

# Electromagnetism

## Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Electricity and Magnetism
Topic	Electromagnetism
Booklet	Question Paper

**Time Allowed:** 60 minutes

**Score:** /50

**Percentage:** /100

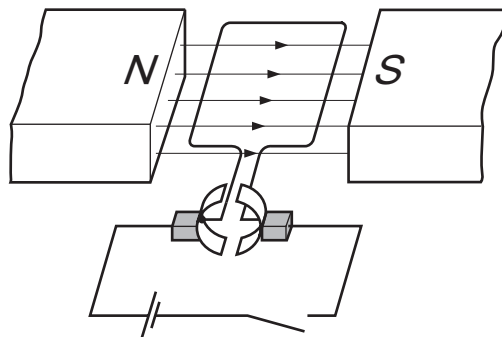
**Grade Boundaries:**

1 A split-ring commutator is used in a simple d.c. motor. It reverses the current in the coil.

How often does it reverse the current?

- A every quarter turn
- B every half turn
- C every full turn
- D every two turns

2 The diagram shows a simple d.c. motor.

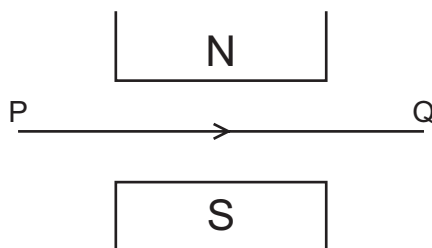


The switch is closed and the coil rotates.

Which change makes the coil rotate in the opposite direction **and** at a faster rate?

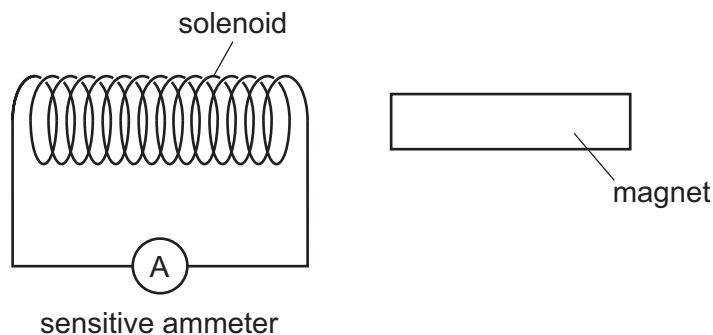
- A increase the current in the coil and increase the number of turns in the coil
- B reverse both the magnetic field and the current in the coil
- C reverse the magnetic field and decrease the current in the coil
- D reverse the magnetic field and increase the current in the coil

- 3 The diagram shows a wire PQ between the N-pole and the S-pole of a magnet. There is a current in the wire in the direction of the arrow.



What is the direction of the force on the wire PQ?

- A into the page
  - B out of the page
  - C towards the N-pole
  - D towards the S-pole
- 4 A magnet is placed near to a solenoid that is connected to a sensitive centre-zero ammeter.

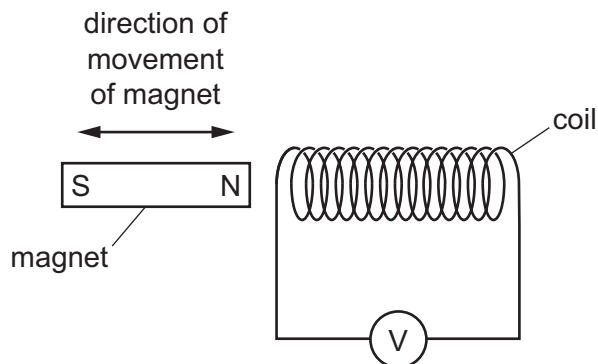


The magnet is pushed towards the solenoid. It accelerates, then moves at constant speed, then decelerates and stops inside the solenoid.

When is the reading on the ammeter zero?

- A when the magnet is accelerating
- B when the magnet is moving at constant speed
- C when the magnet is decelerating
- D when the magnet is stationary

- 5 A teacher moves a magnet into and out of a coil of wire, as shown, in order to demonstrate electromagnetic induction.



Which statement is correct?

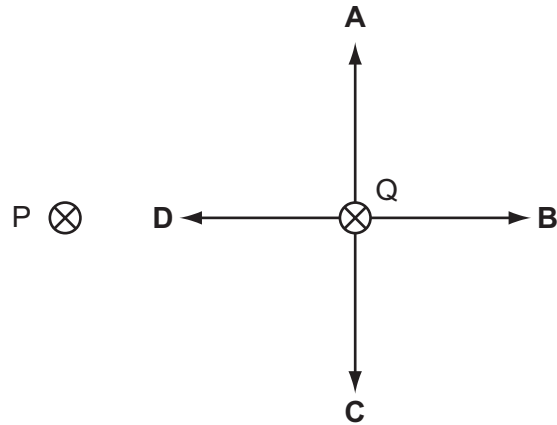
- A** As the magnet is moved into the coil the left-hand end of the coil becomes a S-pole.
  - B** As the magnet is taken out of the coil the left-hand end of the coil becomes a N-pole.
  - C** Increasing the speed at which the magnet enters the coil, increases the induced voltage.
  - D** Increasing the speed at which the magnet leaves the coil decreases the induced voltage.
- 6 A transformer consists of two coils which are wound on to a metallic core.

