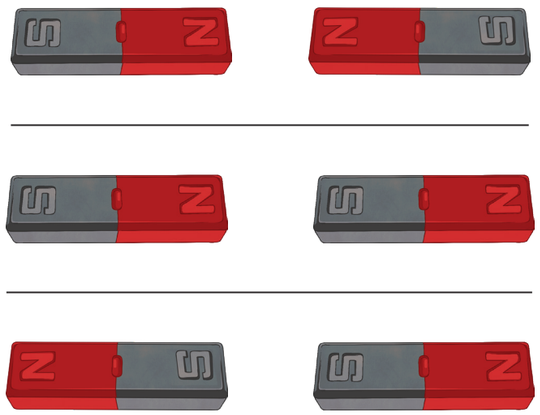
a

Complete the gap fill:

Magnetic force is a type of _____ force and it is strongest at the _____ of the magnet. There are two types of magnetic pole: a _____ and a _____.

b

Write what would happen between the poles in each of the magnetic interactions below:



_____

_____

_____

c

Define the term 'magnetic field':

_____

_____

_____

d

State the factor that affects the strength of the magnetic field:

_____

_____

_____

e

Draw the magnetic field lines on the bar magnet below. Remember lines always start at the _____ and point towards the _____.

f

List four magnetic materials:

1. _____
2. _____
3. _____
4. _____

g

Describe the difference between a permanent magnet and an induced magnet.

_____

_____

_____

_____

_____

_____

_____

_____

h

Explain how a plotting compass could be used to investigate the magnetic field around a magnet.

_____

_____

_____

_____

_____

_____

_____

_____

i

In which direction do compass needles always align? Why?

_____

_____

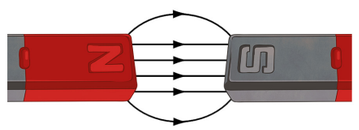
_____

_____

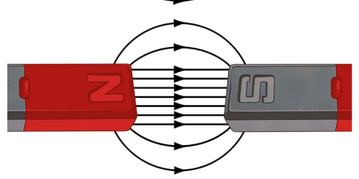
j

Which of these magnets will exert a stronger force on a magnetic material?

A.



B.



Explain your answer.

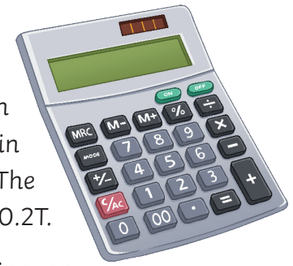
_____

_____

k

You are given the following equation in your exam:

force = magnetic flux density × current × length



A wire with a current of 4.0A is placed between two bar magnets (each has a width of 12mm) in a state of attraction. The magnetic flux density is 0.2T.

Calculate the force acting on the wire.

Note: in other calculations, you may be required to rearrange the formula.

l

When a current flows through a conducting wire, a magnetic field is produced around the wire.

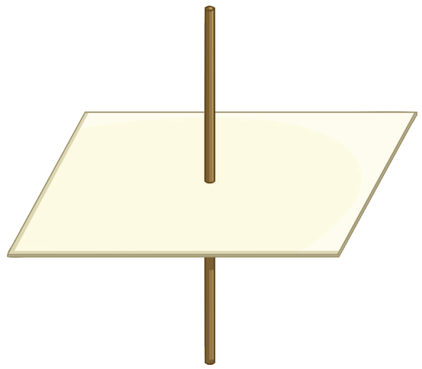
State two factors the strength of the magnetic field depends on:

1. _____
2. _____

a

A long, straight conducting wire is placed vertically so that it passes through a horizontal piece of board.

Iron filings are sprinkled onto the board. Draw the pattern they would form:



b

State the piece of equipment you could use to investigate the magnetic field you have drawn above.

_____

c

State the method that informs you of the direction of the current in a straight wire.

