

# OCR A Physics GCSE

## 4.2 - Uses of Magnetism

(Higher Only)

Flashcards

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# What is an electromagnet?



## What is an electromagnet?

- A solenoid with an added iron core.
- Adding the iron core increases the strength of the magnetic field.



# What is the motor effect?



## What is the motor effect?

When a force is exerted between a magnetic field and a current-carrying conductor placed in that field.



What rule is used to determine the force experienced due to the motor effect?



What rule is used to determine the force experienced due to the motor effect?

Fleming's Left-Hand Rule



When using Fleming's left hand rule  
what does the forefinger represent?





When using Fleming's left hand rule what does the forefinger represent?

The forefinger points in the direction of the magnetic field.



When using Fleming's left hand rule  
what does the second finger represent?



When using Fleming's left hand rule what does the second finger represent?

The second finger points in the direction of current flow in the conductor.



When using Fleming's left hand rule  
what does the thumb represent?



When using Fleming's left hand rule what does the thumb represent?

The thumb points in the direction of the force produced, and therefore the motion produced by the force.



What factors affect the size of the force on a current-carrying wire in a magnetic field?



What factors affect the size of the force on a current-carrying wire in a magnetic field?

- The magnitude of the current flowing through the conductor.
- The strength of the magnetic field that the conductor is placed in.



If the direction of current in a current-carrying wire placed in a uniform magnetic field is reversed, what happens to the force?





If the direction of current in a current-carrying wire placed in a uniform magnetic field is reversed, what happens to the force?

The direction of the force is reversed.



If the strength of the current in a current-carrying wire placed in a uniform magnetic field is increased, what happens to the force?



If the strength of the current in a current-carrying wire placed in a uniform magnetic field is increased, what happens to the force?

The strength of the force is increased.



What criteria must be met for the equation linking force, magnetic flux density, current and length to hold?



What criteria must be met for the equation linking force, magnetic flux density, current and length to hold?

The conductor must be at right-angles to the magnetic field it is placed in.



What is the unit used for magnetic flux density?



What is the unit used for magnetic flux density?

Tesla, T



What equation is used to calculate the force that a current carrying wire experiences in a field?





What equation is used to calculate the force that a current carrying wire experiences in a field?

Force (N) = Magnetic Flux Density (T) x  
Current (A) x Length (m)

$$F = BIL$$



# How does an electric motor work?



## How does an electric motor work?

- A coil of wire, carrying a current, is placed in a magnetic field.
- The forces on the two sides perpendicular to the field experience forces in opposite directions.
- This causes a rotational effect.



How do loudspeakers make use of the motor effect?



# How do loudspeakers make use of the motor effect?

The motor effect is used to convert variations in the current of an electrical circuit into the pressure variations which produce audible sound.



Explain how a loudspeaker works.



## Explain how a loudspeaker works.

- A cone with a wire wrapped around it is connected to an a.c power supply and is placed in a permanent magnetic field.
- When current flows through the wire, it creates a second magnetic field, which interacts with the permanent field.
- This produces a force which causes the cone to vibrate.



How is the pitch of the sound from a loudspeaker changed?





How is the pitch of the sound from a loudspeaker changed?

- The frequency of the a.c current is altered.
- This creates a different frequency of vibration in the cone.



What happens when an electrical conductor moves relative to a magnetic field?



What happens when an electrical conductor moves relative to a magnetic field?

A potential difference is induced across the ends of the conductor.



What happens to an electrical conductor when there is a change to the magnetic field that it is placed in?



What happens to an electrical conductor when there is a change to the magnetic field that it is placed in?

A potential difference is induced across the ends of the conductor.



What is the requirement for an induced potential difference to cause a current flow?



What is the requirement for an induced potential difference to cause a current flow?

The conductor must form a closed loop or be part of a complete circuit.



What can be said about the direction of the magnetic field produced by an induced current?





What can be said about the direction of the magnetic field produced by an induced current?

- The direction of the field is such that it opposes the change that induced the current.
- This change is either the movement of the conductor or a change to the field.



If there is a change in the magnetic field around a conductor, explain what changes occur in the conductor.



If there is a change in the magnetic field around a conductor, explain what changes occur in the conductor.

- A potential difference is induced across its ends.
- This drives a current.
- The direction of the induced current is such that it creates a magnetic field that opposes the change in the existing field.



What are two ways that the generator effect is used to generate different types of current?



What are two ways that the generator effect is used to generate different types of current?

- In an alternator to produce alternating-current.
- In a dynamo to produce direct-current.



What electromagnetic effect does a microphone take advantage of and how?



What electromagnetic effect does a microphone take advantage of and how?

- The generator effect.
- It converts the pressure variations in sound waves into alternating current in a circuit.



Describe the makeup of a basic transformer.





Describe the makeup of a basic transformer.

A primary coil and a secondary coil of wire wrapped around an iron core.



# Why is iron used as the core for a transformer?



Why is iron used as the core for a transformer?

It is easily magnetised.



Explain how a transformer works.



## Explain how a transformer works.

- An alternating current flows through the primary coil.
- This induces a changing magnetic field in the core.
- This changing magnetic induces a current to flow in the secondary coil.



Why must the current flowing through the primary coil of a transformer be alternating?



## Why must the current flowing through the primary coil of a transformer be alternating?

- For current to be induced in the secondary coil, the magnetic field in the core must be continuously changing.
- For the magnetic field to be changing, the current in the primary coil must be alternating.



What can be said about the electrical power input and output of a 100% efficient transformer?





What can be said about the electrical power input and output of a 100% efficient transformer?

The electrical power input is equal to the electrical power output.



What equation is used to link the voltage and number of turns on the coils of a transformer?



What equation is used to link the voltage and number of turns on the coils of a transformer?

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