Which type of voltage is supplied to the transformer and which metal is used to make the core?

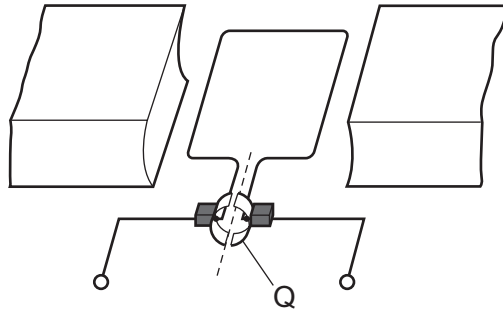
	supply voltage	metal
<b>A</b>	alternating	iron
<b>B</b>	alternating	steel
<b>C</b>	direct	iron
<b>D</b>	direct	steel

- 7 P and Q represent two, parallel, straight wires carrying currents into the plane of the paper. P and Q exert a force on each other.

Which arrow shows the force on Q?



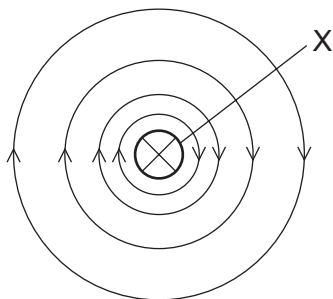
- 8 The diagram shows a simple d.c. motor.



What is the part labelled Q?

- A a coil
- B a commutator
- C a magnet
- D a slip ring

9 The diagram shows the magnetic field around wire X which carries a current into the paper.

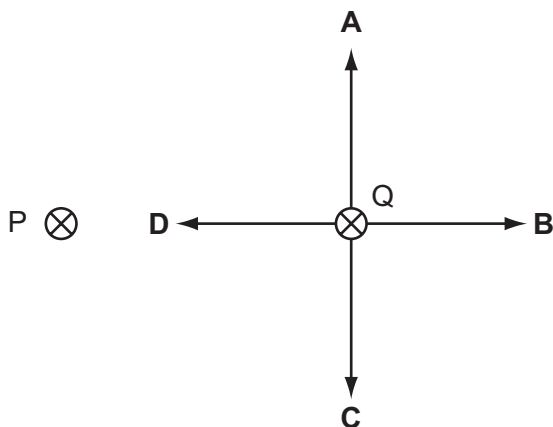


The arrows on the field lines show the direction of the force on

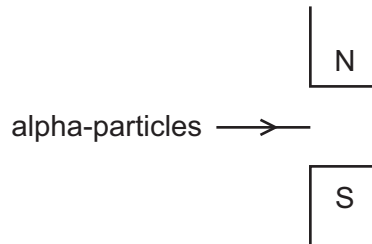
- A a N-pole.
- B a S-pole.
- C a small negative charge.
- D a small positive charge.

10 P and Q represent two, parallel, straight wires carrying currents into the plane of the paper. P and Q exert a force on each other.

Which arrow shows the force on Q?

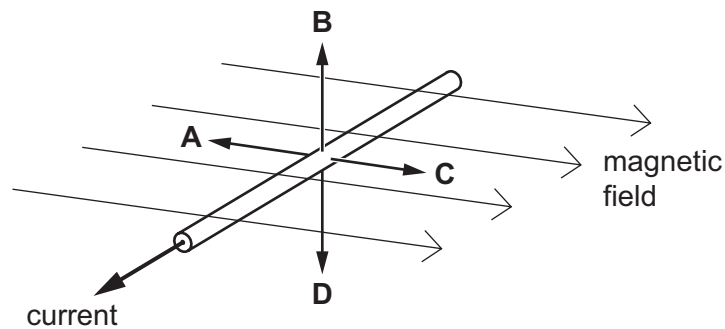


11 A beam of alpha-particles enters the magnetic field between the poles of a magnet.



In which direction is the magnetic force on the beam?

- A down the page
  - B into the page
  - C out of the page
  - D up the page
- 12 Which device uses the force experienced by a current in a magnetic field when in normal use?
- A cathode-ray oscilloscope
  - B electrostatic precipitator
  - C loudspeaker
  - D transformer
- 13 The diagram shows a current-carrying wire in a horizontal magnetic field.



Which arrow shows the direction of the force experienced by the wire?

