

The Motor Effect

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.7 Magnetism and Electromagnetism
Sub-Topic	The Motor Effect
Difficulty Level	Gold Level
Booklet	Question Paper

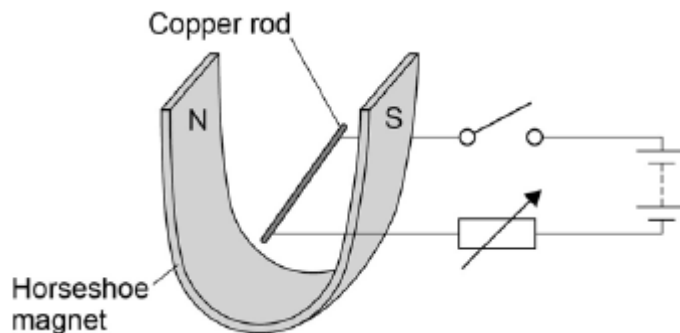
Time Allowed: 37 minutes

Score: /36

Percentage: /100

Grade Boundaries:

Q1. 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.

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(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.

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(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

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Magnetic flux density = T

(5)
(Total 10 marks)

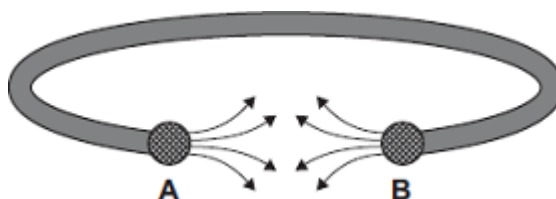
Q2.(a) Some people wear magnetic bracelets to relieve pain.

Figure 1 shows a magnetic bracelet.

There are magnetic poles at both **A** and **B**.

Part of the magnetic field pattern between **A** and **B** is shown.

Figure 1



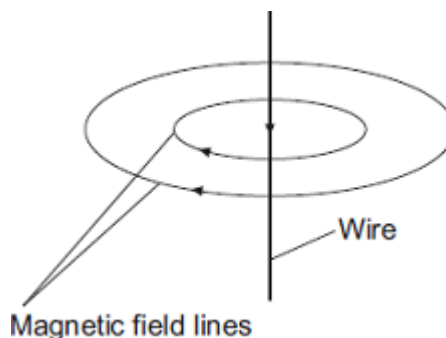
What is the pole at **A**?

What is the pole at **B**?

(1)

(b) **Figure 2** shows two of the lines of the magnetic field pattern of a current-carrying wire.

Figure 2



The direction of the current is reversed.

What happens to the direction of the lines in the magnetic field pattern?

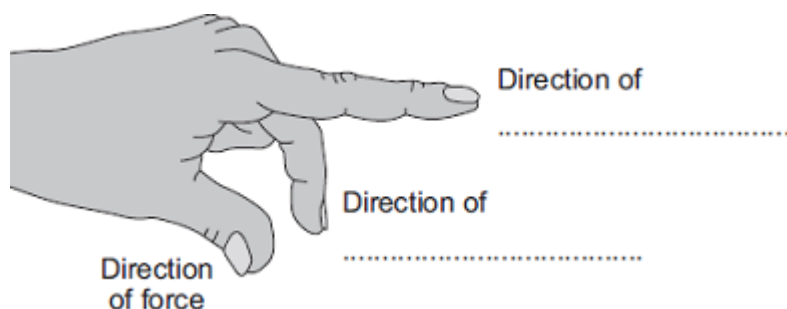
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(1)

- (c) Fleming's left-hand rule can be used to identify the direction of a force acting on a current-carrying wire in a magnetic field.

- (i) Complete the labels in **Figure 3**.

Figure 3

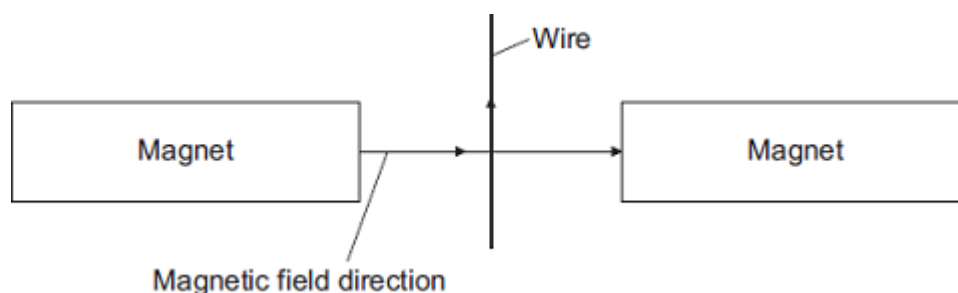


(2)

- (ii) **Figure 4** shows:

- the direction of the magnetic field between a pair of magnets
- the direction of the current in a wire in the magnetic field.

