

Magnets and Magnetic Fields

Q1.a(2018)

Fleming's left-hand rule is used to show the direction of the force produced when a current flows in a magnetic field.

Explain how.

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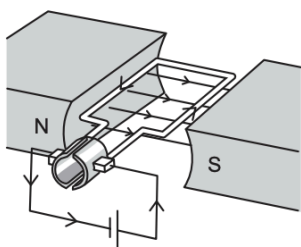
.....

.....

..... [3]

Q1.b(2018)

A simple motor is shown in the diagram.



Use the diagram to explain how rotation is caused in the motor.

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.....

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..... [3]

Q1.c(2018)

Calculate the magnetic flux density on a 0.5 m long conductor when a current of 0.8 A flows.

The force produced is 0.6 N.

Answer = T [3]

Q2.a(2019)

A student wraps a coil of insulated wire around a soft iron rod to make an electromagnet. He places some steel pins on a wooden mat under the iron rod. Fig. 13.1 shows the set-up of the apparatus.

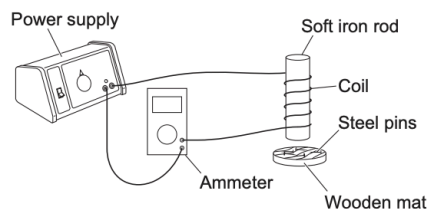


Fig. 13.1

He changes the number of turns in the coil. He records how many pins are picked up by the iron rod. The table shows his results.

Number of turns in coil	Current (A)	Number of pins
10	0.50	1
20	0.50	2
30	0.25	2
40	0.25	2
50	0.50	4

- (i) The student concludes 'The more turns, the stronger the magnetic field'.

Do the results in the table support his conclusion?

Explain your answer.

.....

..... [1]

Q2.b(2019)

The electromagnets with 20 and 40 turns pick up the same number of pins.

Suggest why the electromagnet with 40 turns is more useful.

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..... [1]

Q3.a(2019)

Fig. 13.2 shows the inside of a simple d.c. motor. The direction of the current in the coil is shown.

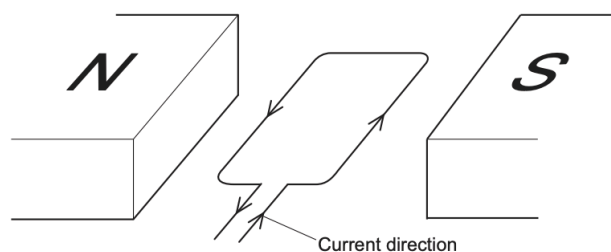


Fig. 13.2

- (i) Which direction will the coil rotate in Fig. 13.2?

State the name of the rule you used to work out your answer.

Direction

Name of rule [1]

Q3.b(2019)

Fig. 13.3 shows the simple d.c. motor from above.

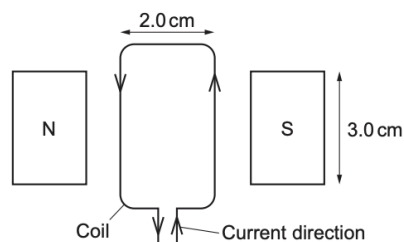


Fig. 13.3

In Fig. 13.3 the magnetic field between the poles is uniform. The magnetic flux density between the poles is 0.08 T. The current in the coil is 0.50 A.

Calculate the maximum magnetic force on **one** side of the coil.

Use the values in the diagram to help you.

Maximum magnetic force = N [4]

Q4.(2020)

This question is about magnetic fields.

(a) Fig. 11.1 is a diagram of the magnetic field around a bar magnet.

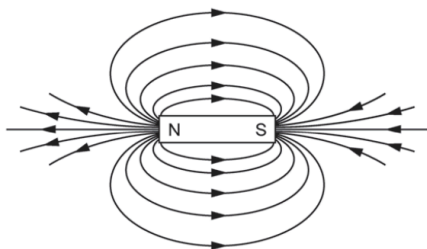


Fig. 11.1

The field lines give information about magnetic forces.

State **two** pieces of information Fig. 11.1 gives you.

1

.....

2

.....

[2]

Q5.(2020)

A student has a permanent magnet and three metal blocks marked **A**, **B** and **C**, as shown in Fig. 11.2.



Fig. 11.2

- One block is a permanent magnet.
- One block is a piece of copper.
- One block is a piece of iron.

