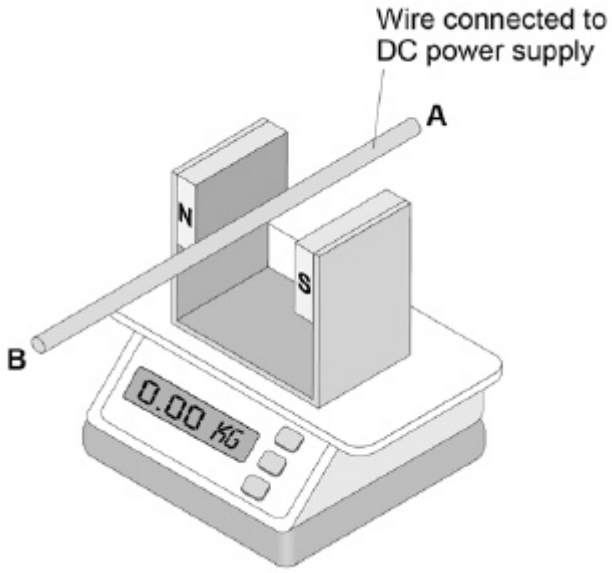
Q4.

A student placed a permanent magnet on a top-pan balance.

He clamped a straight piece of wire so that it was suspended in the magnetic field.

Figure 1 shows the apparatus.

Figure 1



(a) When a current passed through the wire from **A** to **B**, the reading on the balance increased.

Explain why.

_____

STEMUP.CO.UK

(4)

(b) The student increased the current in the wire.

Sketch a graph on **Figure 2** to show the relationship between the current and magnetic force on the wire.

Label the axes, with the independent variable on the x-axis.

Figure 2



(2)

(c) The length of the wire in the magnetic field in **Figure 1** is 4.8×10^{-2} m

The current in the wire is 0.80 A

The reading on the balance is 1.2×10^{-3} kg

Gravitational field strength = 9.8 N/kg

Calculate the magnetic flux density of the permanent magnet.

STEMUP.CO.UK

Magnetic flux density = _____ tesla

(5)

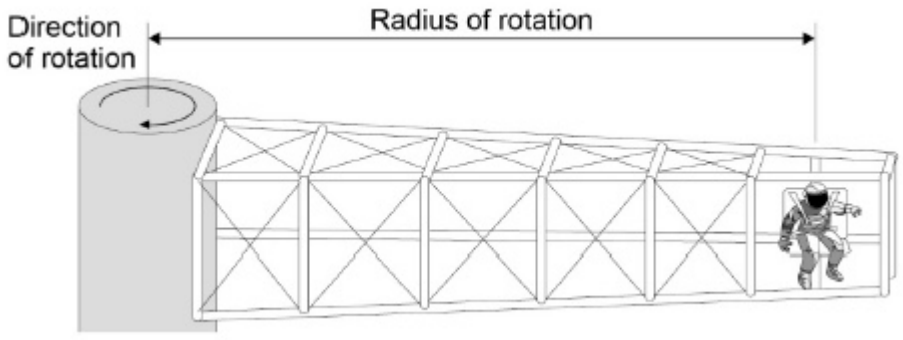
(Total 11 marks)

Q5.

Figure 1 shows a 'G-machine'.

The G-machine is used in astronaut training.

Figure 1



(a) The astronaut travels at constant speed in a circle.

Explain why the astronaut is accelerating.

(3)

