AQA GCSE Physics | 8463

SPECIFICATION POINT 4.7.2.2

Fleming's left-hand rule (HT only)

Past-paper questions

Tier	**Higher**
Question groups	**3**
Available paper years	**2011–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

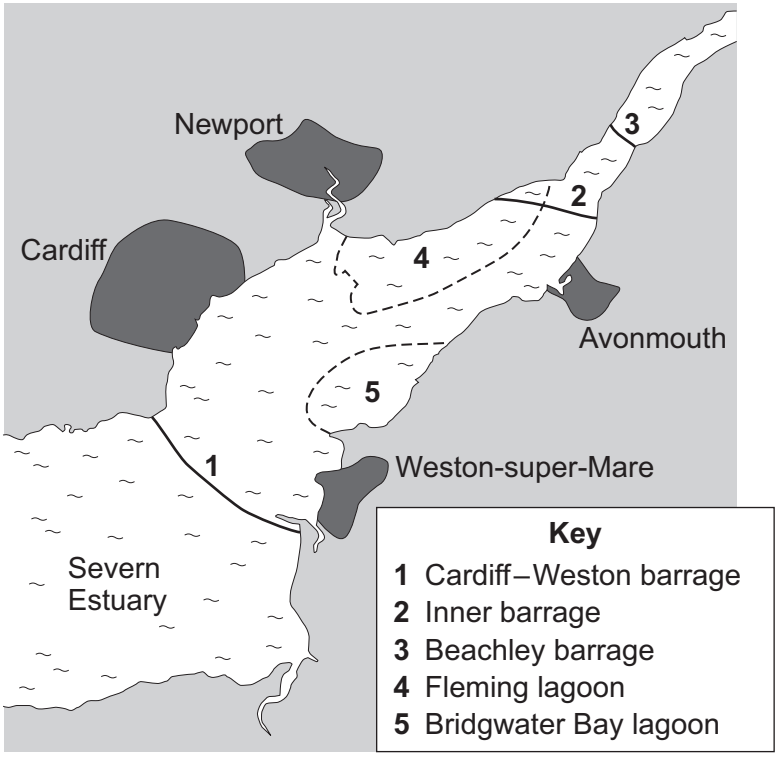
4.7.2.2 Fleming's left-hand rule (HT only)

Question 01

November 2011 | PHY1AP | Original Q9 | Legacy

QUESTION NINE

The UK government is considering five schemes for generating electricity from the tides in the Severn estuary. Three of the schemes involve building a barrage across the estuary. The barrage would contain turbines and generators. The other two schemes would be lagoons, which enclose large areas of water, rather than having a barrier across the estuary.



9A The table gives some information about the five schemes.

	Estimated building cost in billions of £	Maximum power produced in millions of watts (MW)	Annual carbon dioxide emission savings in millions of tonnes
Cardiff–Weston barrage	21.0	8.64	7.2
Inner barrage	3.2	1.05	1.2
Beachley barrage	2.3	0.62	0.7
Fleming lagoon	4.5	1.36	1.0
Bridgwater Bay lagoon	3.8	1.36	1.1

4.7.2.2 Fleming's left-hand rule (HT only)

Question 01 · continued

From the information in the table, which of the following statements is correct?

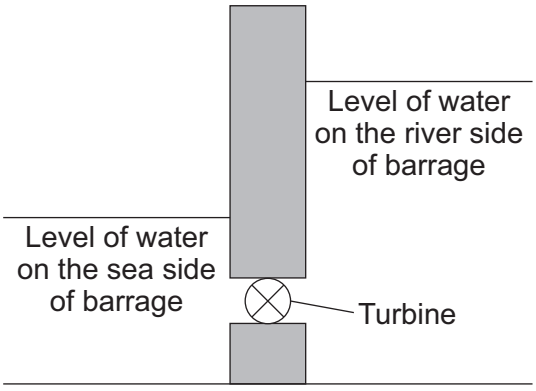
1 The Bridgwater Bay lagoon would produce the cheapest electricity and would be the cheapest to build.

2 The Beachley barrage would be the cheapest to build and would be the best at reducing global warming.

3 The Cardiff–Weston barrage would be the most expensive to build, would produce the most energy and would be the best at reducing global warming.

4 The Fleming lagoon would be the most expensive to build, would produce the most energy and would be the best at reducing global warming.

9B The diagram shows a section through a barrage.



As the tide comes in, water is trapped behind the barrage. Later, water is released to flow back through the turbine.