Explain how the student can use the permanent magnet to identify block **A**, **B** and **C**.

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..... [3]

Q6.a(2020)

Fig. 11.3 is a picture of a dipping compass.

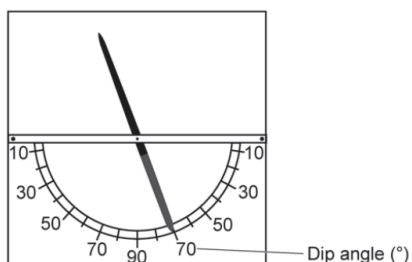


Fig. 11.3

The dip angle can be measured at different distances from the Earth's North pole.

The graph in Fig. 11.4 shows how the dip angle varies with distance from the Earth's North pole.

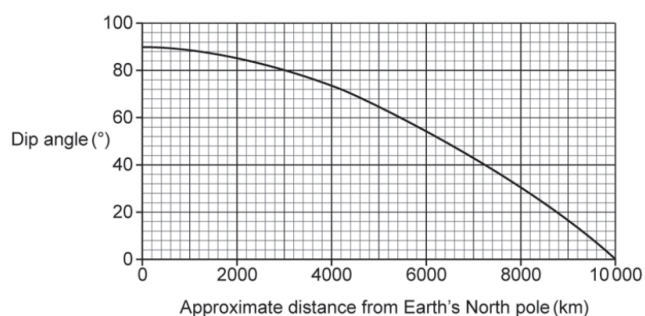


Fig. 11.4

(i) Describe the relationship shown in the graph in Fig. 11.4.

.....

 [2]

Q6.b(2020)

London is approximately 4200 km from the North pole.

Use the graph in Fig. 11.4 to estimate the dip angle in London.

Dip angle =° [1]

Q6.c(2020)

The actual value of the dip angle in London is 66°, with an uncertainty of $\pm 3^\circ$.

Is the value you obtained in part (c)(ii) accurate? Explain your answer.

.....
 [1]

Q6.d(2020)

The dipping compass gives important information about the Earth.

Describe what the dipping compass tells us about the Earth.

.....
..... [1]

Q7.(2020)

The graph in Fig. 11.5 shows how the magnetic field strength around a straight wire decreases with distance from the wire.

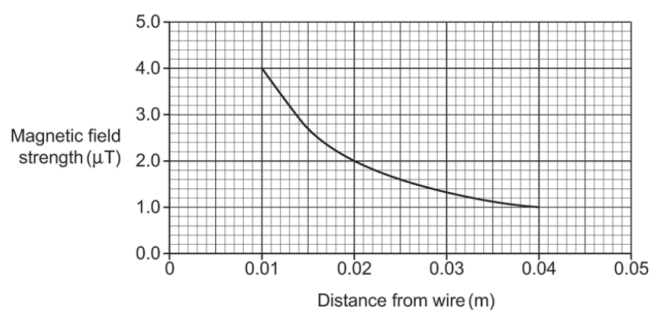


Fig. 11.5

Two students are discussing the graph in Fig. 11.5. This is what they say:

Student X: 'As distance doubles, field strength is multiplied by 0.25.'

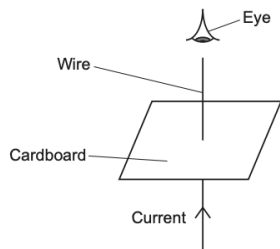
Student Y: 'As distance doubles, field strength is multiplied by 0.75.'

Use the graph in Fig. 11.5 to evaluate each statement.

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..... [2]

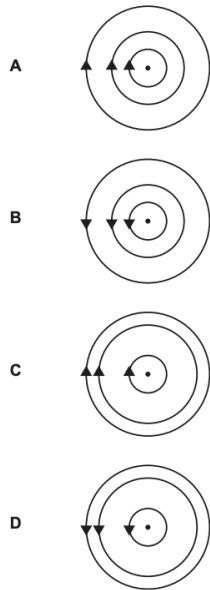
Q8.(2021)

A magnetic field is produced around a current-carrying wire.



A student views the magnetic field from above, as shown by the eye in the diagram.

Which diagram shows the magnetic field around the wire?



