MR SULLY UNFOLDS PHYSICS ANSWERS

Electromagnetism and the motor effect

AQA 4.7.2
Magnetism · Paper 2
Foundation & Higher

Name Class Date

A current in a wire produces a magnetic field. In a magnetic field, a current-carrying wire feels a force: the **motor effect**.

KEY EQUATION

$$F = B I l \text{ (Higher)}$$

F = force (N)
B = magnetic flux density (tesla, T)
I = current (A)
l = length of wire in the field (m)
Fleming's left-hand rule: First finger = Field, seCond = Current, thuMb = Motion

Section A · Recall

Grade 4–5

1 Describe the magnetic field around a straight wire carrying a current. [2]

Circles centred on the wire;

stronger closer to the wire and with a bigger current.

2 Give three ways to make an electromagnet stronger. [3]

Increase the current.

Add more turns to the coil.

Add an iron core.

3 Describe the shape of the magnetic field inside a solenoid. [1]

Strong and uniform (parallel lines).

Section B · The motor effect

Grade 5–6 · Higher

4 A wire 0.2 m long carries a current of 3 A at right angles to a 0.5 T magnetic field. Calculate the force on the wire. [2]

F = BIl = 0.5 × 3 × 0.2

F = 0.3 N

5 State two ways to reverse the direction of the force on the wire. [2]

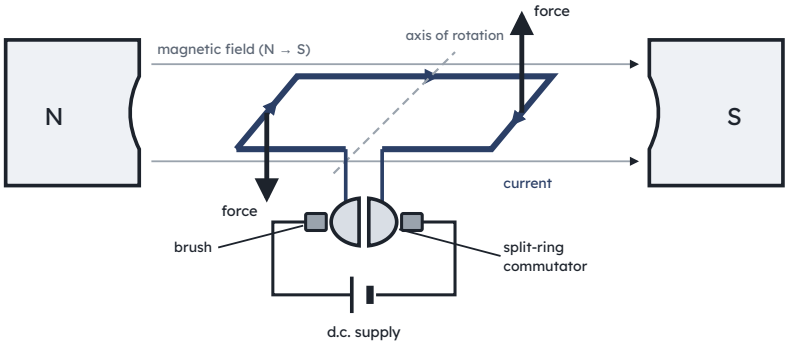
Reverse the direction of the current.

Reverse the direction of the magnetic field (swap the poles).

Section C · Stretch

Grade 7+

6 Explain how a simple electric motor works. [4]



A current flows through a coil in a magnetic field.

Each side of the coil feels a force (motor effect), in opposite directions,

so the coil turns.

A split-ring commutator reverses the current every half turn so it keeps turning the same way.

7 Explain how a loudspeaker produces sound. (Physics only) [3]

An alternating current flows in a coil in a magnetic field.

The coil feels a force that keeps changing direction (motor effect),

so the cone vibrates and makes pressure waves: sound.

Exam-style question

AQA style

8 An electric bell uses an electromagnet. (Physics only)

a Explain why an electromagnet, not a permanent magnet, is used. [1]

It can be switched on and off.

b Explain how the bell rings repeatedly when the switch is pressed. [4]

Current flows through the electromagnet, which attracts the iron armature.

The hammer hits the bell, and the moving armature breaks the circuit.

The electromagnet switches off and a spring pulls the armature back,

completing the circuit again, so it repeats.

Total: _____ / 22

How confident am I?

	Not yet	Nearly	Got it
I can describe the field around a wire and a solenoid	☐	☐	☐
I can use F = BIl (Higher)	☐	☐	☐
I can explain how motors and loudspeakers work	☐	☐	☐