_____

What do your thumb and fingers represent in this method?

thumb:

_____

fingers:

_____

d

Describe how you would use the piece of equipment previously stated to investigate the magnetic field you have drawn.

_____

_____

_____

_____

_____

_____

_____

e

What is a solenoid?

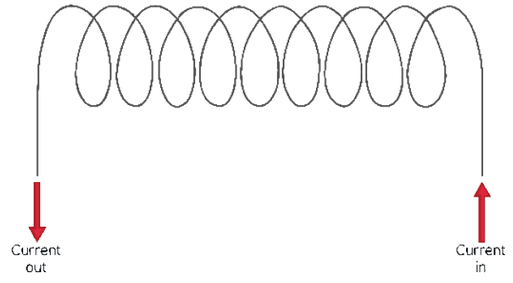
_____

_____

_____

f

Draw the magnetic field pattern around a solenoid below:



What is this pattern similar to?

_____

_____

g

How can you find the north pole of a solenoid?

_____

_____

_____

_____

_____

_____

_____

_____

h

List four ways in which you can make the magnetic field around a solenoid/ electromagnet stronger:

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

i

Describe what happens to the magnetic field around a straight wire when the current is reversed.

_____

_____

_____

j

What is the motor effect?

_____

_____

_____

_____

k

State three ways you can increase the force:

1. _____

_____

2. _____

_____

3. _____

_____

l

How can you reverse the direction of the force?

_____

_____

_____

m

A motor has a magnetic flux density of 1.5T and a current of 8A.

The total length of the wire is 500cm.

Calculate the force on the wire using the equation F = BIL.

a

You are given the following equation in your exam.

force = magnetic flux density × current × length

Complete the table:

Symbol Part of the Equation	What It Represents	Units
	force	
B		
		A
L		

b

What is the basis of an electric motor?

c

How can the direction of a motor be reversed?

d

How can the speed of a motor be increased?

e

What rule can be used to find the direction of the force?

What angle do your thumb, first and second finger need to be at? _____

What does each part represent?

thumb: _____

first finger: _____

second finger: _____

f

Describe how you would use an iron nail, a length of insulated wire and a cell to make an electromagnet that can be used to pick up some steel paper clips.

g

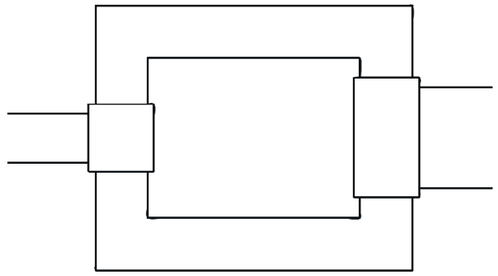
Why will a motor not work without a commutator?

h

Describe a simple electric motor.

i

A step-down transformer has three main parts inside of it. Briefly describe each of the three main parts (4 marks).

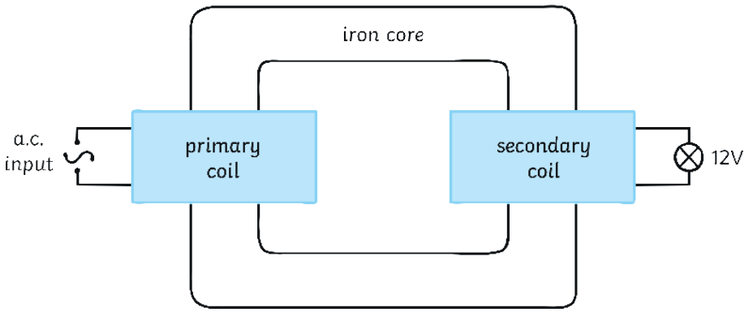


j

In terms of magnetic fields, explain how a transformer works (4 marks

a

The illustration below shows a transformer that is used to light a 12V lamp.



The lamp is very dim when the power is switched on.