What is the main energy transformation as water is released to flow through the turbine?

1 electrical energy to gravitational potential energy

2 electrical energy to kinetic energy

3 gravitational potential energy to kinetic energy

4 kinetic energy to gravitational potential energy

Question 9 continues on the next page

4.7.2.2 Fleming's left-hand rule (HT only)

Question 01 · continued

9C There are many arguments for and against the Cardiff–Weston barrage scheme.

Which row in the table of statements for and against the scheme gives two correct **environmental** issues?

	For the scheme	Against the scheme
1	It will increase the number of ships using Cardiff docks.	It will provide only a small percentage of the UK's electricity.
2	It will provide up to 1500 extra jobs.	It will cost many billions of pounds to build.
3	It will reduce the total harmful emissions from UK power stations.	It will destroy wildlife habitats and block fish migration routes.
4	It will reduce the amount of salt in the water in the Severn estuary.	It will attract more tourists to the area.

9D The UK uses about 360 terawatt-hours (TWh) of electricity each year. A barrage across the Severn estuary is expected to generate 18 TWh of electricity each year.

1 terawatt-hour is a very large unit of energy

What percentage of the UK's electricity would the barrage generate each year?

1 2 %

2 5 %

3 20 %

4 80 %

END OF TEST

4.7.2.2 Fleming's left-hand rule (HT only)

Question 02

November 2021 | 8463/2H | Original Q9

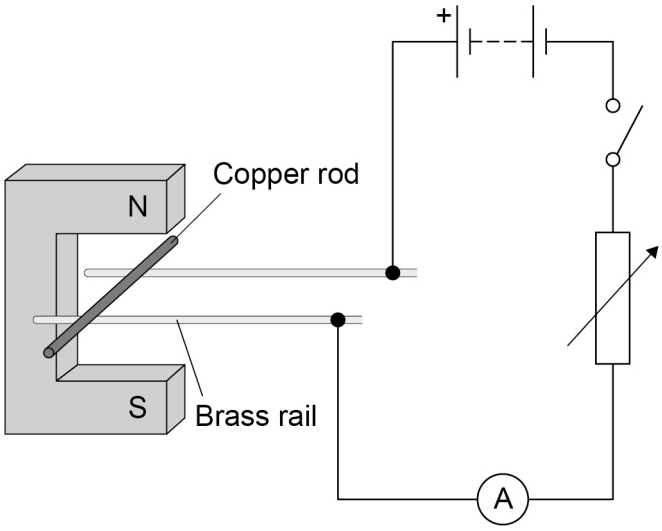
0 9 A teacher demonstrated how a magnetic field can cause a copper rod to accelerate.

The teacher placed the copper rod on two brass rails in a magnetic field.

The copper rod was able to move.

Figure 16 shows the equipment used.

Figure 16



4.7.2.2 Fleming's left-hand rule (HT only)

Question 02 · continued

0 9 . 1 The teacher closes the switch and the copper rod accelerates.

Explain how Fleming's left hand rule can be used to predict the direction in which the copper rod will move.

[5 marks]

0 9 . 2 Suggest **two** changes to the equipment that would increase the force on the copper rod.

[2 marks]

1

2

Question 9 continues on the next page

4.7.2.2 Fleming's left-hand rule (HT only)

Question 02 · continued

0 9 . 3 The teacher closed the switch and the copper rod accelerated uniformly from rest for 0.15 s.

The current in the copper rod was 1.7 A.

mass of copper rod = 4.0 g

length of copper rod in the magnetic field = 0.050 m

magnetic flux density = 0.30 T

Calculate the maximum possible velocity of the copper rod when it left the magnetic field.

[6 marks]