14 Two long, parallel conductors carrying current lie in a horizontal plane.

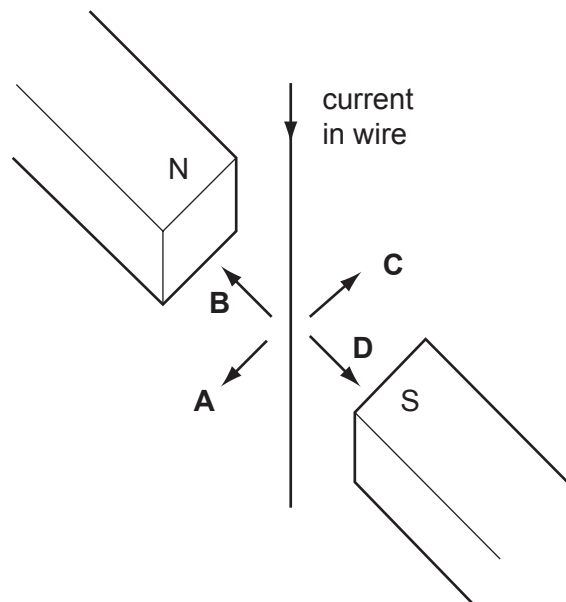
The two conductors attract one another.

The two currents **must**

- A be in the same direction.
- B be in opposite directions.
- C be parallel to the Earth's magnetic field.
- D be at  $90^\circ$  to the Earth's magnetic field.

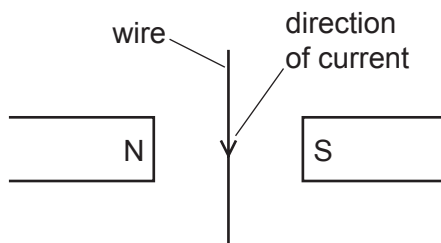
15 A wire hangs between the poles of a magnet.

When there is a current in the wire, in which direction does the wire move?





16 A current-carrying wire lies between the poles of two magnets, as shown.

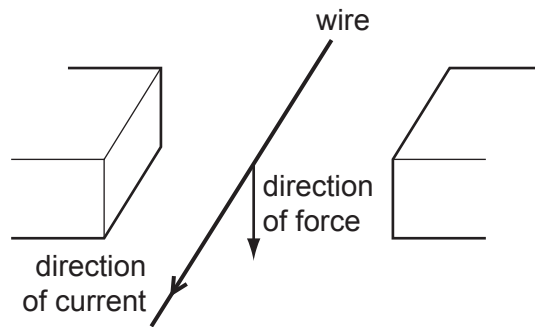


What is the direction of the force on the wire?

- A** into the plane of the paper
- B** out of the plane of the paper
- C** towards the N-pole
- D** towards the S-pole

17 The diagram shows a wire placed between two magnetic poles of equal strength.

A current passes through the wire in the direction shown. The current causes a downward force on the wire.



What is the arrangement of the magnetic poles?

- A
- B
- C
- D

- 18 Two straight electrical conductors are parallel to one another. Each carries a current, one into the plane of the paper and one out of the plane of the paper.

Which diagram shows the magnetic field around the two wires?

**A**

**B**

**C**

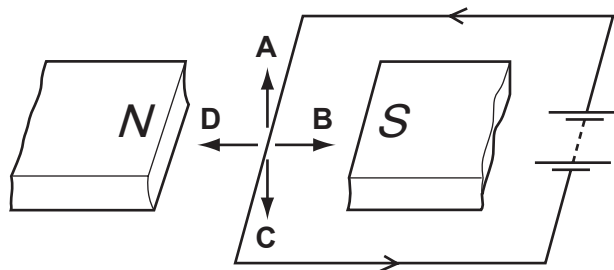
**D**

key

- current into plane of paper
- current out of plane of paper

- 19 A current-carrying wire is placed between the poles of a magnet.

What is the direction of the force on the wire due to the current?



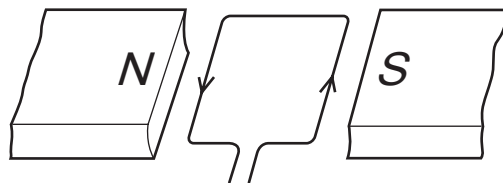


- 22 The diagram shows a beam of electrons entering a magnetic field. The direction of the field is into the page.



In which direction are the electrons deflected?

- A into the page
  - B out of the page
  - C towards the bottom of the page
  - D towards the top of the page
- 23 A rectangular coil is placed between the poles of a magnet. A current passes through the coil, as shown.

