

Motor Effect

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

State Fleming's left-hand rule and two ways to reverse the force on a wire in a magnetic field. (4 marks)

Step 1 · The rule

Hold the thumb, first finger and second finger of the left hand at right angles: first finger = field (N to S), second finger = current (+ to -), thumb = motion (force).

Step 2 · Reverse 1

Reverse the direction of the current.

Step 3 · Reverse 2

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

Answer: First finger = Field, seCond finger = Current, thuMb = Motion; reverse the current or the field

Check: Reversing both leaves the force in the same direction.

2. Now try one with the steps

A 0.50 m length of wire carrying 3.0 A is at right angles to a magnetic field of flux density 0.40 T. Calculate the force on the wire. (2 marks)

Step 1 · Equation (on the equation sheet)

Step 2 · Calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Describe the motor effect. [1]

2. State what each finger represents in Fleming's left-hand rule. [3]

3. Give two ways to reverse the direction of the force on a current-carrying wire in a magnetic field. [2]

4. Give two ways to increase the force on a current-carrying wire in a magnetic field. [2]

5. State the size of the force on a current-carrying wire that is parallel to the magnetic field. [1]

6. A magnetic field points from left to right and the current in a wire flows into the page. State the direction of the force on the wire. [1]

7. Explain why the coil of an electric motor rotates. [3]

8. Give two ways to make an electric motor turn faster. [2]

9. State the unit of magnetic flux density. [1]

10. Calculate the force on a 0.50 m wire carrying 3.0 A at right angles to a 0.40 T field, in newtons. [2]

11. Calculate the force on 0.050 m of wire carrying 2.0 A at right angles to a 0.15 T field. [2]

12. A 0.30 m wire in a 0.20 T field experiences a force of 0.12 N. Calculate the current in amperes. [3]

13. Explain the purpose of the split-ring commutator in a d.c. motor. [2]

14. Explain how a loudspeaker uses the motor effect to produce sound. [4]

4. Before you hand it in

Using the right hand for the motor effect

Fleming's LEFT-hand rule gives the force on a current in a field. (The right-hand grip rule gives the field around a wire.)

Using the whole wire length in $F = B I l$

l is the length of wire inside the magnetic field, at right angles to it.

"The commutator makes the current."

The split-ring commutator reverses the current in the coil every half turn.

Expecting a force when the wire is parallel to the field

The force is greatest at 90° and zero when the current is parallel to the field.