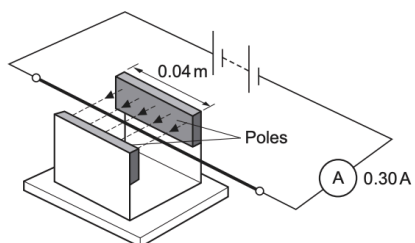
Your answer

☐

[1]

Q9.(2021)

A current-carrying wire is placed in a magnetic field.



The magnetic flux density between the poles is 0.08 T.

Calculate the force acting on the wire.

Use values from the diagram and an equation from the Data Sheet to help you.

- A $9.6 \times 10^{-5} \text{ N}$
- B $9.6 \times 10^{-4} \text{ N}$
- C $9.6 \times 10^{-3} \text{ N}$
- D $9.6 \times 10^{-2} \text{ N}$

Your answer

[1]

Q10.(2022)

A compass needle is made of a magnet containing a north pole and a south pole.
The N pole of the compass needle points north on Earth.

Which row in the table describes the magnetic field of the Earth?

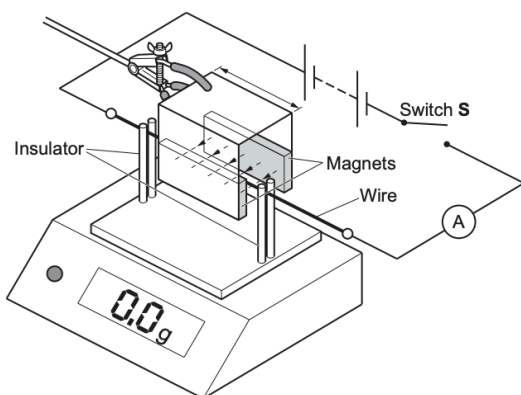
	Type of magnetic pole near to the Earth's geographic north pole	Direction of magnetic field
A	N	N to S
B	N	S to N
C	S	N to S
D	S	S to N

Your answer

[1]

Q11.a(2022)

The diagram shows a wire placed in a magnetic field.



The electronic balance is used to work out the force acting on the wire.

- (a) When Switch **S** is open, the electronic balance reading is 0.0g.
Explain why.

.....
..... [1]

Q11.b(2022)

When Switch **S** is closed, the electronic balance has a positive reading of 0.3g.

- (i) Explain why the balance shows a reading when Switch **S** is closed.

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.....
..... [3]

Q11.c(2022)

State the reading on the balance if the polarity of the battery is reversed.

Answer = g [1]

Q11.d(2022)

The polarity of the battery is unchanged from **(b)(i)**.

State the reading on the balance if the poles of the magnet are reversed.

Answer = g [1]

Q11.e(2022)

The experiment is repeated.

- When Switch **S** is closed the force on the wire is 0.004 N.
- The ammeter reads 0.8A.
- The length of the wire in the magnetic field is 0.05 m.

Calculate the magnetic flux density around the wire.
Use the Data Sheet.

Magnetic flux density = T [3]

Q11.f(2022)

A student investigates if the current in the wire changes the force on the wire.

Answer the questions to describe how the student can do this investigation.

(i) What does the student **vary**?

..... [1]

Q11.g(2022)

What does the student **control**?

..... [1]

Q12.(2023)

Two magnets, **X** and **Y**, are placed next to each other.

S **N**

Magnet **X**

N **S**

Magnet **Y**

Which row is correct?

	Magnet X produces a force on Magnet Y	Magnet Y produces a force on Magnet X
A	no	no
B	yes	no
C	no	yes
D	yes	yes

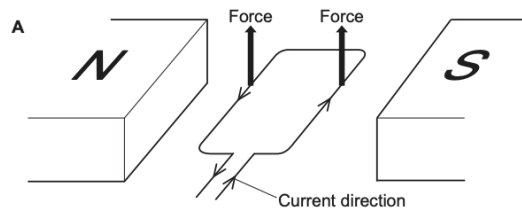
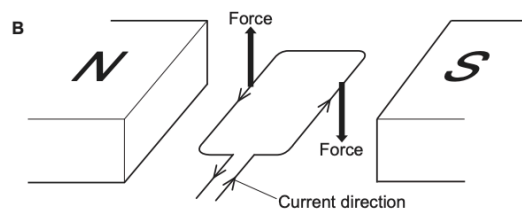
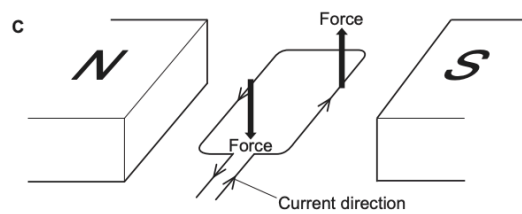
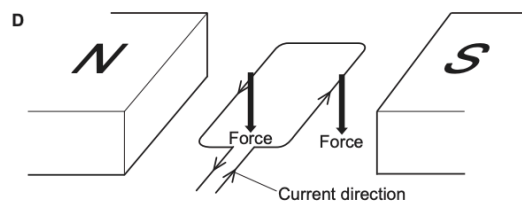
Your answer