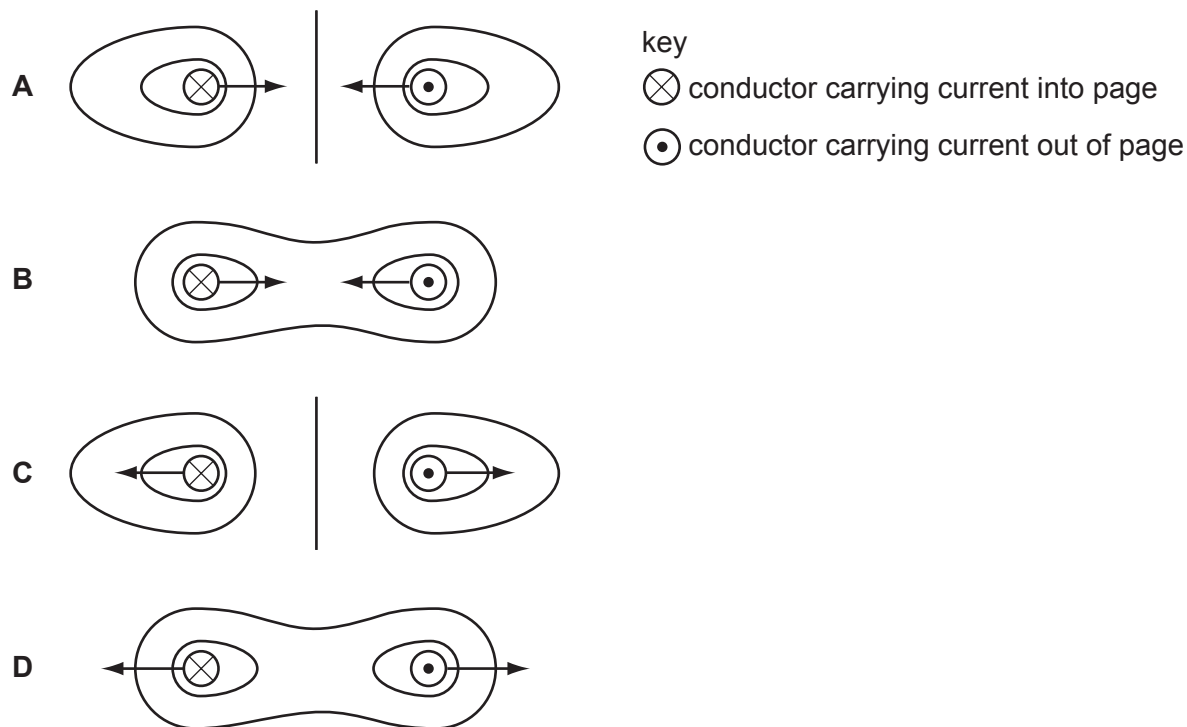


What happens to the coil?

- A It moves downwards.
- B It moves upwards.
- C It rotates anticlockwise.
- D It rotates clockwise.

24 Each of the diagrams shows a cross-section through two parallel, current-carrying conductors.

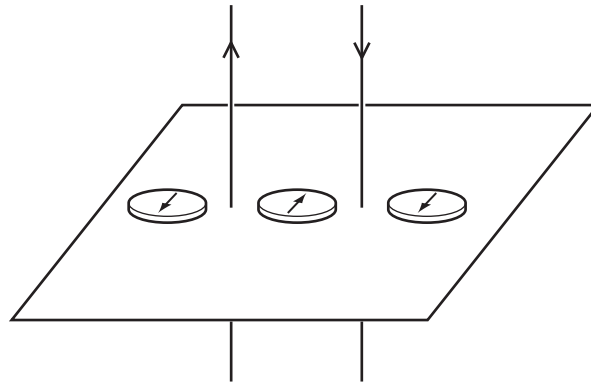
Which diagram shows the shape of the magnetic field pattern **and** the directions of the forces on the two conductors?



25 Which single-coil motor has the largest turning effect?

	current in coil / A	number of turns in coil	iron core
<b>A</b>	6	100	no
<b>B</b>	10	200	no
<b>C</b>	6	100	yes
<b>D</b>	10	200	yes

- 26 Two parallel wires carry currents in opposite directions. Three plotting compasses are placed in the positions shown.



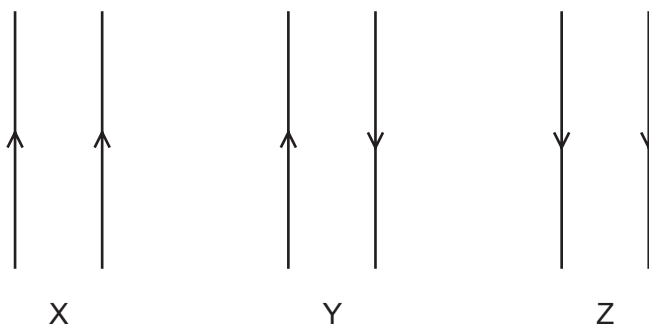
The currents in **both** wires are reversed. How many compass needles change direction?  
(Ignore the effect of the Earth's magnetic field.)

- A** 0                      **B** 1                      **C** 2                      **D** 3

- 27 Which single-coil motor has the largest turning effect?

	current in coil / A	number of turns in coil	iron core
<b>A</b>	6	100	no
<b>B</b>	10	200	no
<b>C</b>	6	100	yes
<b>D</b>	10	200	yes

28 The diagram shows three pairs of parallel wires with the currents in the directions shown.



For each pair of wires, what are the forces between the wires?