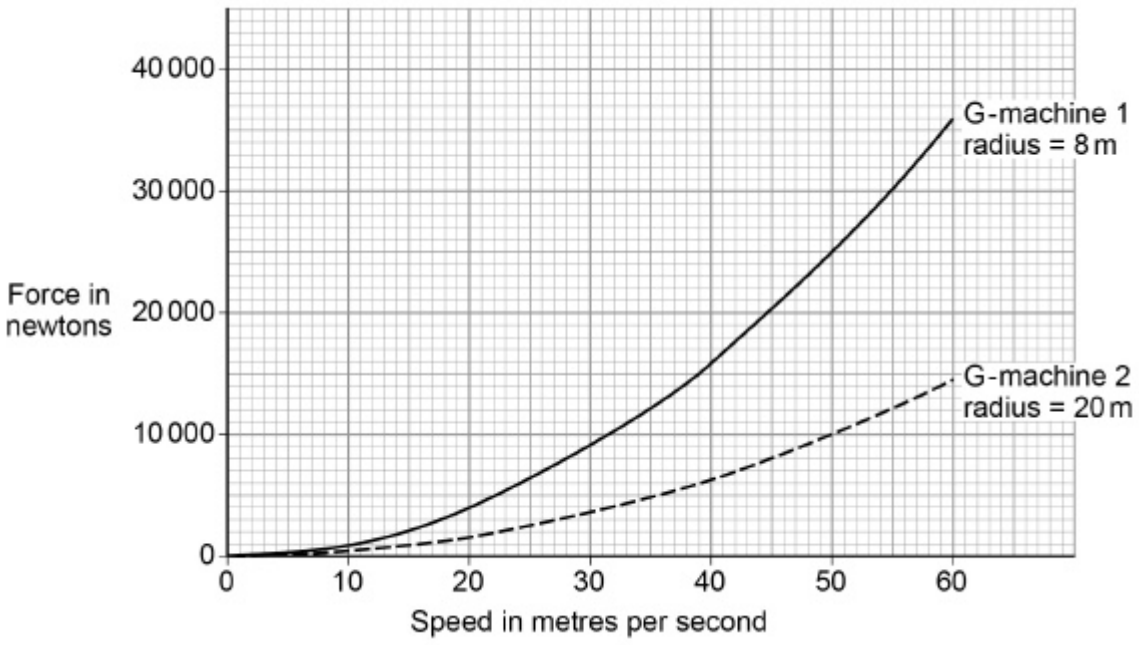
(b) The force causing the astronaut to move in a circle is measured.

STEMUP.CO.UK

Figure 2 shows how the speed of the astronaut affects the force causing the astronaut to move in a circle.

The radius of rotation of the astronaut is different for each G-machine.

Figure 2



Give **three** conclusions about the factors affecting the size of the force required to move the astronaut in a circle.

1. _____

_____

2. _____

_____

3. _____

_____

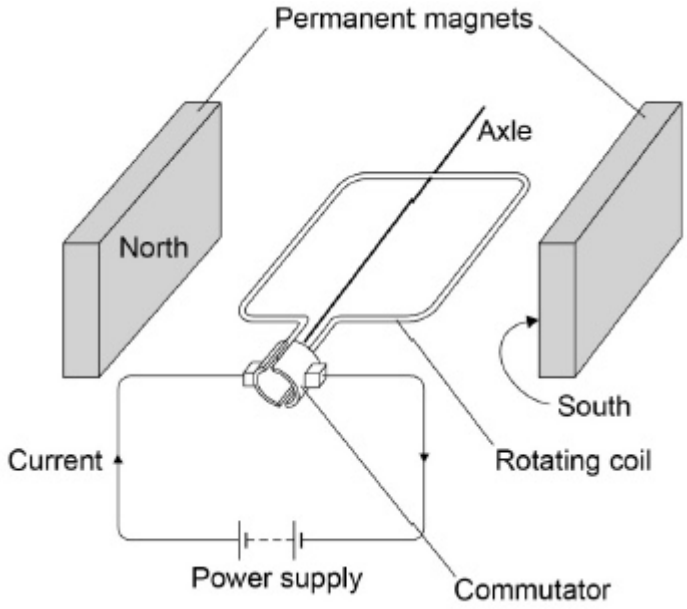
(3)

(c) Each G-machine is rotated by an electric motor.

Figure 3 shows a simple electric motor.

Figure 3

STEMUP.CO.UK



Explain why the coil rotates when there is a current in the circuit.

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)

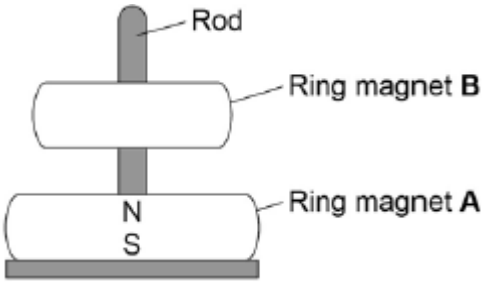
Q6.

A magnetic toy uses ring-shaped magnets.

Look at **Figure 1**.

The magnets can move up and down the rod. Ring magnet **B** appears to float.

Figure 1



(a) The magnetic poles are labelled on ring magnet **A**.

Label the magnetic poles on ring magnet **B**.

STEMUP.CO.UK

(1)

(b) What would happen if ring magnet **B** was turned upside down?