Suggest one way to increase the voltage at the lamp without changing the power supply.

b

A transformer has 75 turns on its primary coil. Across the primary coil there is a potential difference of 230 volts and across the secondary coil, there is a potential difference of 32 200 volts.

$$\frac{\text{p.d.across primary}}{\text{p.d.across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

Use the equation to help you calculate the number of turns on the secondary coil.

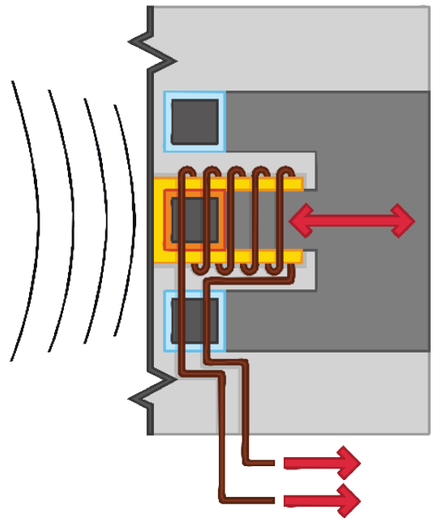
c

A step-down transformer converts 12 500V into 230V. The power output is used to run a 3000W hairdryer. Calculate the current flowing in the primary coil.

potential difference across primary coil (V_p) × current in primary coil (I_p) = potential difference across secondary coil (V_s)× current in secondary coil (I_s)

d

Explain how a moving-coil microphone converts sound waves into electrical signals.



e

How can the size of an induced voltage be increased?

a

Complete the gap fill:

Magnetic force is a type of **non-contact** force and it is strongest at the **poles** of the magnet. There are two types of magnetic pole: a **north pole** and a **south pole**.

b

Write what would happen between the poles in each of the magnetic interactions below:

repulsion

attraction

repulsion

c

Define the term 'magnetic field':

The region around a magnet where a force acts on another magnet or on a magnetic material.

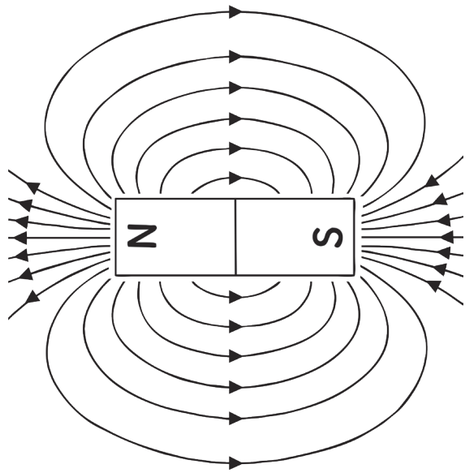
d

State the factor that affects the strength of the magnetic field:

The strength of the magnetic field depends on the distance from the magnet.

d

Draw the magnetic field lines on the bar magnet below. Remember lines always start at the **north pole** and point towards the **south pole**.



f

List four magnetic materials:

1. **iron**
2. **steel**
3. **nickel**
4. **cobalt**

e

Describe the difference between a permanent magnet and an induced magnet.

Permanent magnets produce their own magnetic field. Induced magnets become a magnet when placed in a magnetic field. However, when removed from the magnetic field, an induced magnet loses most/all of its magnetism quickly.

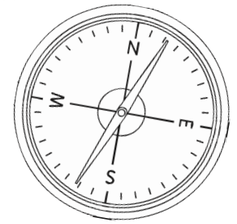
h

Explain how a plotting compass could be used to investigate the magnetic field around a magnet.

Place the magnet on a blank piece of paper. Place the plotting compass at one end/above the pole of the magnet. Mark on the paper where the point of the needle points. Move the compass to the place you have just marked. Repeat until you have moved to the other pole of the magnet. Repeat on the other length of the magnet (e.g. top and then bottom).

i

In which direction do compass needles always align? Why?