Figure 4



In which direction does the force on the wire act?

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(1)

(iii) Suggest **three** changes that would **decrease** the force acting on the wire.

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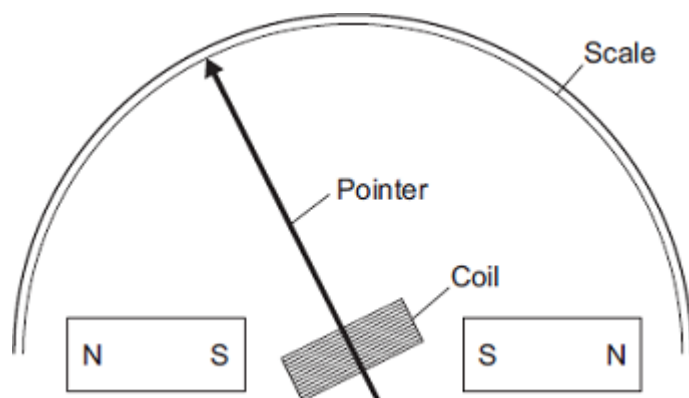
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(3)

(d) **Figure 5** shows part of a moving-coil ammeter as drawn by a student.

The ammeter consists of a coil placed in a uniform magnetic field. When there is a current in the coil, the force acting on the coil causes the coil to rotate and the pointer moves across the scale.

Figure 5



(i) The equipment has **not** been set up correctly.

What change would make it work?

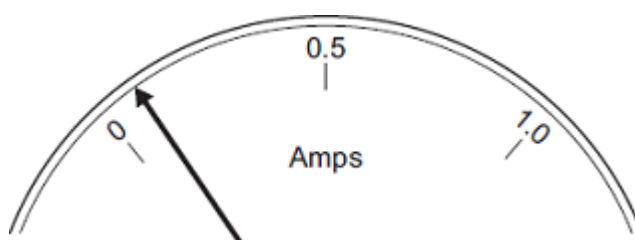
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(1)

- (ii) **Figure 6** shows the pointer in an ammeter when there is no current.

Figure 6



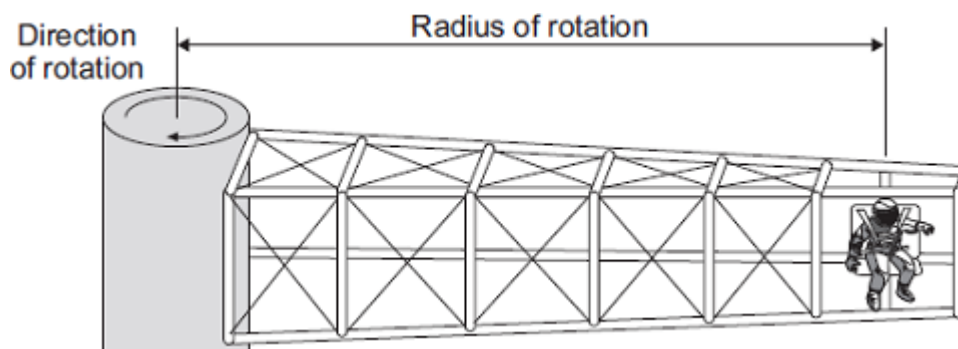
What type of error does the ammeter have?

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(1)

(Total 10 marks)

Q3. The diagram shows a 'G-machine'. The G-machine is used in astronaut training.