	X	Y	Z
A	attraction	none	repulsion
B	attraction	repulsion	attraction
C	repulsion	attraction	repulsion
D	repulsion	repulsion	repulsion

29 The coil in an electric motor is wound onto a cylinder.

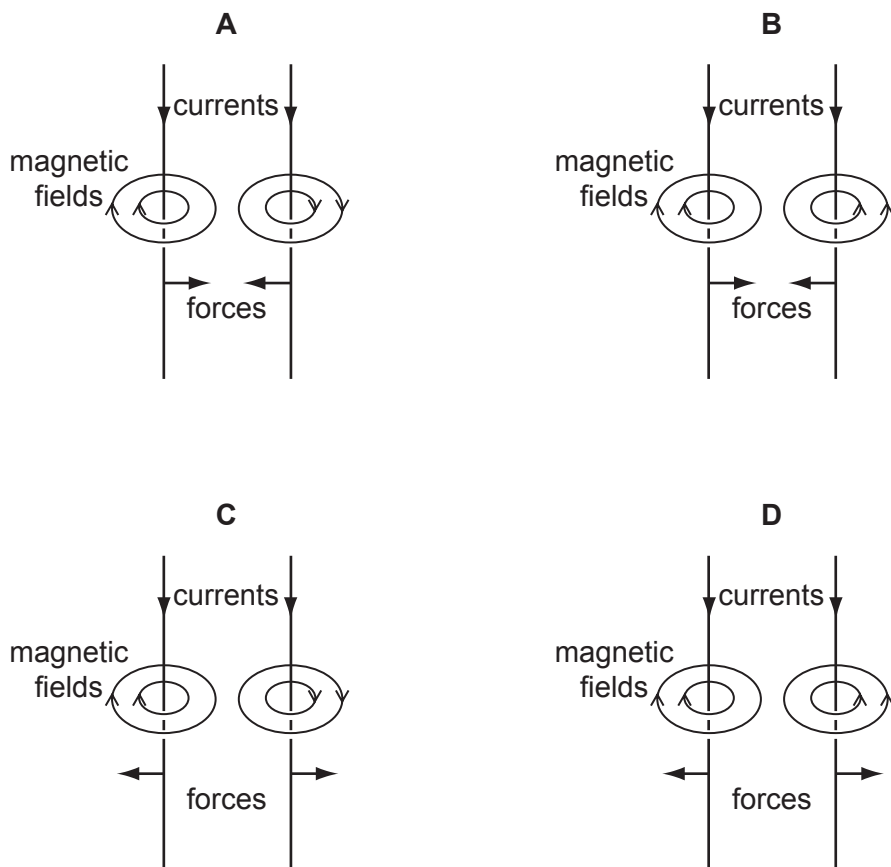
Why is the cylinder made of soft iron?

- A to deflect the magnetic field away from the coil
- B to increase the current through the coil
- C to increase the strength of the magnetic field through the coil
- D to support the coil and prevent it from collapsing



30 Two parallel wires carry currents in the same direction.

Which diagram shows the magnetic field around each wire and the direction of the force on each wire?

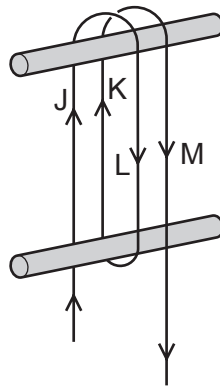


31 One component of a simple d.c. motor is a split-ring commutator.

Which metal is used to make the commutator, and why is this metal chosen?

	metal	reason
<b>A</b>	copper	it is a good conductor of electricity
<b>B</b>	copper	it is a good conductor of heat
<b>C</b>	iron	it increases the magnetic field strength
<b>D</b>	iron	it is attracted to the brushes

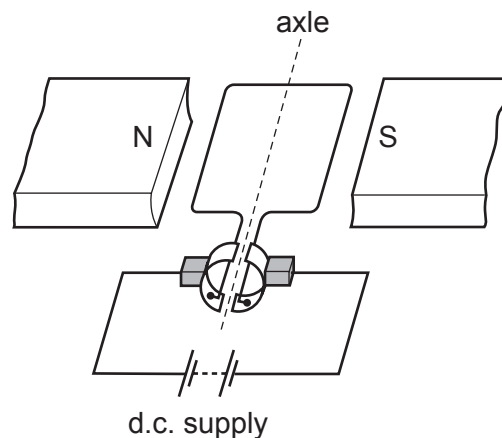
- 32 A long flexible wire is wrapped round two wooden pegs. A large current is passed in the direction shown.



Which two pairs of lengths of wire attract each other?

	first pair	second pair
<b>A</b>	J and K	K and M
<b>B</b>	J and K	L and M
<b>C</b>	J and L	K and M
<b>D</b>	J and L	L and M

- 33 The diagram shows a d.c. motor.



Why is a split-ring commutator used?