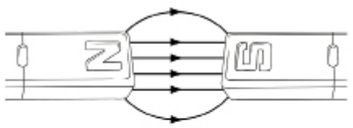


Magnetic north, because the earth has a magnetic field. This is possibly due to the iron content in the core.

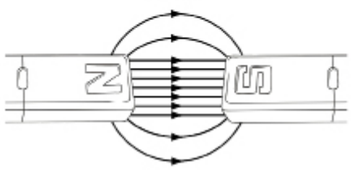
i

Which of these magnets will exert a stronger force on a magnetic material? **B**

A.



B.



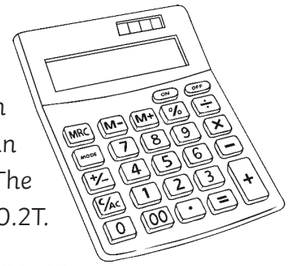
Explain your answer.

B has more lines of magnetic flux.

j

You are given the following equation in your exam:

force = magnetic flux density × current × length



A wire with a current of 4.0A is placed between two bar magnets (each has a width of 12mm) in a state of attraction. The magnetic flux density is 0.2T.

Calculate the force acting on the wire.

Note: in other calculations, you may be required to rearrange the formula.

convert 12mm into metres = 0.012m

place values into equation:

force = 0.2T × 4.0A × 0.012m

force = 0.0096N (newtons)

k

When a current flows through a conducting wire, a magnetic field is produced around the wire.

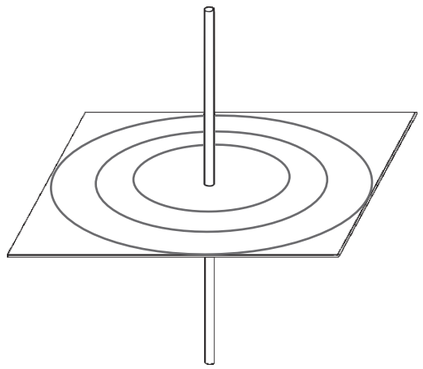
State two factors the strength of the magnetic field depends on:

1. **size of the current**
2. **distance from the wire**

a

A long, straight conducting wire is placed vertically so that it passes through a horizontal piece of board.

Iron filings are sprinkled onto the board. Draw the pattern they would form:



b

State the piece of equipment you could use to investigate the magnetic field you have drawn above.

plotting compass

c

State the method that informs you of the direction of the current in a straight wire.

Right-hand grip method/rule.

What do your thumb and fingers represent in this method?

thumb:

The direction of the current.

fingers:

The direction the field lines should be drawn.

d

Describe how you would use the piece of equipment previously stated to investigate the magnetic field you have drawn.

Place a magnetic compass at one point along the wire. Turn the power supply on and off. Move the magnetic compass further along the wire. Again, turn the power supply on and off. Move the compass further away from the wire to see that the magnetic field is weaker.

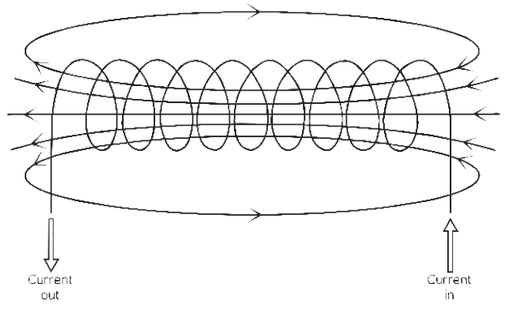
e

What is a solenoid?

A solenoid is formed when a long piece of conducting (and insulated) wire is looped into a coiled cylinder.

f

Draw the magnetic field pattern around a solenoid below:



What is this pattern similar to?

The magnetic field around a bar magnet.

g

How can you find the north pole of a solenoid?

Using the right-hand grip method. Hold the solenoid with your right hand and fingers pointing in the direction the current is flowing. Your thumb should point to the north pole.

h

List four ways in which you can make the magnetic field around a solenoid/ electromagnet stronger:

1. **Use a larger current.**
2. **Use an iron core.**
3. **Add more turns to the wire.**
4. **Place the turns of the wire closer together.**

i

Describe what happens to the magnetic field around a straight wire when the current is reversed.