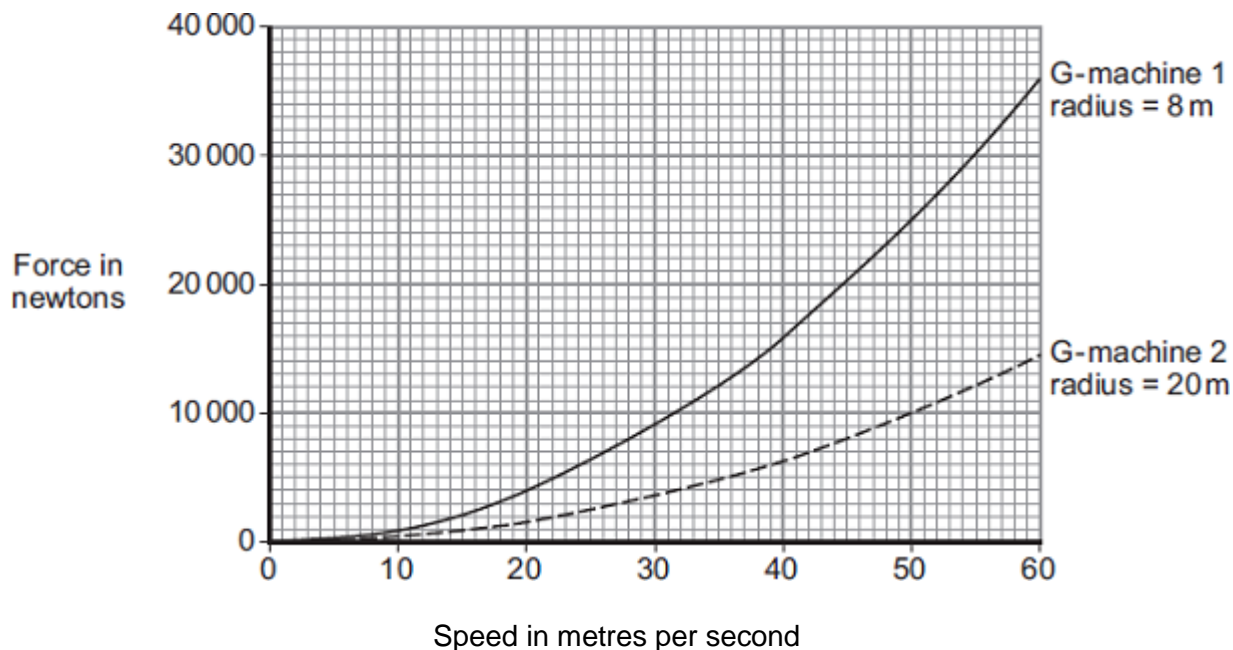


The G-machine moves the astronaut in a horizontal circle.

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

The graph shows how the speed of the astronaut affects the force causing the astronaut to move in a circle for two different G-machines.

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



- (i) State **three** conclusions that can be made from the graph.

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(3)

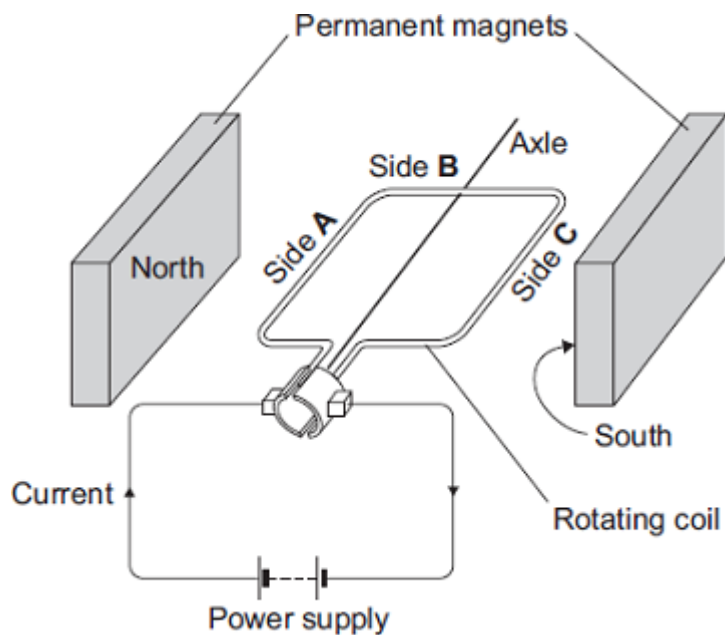
- (ii) The speed of rotation of G-machine 1 is increased from 20 m/s to 40 m/s.
Determine the change in force on the astronaut.

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Change in force = N

(1)

- (b) Each G-machine is rotated by an electric motor. The diagram shows a simple electric motor.



- (i) A current flows through the coil of the motor.

Explain why side **A** of the coil experiences a force.

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(2)

- (ii) Draw arrows on the diagram to show the direction of the forces acting on side **A** of the coil and side **C** of the coil.

(1)

- (iii) When horizontal, side **B** experiences no force.

Give the reason why.

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(1)

- (c) While a G-machine is rotating, the operators want to increase its speed.