Maximum velocity = _____ m/s

13

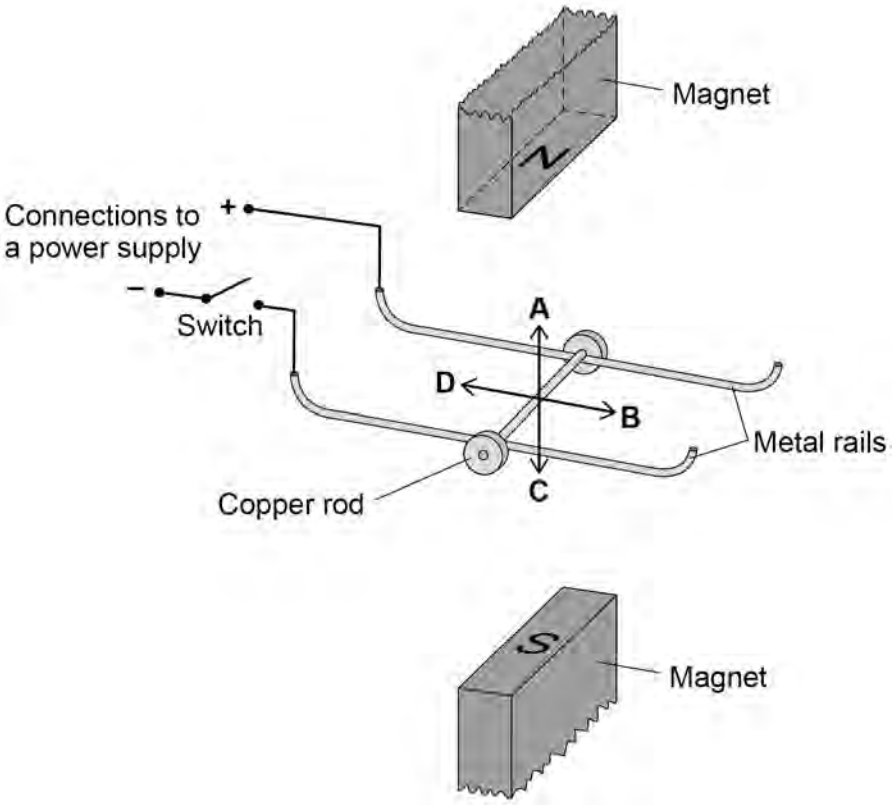
4.7.2.2 Fleming's left-hand rule (HT only)

Question 03

June 2025 | 8463/2H | Original Q7

0 7 **Figure 7** shows some apparatus used to demonstrate the motor effect.

Figure 7



When the switch is closed the copper rod accelerates.

0 7 . 1 What direction is the acceleration of the copper rod?

[1 mark]

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

4.7.2.2 Fleming's left-hand rule (HT only)

Question 03 · continued

0 7 . 2 The copper rod has a mass of 5.0 g.

The length of the copper rod in the magnetic field is 0.070 m.

The magnetic flux density is 0.30 T.

Calculate the initial acceleration of the rod when the current in the rod is 2.0 A.

Use the Physics Equations Sheet.

[5 marks]

Initial acceleration = _____ m/s^2

Question 7 continues on the next page

4.7.2.2 Fleming's left-hand rule (HT only)

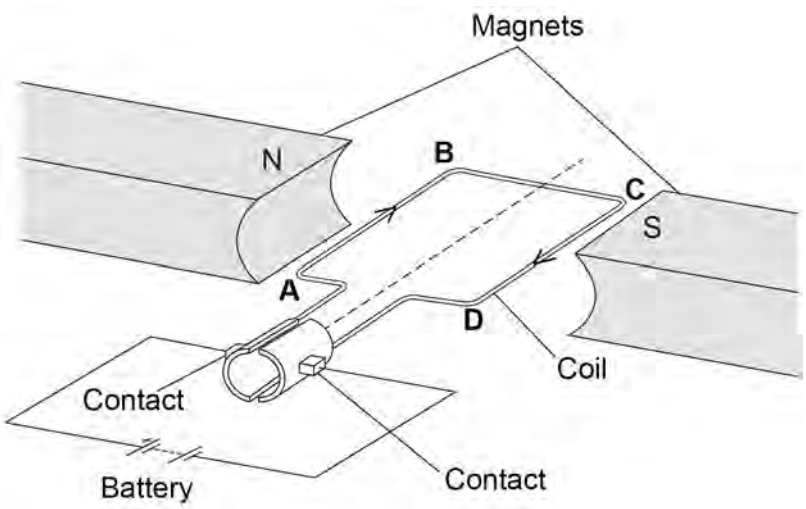
Question 03 · continued

Figure 8 shows a simple motor.

There is a magnetic field between the two permanent magnets.

When there is a current in the coil, a magnetic field is produced around the coil.

Figure 8



0 7 . 3 Explain how these magnetic fields cause the coil to continuously rotate.

[4 marks]

4.7.2.2 Fleming's left-hand rule (HT only)

Question 03 · continued

0 7 . 4 In **Figure 8** the coil of the motor is in a horizontal position.

Explain why the resultant moment on the coil is zero when the coil is in a vertical position.

[2 marks]

12

Turn over for the next question