The magnetic field is also reversed.

j

What is the motor effect?

If a conductor carrying a current is placed in a magnetic field, the magnet producing the field and the conductor exert a force on each other.

k

State three ways you can increase the force:

1. **Increasing the size of the current.**
2. **Increasing the length of the conductor in the magnetic field.**
3. **Increasing the flux density.**

l

How can you reverse the direction of the force?

By reversing the direction of the current or reversing the direction of the magnetic field.

m

A motor has a magnetic flux density of 1.5T and a current of 8A.

The total length of the wire is 500cm.

Calculate the force on the wire using the equation F = BIL.

convert cm into metres = 5m

place values into equation:

force = 1.5T × 8.0A × 5m

force = 60N (newtons)

a

You are given the following equation in your exam.

force = magnetic flux density × current × length

Complete the table:

Symbol Part of the Equation	What It Represents	Units
F	force	N
B	magnetic flux density	T
I	current	A
L	Length of the wire within the field.	m

b

What is the basis of an electric motor?

A coil of wire carrying a current in a magnetic field tends to rotate.

c

How can the direction of a motor be reversed?

By reversing the direction of the current or reversing the direction of the magnetic field.

d

How can the speed of a motor be increased?

By increasing the size of the current or increasing the magnetic field/use a larger magnet.

e

What rule can be used to find the direction of the force?

Fleming's left-hand rule

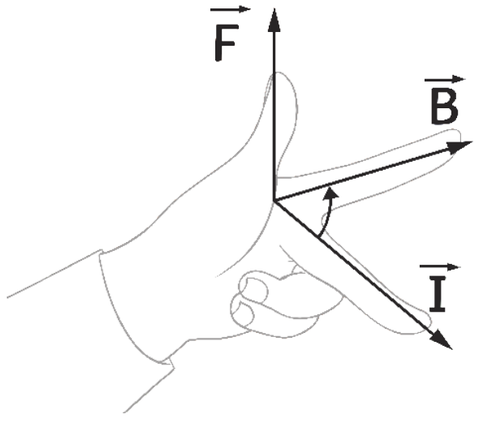
What angle do your thumb, first and second finger need to be at? **90°**

What does each part represent?

thumb: **movement**

first finger: **field**

second finger: **current**



f

Describe how you would use an iron nail, a length of insulated wire and a cell to make an electromagnet that can be used to pick up some steel paper clips.

Wrap the wire around the iron nail. Connect the wire to the power supply (with connecting leads and crocodile clips). Switch on the power supply. Use de-magnetised paper clips. Suspend the nail near the paperclips and record how many collected. The more paperclips suspended, the stronger the electromagnet is. Change the number of turns (on the coil). Change the current (through the coil).

g

Why will a motor not work without a commutator?

The commutator ensures that the current stays in the same direction. Also the coil would not be free to spin. This means the coil would remain still and not rotate.

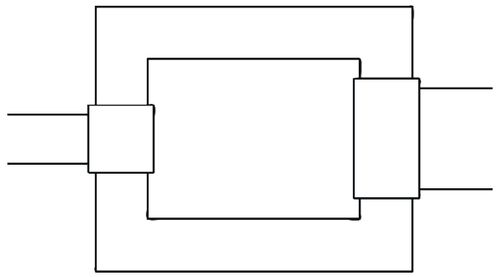
h

Describe a simple electric motor.

A coil of wire is fixed (on an axle). The ends of the wire are connected via a split-ring commutator. To a battery/power supply. The carbon brush contacts at the commutator ensures the current direction in the coil is always the same. The coil is placed between two (flat) magnets. With opposite poles facing each other. The coil rotates continuously and this is the basis of an electric motor.

i

A step-down transformer has three main parts inside of it. Briefly describe each of the three main parts (4 marks).