What can the operators do to make the G-machine rotate faster?

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(1)

- (d) The exploration of space has cost a lot of money.

Do you think spending lots of money on space exploration has been a good thing?

Draw a ring around your answer.

Yes No

Give a reason for your answer.

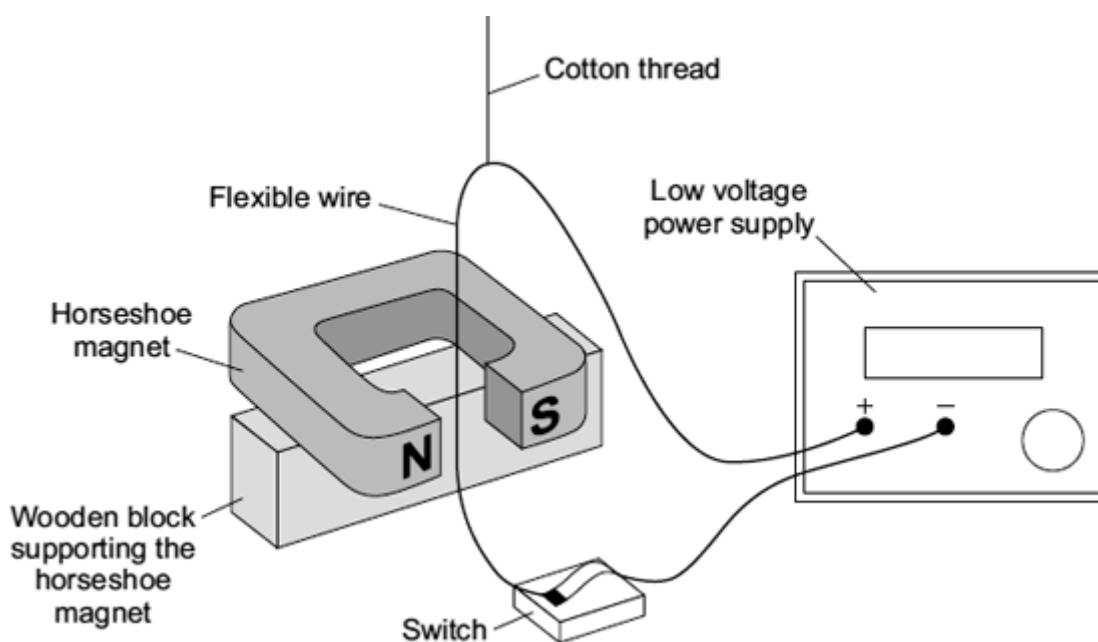
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(1)

(Total 10 marks)

- Q4.** (a) A laboratory technician sets up a demonstration.



A flexible wire is suspended between the ends of a horseshoe magnet. The flexible

wire hangs from a cotton thread. When the switch is closed, the wire kicks forward.

Identify the effect which is being demonstrated.

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(1)

- (b) A teacher makes some changes to the set-up of the demonstration.

What effect, if any, will each of the following changes have?

- (i) more powerful horseshoe magnet is used.

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(1)

- (ii) The connections to the power supply are reversed.

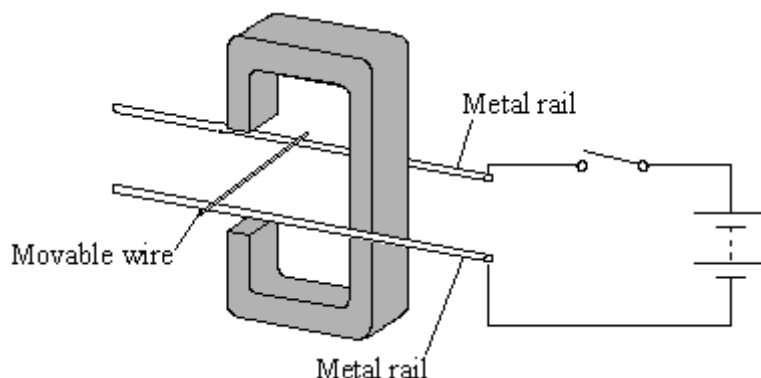
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(1)

(Total 3 marks)

- Q5.** The diagram shows apparatus used to demonstrate the electric motor effect. When the switch is closed the wire moves.



- (i) Draw an arrow on the diagram to show the direction the wire moves.

(1)

- (ii) Explain why the wire moves.

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(2)

(Total 3 marks)