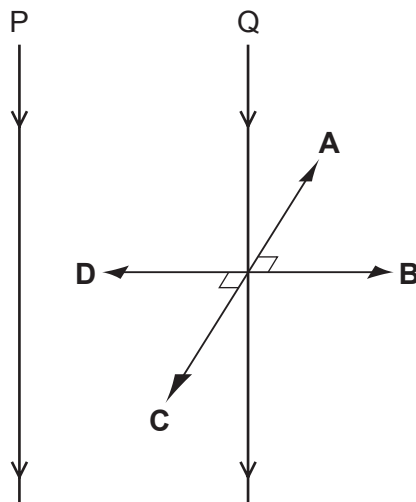
- A** to change the current direction in the coil as the coil passes the horizontal position
- B** to change the current direction in the coil as the coil passes the vertical position
- C** to change the current direction in the d.c. supply as the coil passes the horizontal position
- D** to change the current direction in the d.c. supply as the coil passes the vertical position

34 What does **not** alter the size of the turning effect on the coil of an electric motor?

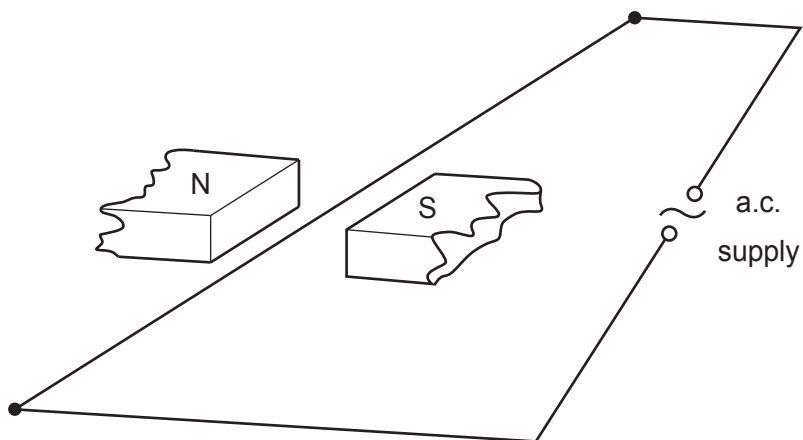
- A the direction of the current in the coil
- B the number of turns in the coil
- C the size of the current in the coil
- D the strength of the magnetic field

35 Two parallel vertical wires P and Q are a small distance apart in air. There is a downwards electric current in both wires. A force acts on Q owing to the current in P. This force is perpendicular to the wire Q.

What is the direction of the force on Q?



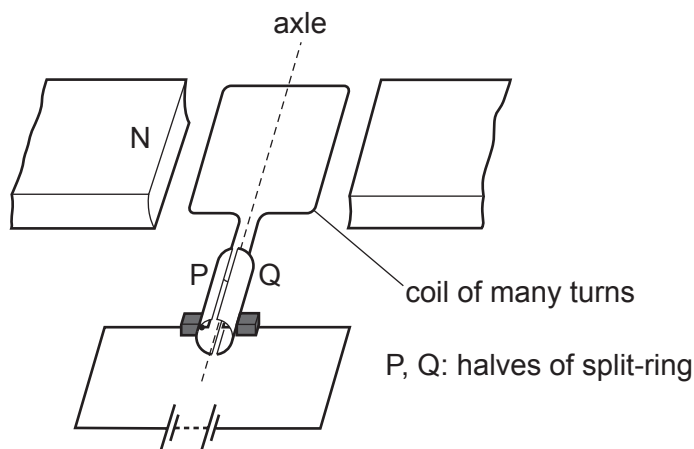
36 An a.c. supply is connected to a wire stretched between the poles of a magnet.



Which way will the wire move?

- A left and right
- B right only
- C up and down
- D up only

37 A d.c. motor consists of a coil of many turns rotating in a fixed magnetic field. The coil is connected to a d.c. supply through a split-ring commutator.



Some changes are made, one at a time.

- The d.c. supply is reversed.
- The coil is turned before switching on, so that P starts on the right and Q on the left.
- The poles of the magnet are reversed.
- The turns on the coil are increased in number.

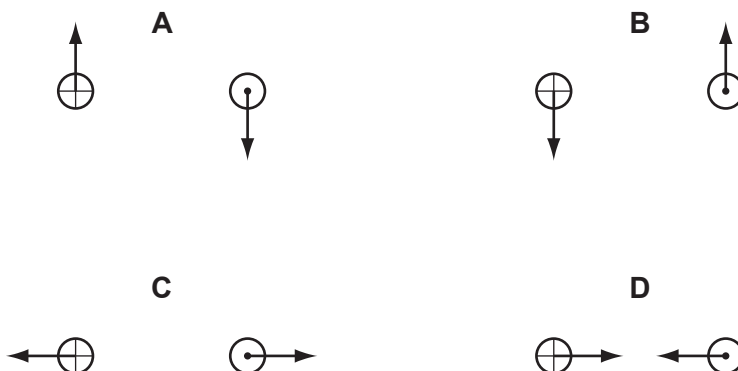
How many of these changes make the coil rotate in the opposite direction?

- A** 1                      **B** 2                      **C** 3                      **D** 4

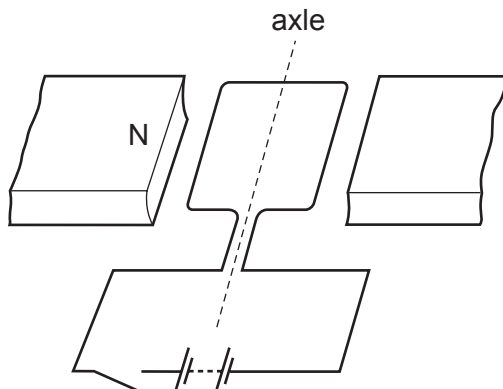
38 Each diagram shows a cross-section through two parallel conductors, each carrying an electric current.

