FREE REVISION PACK

Force on a Current-Carrying Wire

AQA A-level Physics · 7408 · Specification 3.7.5.1

Easy | Medium | Hard | Multiple choice · past-paper questions

7	7	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Current that just supports a wire	AQA June 2019 · A-level Paper 2 · Q24	1 mark
2	Easy	Flux density from a change in force	AQA June 2023 · A-level Paper 2 · Q20	1 mark
3	Easy	Which sides of a coil feel a force?	AQA June 2019 · A-level Paper 2 · Q23	1 mark
4	Medium	Forces on a coil in a perpendicular field	AQA June 2018 · A-level Paper 2 · Q27	1 mark
5	Medium	Rod on rails in a horizontal field	AQA November 2021 · A-level Paper 2 · Q21	1 mark
6	Medium	Flux density that supports a wire	AQA June 2022 · A-level Paper 2 · Q22	1 mark
7	Hard	Current to support a shorter, thicker wire	AQA June 2025 · A-level Paper 2 · Q20	1 mark

Key ideas to have ready

- Force on a wire at right angles to a magnetic field: F = BIl. There is no force on a wire parallel to the field.
- Fleming's left-hand rule gives the direction: First finger = Field, seCond finger = Current, thuMb = Motion (force).
- A wire 'just supported' by the field: BIl = mg.
- For a wire of density ρ and diameter d, the weight is ρgl × $\pi d^2/4$, so the current needed to support it does not depend on its length.

How to use this pack

1. The questions are grouped into levels (Easy, Medium and Hard). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in AQA's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

Questions are reproduced from AQA past papers; AQA material is © AQA. Question numbers have been changed to suit this pack. Get Better At Physics is an independent tutor and is not affiliated with or endorsed by AQA. Free for personal revision and classroom use.

Easy

Definitions and one-step ideas. Most students get these right.

Questions 1–3

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2019 · A-level Paper 2 · Q24

1 A horizontal wire of length $0.50\ \text{m}$ and weight $1.0\ \text{N}$ is placed in a uniform horizontal magnetic field of flux density $1.5\ \text{T}$ directed at $90°$ to the wire.

What is the current that just supports the wire?

[1 mark]

A $0.33\ \text{A}$ ⬭

B $0.75\ \text{A}$ ⬭

C $1.3\ \text{A}$ ⬭

D $3.0\ \text{A}$ ⬭

AQA June 2023 · A-level Paper 2 · Q20

2 A wire is at right angles to a uniform magnetic field and carries an electric current. The wire is $150\ \text{mm}$ in length.

When the current in the wire is increased by $4.0\ \text{A}$, the force acting on the wire increases by $3.6 \times 10^{-3}\ \text{N}$.

What is the magnetic flux density of the field?

[1 mark]

A $6.0 \times 10^{-6}\ \text{T}$ ⬭

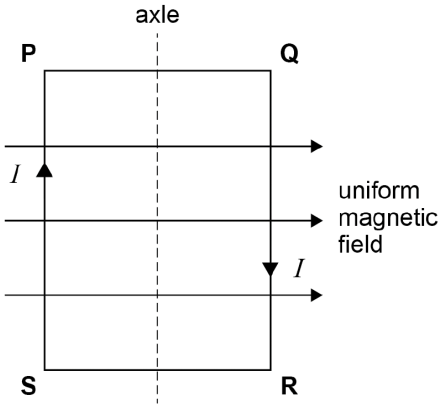
B $6.0 \times 10^{-3}\ \text{T}$ ⬭

C $1.7 \times 10^{2}\ \text{T}$ ⬭

D $1.7 \times 10^{5}\ \text{T}$ ⬭

AQA June 2019 · A-level Paper 2 · Q23

3 The plane of coil **PQRS** is parallel to a uniform magnetic field.



When a current I is in the coil

[1 mark]

A there are no magnetic forces acting on **SP** and **QR**. ⬭

B there are no magnetic forces acting on **PQ** and **RS**. ⬭

C an attractive magnetic force acts between **SP** and **QR**. ⬭

D an attractive magnetic force acts between **PQ** and **RS**. ⬭

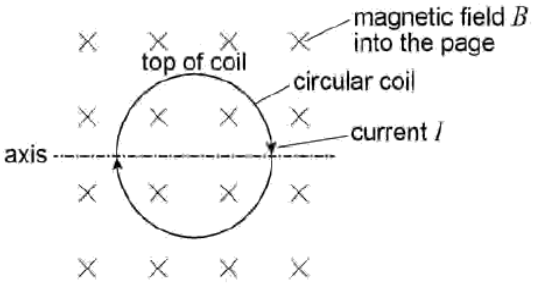
Medium

Two or three steps. Roughly a third to a half of students get these right.