A transformer is made up of a primary coil from the alternating current (ac) input, a secondary coil leading to the ac output and an iron core. A transformer has one coil of insulated wire on each side. There are a greater number of turns of wire on the primary coil than there are on the secondary coil.

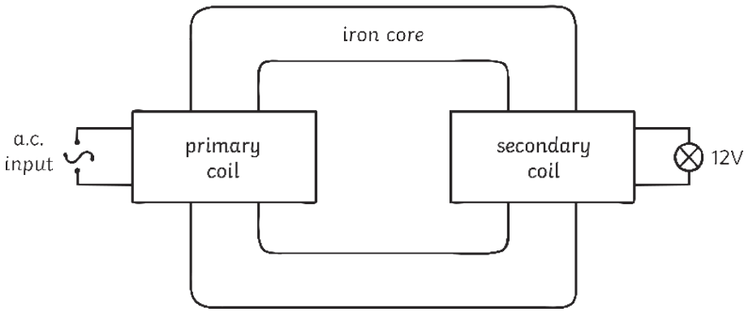
j

In terms of magnetic fields, explain how a transformer works (4 marks

Changing the current in the primary coil produces a magnetic field which changes as the current changes. The magnetic field strength of the iron core increases. The increase in magnetic field strength causes a changing potential difference (p.d.) in the secondary coil. An alternating current in the external circuit is produced as a result.

a

The illustration below shows a transformer that is used to light a 12V lamp.



The lamp is very dim when the power is switched on.

Suggest one way to increase the voltage at the lamp without changing the power supply.

The number of turns on the secondary coil could be increased or the number of turns on the primary coil could be decreased.

b

A transformer has 75 turns on its primary coil. Across the primary coil there is a potential difference of 230 volts and across the secondary coil, there is a potential difference of 32 200 volts.

$$\frac{\text{p.d.across primary}}{\text{p.d.across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

Use the equation to help you calculate the number of turns on the secondary coil.

75 × 32 200 = 2 415 000

2 415 000 ÷ 230 = 10 500 turns

c

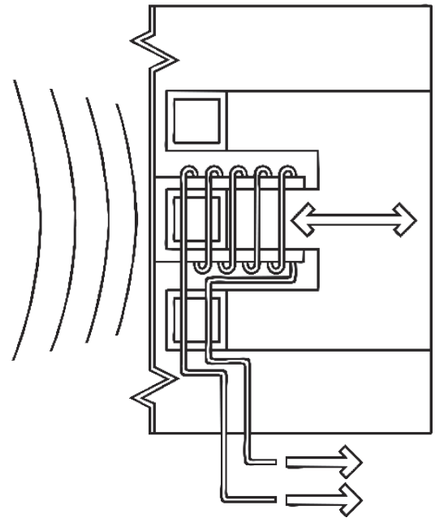
A step-down transformer converts 12 500V into 230V. The power output is used to run a 3000W hairdryer. Calculate the current flowing in the primary coil.

potential difference across primary coil (V_p) × current in primary coil (I_p) = potential difference across secondary coil (V_s)× current in secondary coil (I_s)

3000 ÷ 12 500 = 0.24A

d

Explain how a moving-coil microphone converts sound waves into electrical signals.



A microphone consists of a flexible diaphragm. Variations in pressure from sound waves cause the diaphragm to vibrate. Vibrations in the diaphragm result in vibrations in the coil. A potential difference is induced in the coil by the movement of the coil in relation to a permanent magnet. This movement causes a current to flow around the circuit. The size and direction of the current match the coil vibrations. The electrical signal produced matches the variation in pressure of the sound waves.

e

How can the size of an induced voltage be increased?

It can be increased by increasing the number of turns on the coil, increasing the magnetic field strength and increasing the rotation speed of the magnet or electromagnet.