In the conductor on the left, the current is into the page; on the right, it is out of the page.

Which diagram shows the directions of the forces on the two conductors?



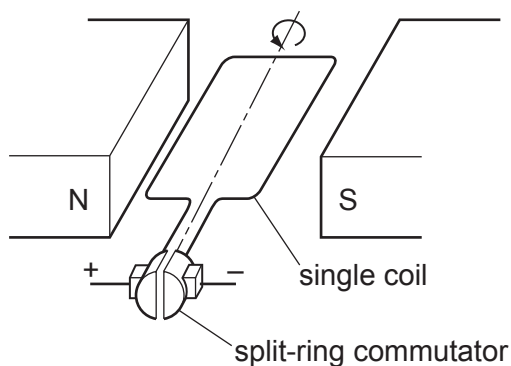
- 39 A simple model of a d.c. motor is made. By mistake, the split-ring commutator is left out. The coil can turn, but is always connected to the battery in the same way.



The coil starts in the horizontal position.

What happens to the coil when the circuit is switched on?

- A It does not move at all.
  - B It moves upwards, out of the magnetic field.
  - C It turns to the vertical position and eventually stops there.
  - D It turns to the vertical position then comes back to the horizontal position.
- 40 The diagram shows a simple electric motor.



The split-ring commutator reverses the current in the coil as the coil rotates.

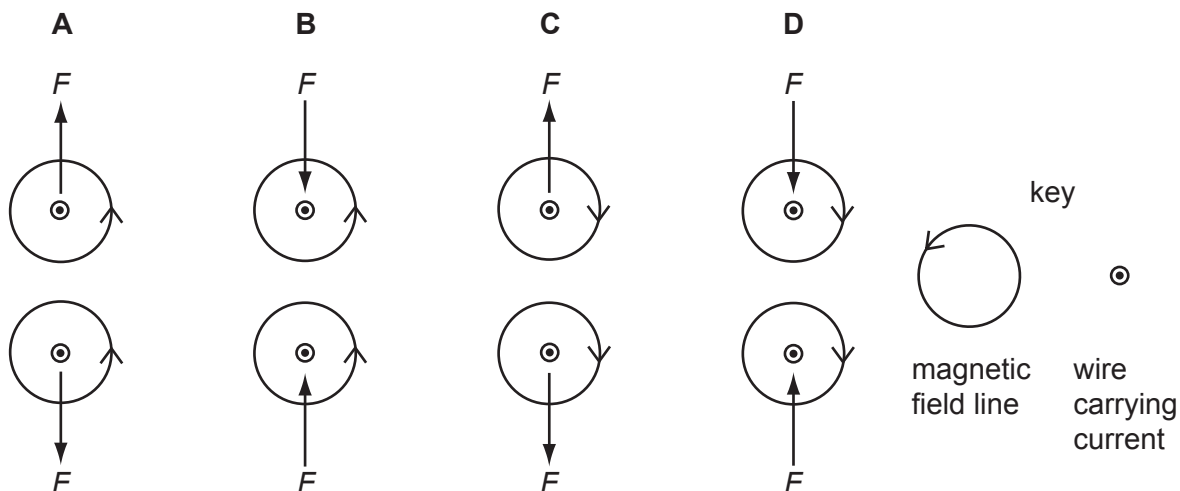
The coil is rotated  $360^\circ$  from the position shown.

How many times is the current in the coil reversed?

- A 1
- B 2
- C 3
- D 4

41 The diagrams show the forces  $F$  between two wires carrying currents out of the page. The magnetic fields close to the wires are also shown.

Which diagram is correct?



42 In a d.c. motor, the coil is wound on a soft iron cylinder.

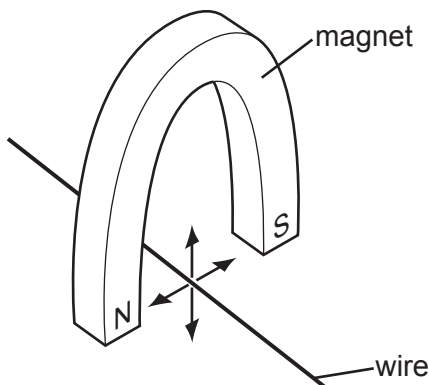
Why is soft iron used?

- A** to increase the strength of the magnetic field
- B** to increase the weight of the coil
- C** to insulate the coil from the magnet
- D** to prevent the coil from spinning too quickly

43 Which single-coil motor will have the largest turning effect?

	current in coil	number of turns in coil	iron core
<b>A</b>	6A	100	no
<b>B</b>	10A	200	no
<b>C</b>	6A	100	yes
<b>D</b>	10A	200	yes

44 A copper wire is held between the poles of a magnet.



The current in the wire can be reversed. The poles of the magnet can also be changed over.