_____

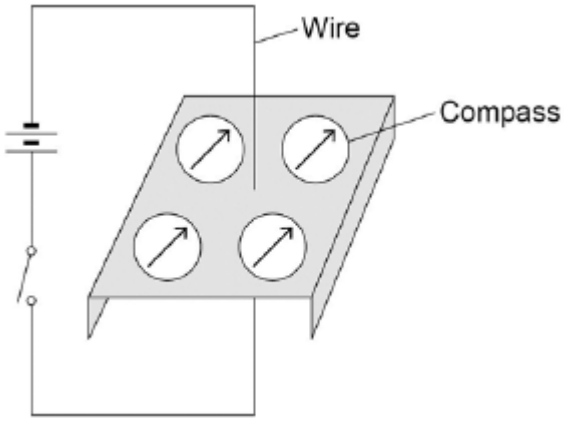
_____

(1)

(c) **Figure 2** shows four plotting compasses arranged around a wire.

The needle of a compass is a magnet.

Figure 2



In **Figure 2** the switch is open and there is no current in the wire.

Explain why the compass needles all point in the same direction.

_____

_____

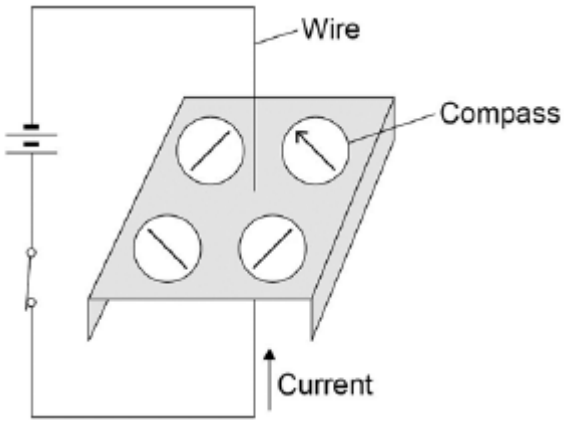
_____

_____

(2)

(d) **Figure 3** shows the switch closed.

Figure 3



STEMUP.CO.UK

There is now a current in the wire.

The compass needles change direction.

On **Figure 3** draw arrowheads on the three incomplete compass needles to show their direction.

(1)

(e) What would happen to the direction of the compass needles if the current was reversed?

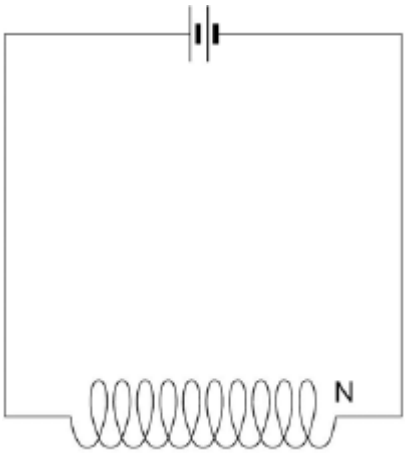
_____

_____

(1)

(f) **Figure 4** shows a coil of wire in a circuit.

Figure 4



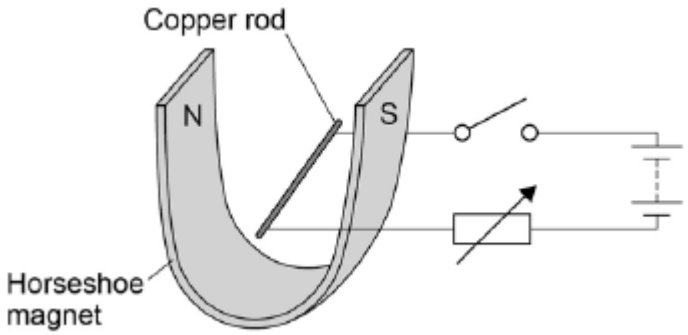
On **Figure 4** draw the magnetic field due to the current in the coil.

(3)

(Total 9 marks)

Q7.

A teacher used the equipment shown in the figure below to demonstrate the motor effect.



(a) Describe how Fleming's left-hand rule can be used to determine the direction in which the rod will move when the switch is closed, and state the direction.

_____

STEMUP.CO.UK

(4)

(b) Increasing the current can increase the force acting on the copper rod.

Give **one** other way in which the size of the force acting on the copper rod could be increased.

(1)

(c) The copper rod in the figure above has a length of 7 cm and a mass of 4×10^{-4} kg.

When there is a current of 1.12 A the resultant force on the copper rod is 0 N.

Calculate the magnetic flux density.

Gravitational field strength = 9.8 N / kg

Magnetic flux density = _____ T

(5)

(Total 10 marks)

STEMUP.CO.UK