Questions 4–6

AQA June 2018 · A-level Paper 2 · Q27

4 The diagram shows a clockwise current I in a circular coil placed in a uniform magnetic field B with the plane of the coil perpendicular to the magnetic field.



What is the effect on the coil of the interaction between the current and the magnetic field?

[1 mark]

A It rotates about the axis with the top moving out of the page. ⬭

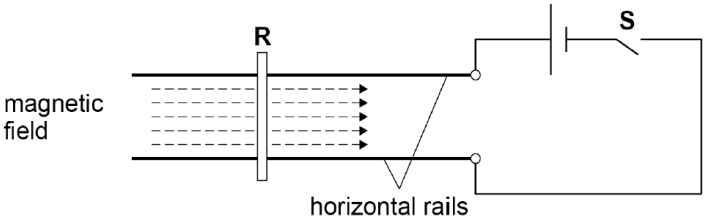
B It rotates about the axis with the top moving into the page. ⬭

C It causes an increase in the diameter of the coil. ⬭

D It causes a decrease in the diameter of the coil. ⬭

AQA November 2021 · A-level Paper 2 · Q21

5 A short copper rod **R** is placed on a pair of thick horizontal parallel copper rails. A horizontal magnetic field exists in the direction shown by the dashed arrows. The diagram shows the apparatus when viewed from directly above.



When switch **S** is closed, **R** will tend to

[1 mark]

A lift upwards away from the rails. ⬭

B move to the left. ⬭

C move to the right. ⬭

D be pressed downwards onto the rails. ⬭

AQA June 2022 · A-level Paper 2 · Q22

6 A horizontal wire of length $0.25\ \text{m}$ carrying a current of $3.0\ \text{A}$ is perpendicular to a magnetic field. The mass of the wire is $3.0 \times 10^{-3}\ \text{kg}$ and the weight of the wire is supported in equilibrium by the magnetic field.

What is the flux density of the magnetic field?

[1 mark]

A $2.6\ \text{T}$ ⬭

B $3.9 \times 10^{-2}\ \text{T}$ ⬭

C $2.2 \times 10^{-2}\ \text{T}$ ⬭

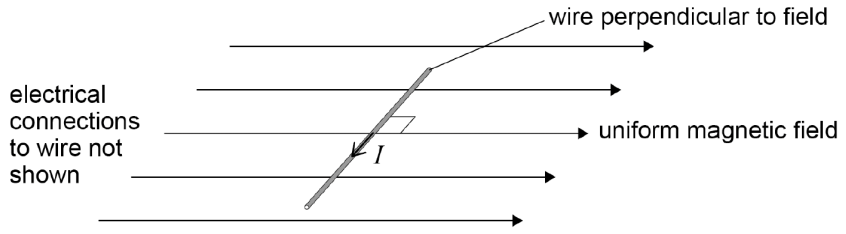
D $4.0 \times 10^{-3}\ \text{T}$ ⬭

Hard Several steps, often with a trap built in. Fewer than 3 in 10 students get these right. **Question 7**

AQA June 2025 · A-level Paper 2 · Q20

7 A horizontal wire is perpendicular to a horizontal uniform magnetic field of flux density B. The wire has length L and diameter d. The current in the wire is I.

The magnetic force acting on the wire is equal in magnitude and opposite in direction to the weight of the wire so that the wire is supported.



The wire is replaced with a second wire in the same orientation and position.

The second wire is made of the same material and has length $\frac{L}{2}$ and diameter $2d$.

What current is required to support the second wire?

[1 mark]

A $\frac{I}{2}$ ⬭

B I ⬭

C $2I$ ⬭

D $4I$ ⬭

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**