In how many of the four directions shown can the force act on the wire?

- A** 1                      **B** 2                      **C** 3                      **D** 4

45 **X** and **Y** are wires carrying electric currents at right angles to the page. **P**, **Q** and **R** are plotting compasses. Any effect of the Earth’s magnetic field has been ignored.

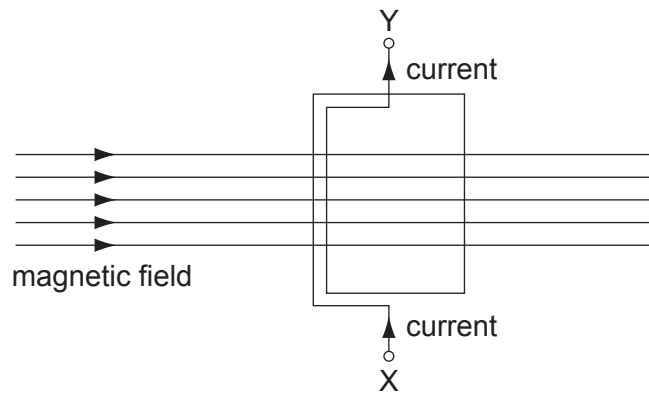


What is true about the direction and size of the currents?

	direction of currents	size of currents
<b>A</b>	same	larger in <b>X</b> than in <b>Y</b>
<b>B</b>	same	smaller in <b>X</b> than in <b>Y</b>
<b>C</b>	different	larger in <b>X</b> than in <b>Y</b>
<b>D</b>	different	smaller in <b>X</b> than in <b>Y</b>



- 46 A coil, carrying a current, is arranged within a magnetic field. The coil experiences forces that can make it move.



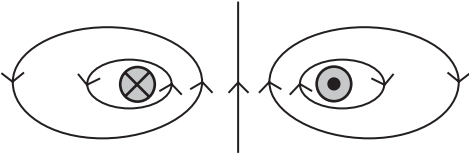
In which direction does the coil move?

- A along the magnetic field
- B from X to Y
- C out of the paper
- D turns about the axis XY


47 Each of the diagrams below is a cross-section through two parallel current-carrying conductors.

Which diagram correctly shows the magnetic field pattern formed by the currents in the two conductors?

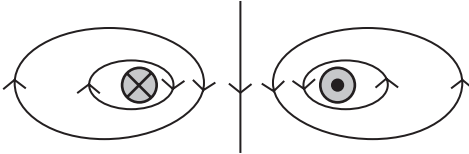
**A**




**B**



**C**



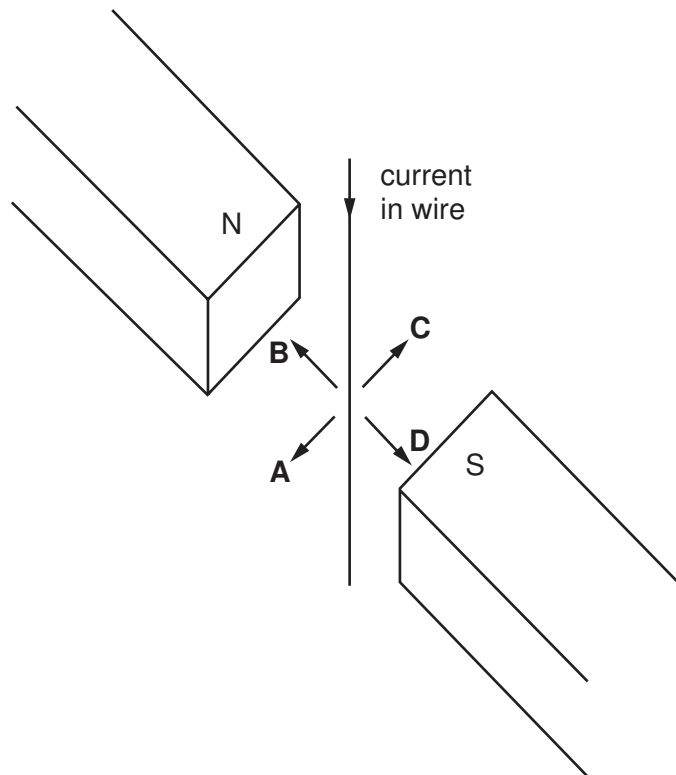
**D**



⊗ current into plane of diagram  
⊙ current out of plane of diagram

48 A wire hangs between the poles of a magnet.

When there is a current in the wire, in which direction does the wire move?



49 What is the part of a simple d.c. motor that reverses the direction of current through the coil every half-cycle?

- A the armature
- B the brushes
- C the commutator
- D the slip rings

50 Which of the following has **no** effect on the size of the turning effect on the coil of an electric motor?

- A the size of the current in the coil
- B the direction of the current in the coil
- C the number of turns in the coil
- D the strength of the magnetic field