☐

[1]

Q13.(2023)

Which diagram explains how a simple d.c. electric motor spins?



Your answer ☐

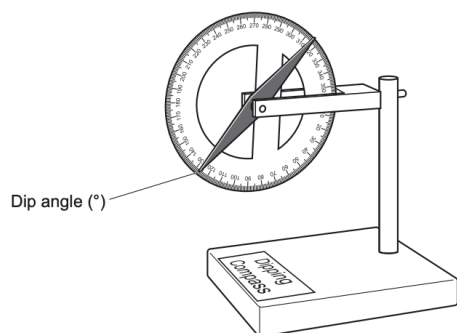
[1]

Q14.(2024)

This question is about magnetism.

Fig. 15.1 shows a dipping compass.

Fig. 15.1



In some places, a dipping compass shows a dip angle of 90° .

Where could the dipping compass be on Earth?

Tick (✓) **two** boxes.

- At the equator
- At the North geographic pole
- At the North magnetic pole
- At the South magnetic pole
- In the United Kingdom

☐
☐
☐
☐
☐

[1]

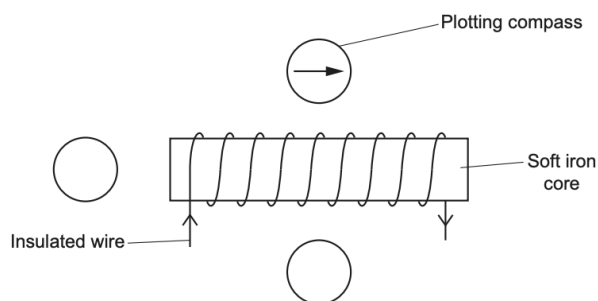
Q15.a(2024)

A student uses a coil of insulated wire to construct an electromagnet.

The student uses plotting compasses to show the magnetic field around the electromagnet.

Fig. 15.2 shows a diagram of the electromagnet. The circles show the position of three plotting compasses when the electromagnet is switched on.

Fig. 15.2



Complete **Fig. 15.2** by drawing arrows on the plotting compasses to show the direction they point.

One is already drawn for you.

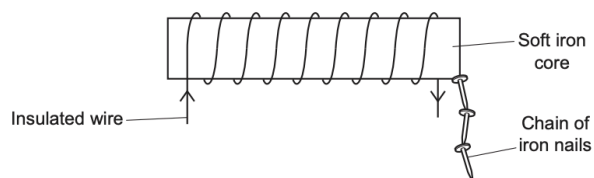
[2]

Q15.b(2024)

The student uses the electromagnet to pick up some iron nails.

Fig. 15.3 shows what happens when the electromagnet is switched on.

Fig. 15.3



Explain why a chain of iron nails is attracted to the electromagnet.

You can label Fig. 15.3 to help explain your answer.

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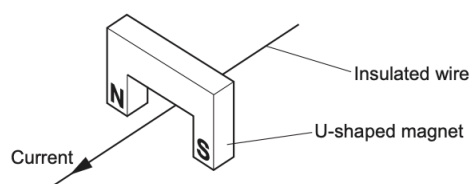
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..... [2]

Q15.c(2024)

The student then places some insulated wire in a straight line between the poles of a U-shaped magnet as shown in Fig. 15.4.

Fig. 15.4



Explain what happens when a current passes through the insulated wire.

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..... [2]

Q15.d(2024)

The magnetic flux density between the poles of the U-shaped magnet is 0.12 T.
The length of wire that lies between the poles is 0.04 m.

Calculate the force on this length of wire when a current of 0.25 A flows through it.

Use the Equation Sheet.

Give your answer in mN.

Force = mN [3]

