



Year 9 Physics – Magnets and electromagnets

Learning about this topic is important because: Magnetism plays an essential role in modern technology. From electric motors and loudspeakers to MRI scanners, recycling cranes and electric door locks, magnets and electromagnets are used in countless everyday devices. Understanding how electricity and magnetism are linked helps explain how many of the technologies we rely on every day work. This unit explores magnetic fields, electromagnets and their practical applications.

This builds on: Building on your prior knowledge of simple electrical circuits and electric current, where you learnt that a battery drives current around a complete circuit and that current can be measured using an ammeter. You have also previously studied that magnets attract certain materials and that magnets have north and south poles which attract and repel each other.

This leads to: This unit prepares you for the Year 9 **Electromagnetism** unit and later GCSE Physics by developing your understanding of the relationship between electricity and magnetism. You will build on these ideas to study the motor effect, generators, transformers and electromagnetic induction, helping you understand how electricity is generated and used in modern technology.

We will learn:

1. to describe how magnets attract magnetic materials and attract or repel other magnets.
2. to identify magnetic poles and explain attraction and repulsion between magnets.
3. to plot and interpret magnetic field patterns around a bar magnet.
4. to explain that an electric current produces a magnetic field.
5. to describe how an electromagnet is made using a coil of wire and an iron core.
6. to investigate the factors that affect the strength of an electromagnet.
7. to explain how electromagnets are used in everyday devices such as cranes, electric bells, door locks and motors.
8. to plan and evaluate scientific investigations involving electromagnets.

We will develop/practise skills including:

- Planning scientific investigations
- Identifying independent, dependent and control variables
- Using scientific equipment safely and accurately
- Recording observations and measurements
- Drawing and interpreting magnetic field diagrams
- Analysing patterns in results
- Evaluating the quality of experimental evidence

Some of the vocabulary that we will use includes:

magnet: an object that produces a magnetic field.

magnetic material: a material that can be attracted by a magnet, such as iron, nickel or cobalt.

north pole: one end of a magnet that points towards Earth's north when freely suspended.

south pole: the opposite end of a magnet.

attract: when two objects pull towards each other.

repel: when two objects push away from each other.

magnetic field: the region around a magnet where magnetic forces act.

You could learn more about this topic by:

- looking at the **Magnets and Electromagnets** topic in **BBC Bitesize**
- using **Educake**
- exploring the Oak National Academy lesson resources



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field lines: lines used to represent the direction and strength of a magnetic field.
electromagnet: a magnet produced by an electric current flowing through a coil of wire.
coil: a wire wound into loops.
core: the material placed inside the coil, usually soft iron, to strengthen an electromagnet.
current: the flow of electric charge through a conductor.
solenoid: a long coil of wire that produces a magnetic field when current flows through it.
soft iron: a magnetic material that is easily magnetised and demagnetised.

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: Educake quizzes, a mid topic review and end of unit test.



Year 9 Physics – Hidden Forces

Learning about this topic is important because: Many of the forces that affect objects cannot be seen directly, but they have a huge impact on the world around us. Engineers, scientists and designers use ideas about hidden forces to build bridges, design vehicles, create lifting equipment and understand why objects float or sink. In this topic, you will investigate forces that cause objects to stretch, turn, float and experience pressure, helping you explain many everyday and industrial applications.

This builds on: Building on your prior knowledge of forces from Year 7, where you learnt about contact and non-contact forces, balanced and unbalanced forces, friction, drag and resultant forces. You have also developed skills in measuring forces and representing them using force arrows.

This leads to: This unit prepares you for GCSE Physics by introducing ideas including deformation, Hooke's Law, moments, pressure and upthrust. These concepts are developed further at Key Stage 4 when you study elasticity, pressure in fluids, moments and mechanical systems, as well as applying mathematical relationships to solve physics problems. It also provides the foundation for the Oak National unit **Particle explanations of density and pressure**, where particle models are used to explain why fluids exert pressure and why objects float.

We will learn:

1. to describe the relationship between mass, weight and gravitational force.
2. to investigate how springs stretch and measure extension accurately.
3. to describe and apply Hooke's Law.
4. to compare the stretching behaviour of springs and rubber bands.
5. to explain how surfaces support objects using reaction forces.
6. to identify levers and explain how they make work easier.
7. to calculate and explain turning forces (moments).
8. to explain why some objects float and others sink using ideas about density and upthrust.
9. to describe and calculate pressure as a force acting over an area.
10. to explain how pressure changes with depth in liquids and with height in the atmosphere.

We will develop/practise skills including:

- Measuring forces and extensions accurately
- Collecting and presenting experimental data
- Drawing graphs and identifying patterns
- Using and rearranging equations
- Calculating moments and pressure
- Evaluating practical methods and evidence
- Applying scientific ideas to explain everyday phenomena

Some of the vocabulary that we will use includes:

mass: the amount of matter in an object, measured in kilograms (kg).

weight: the force of gravity acting on an object, measured in newtons (N).

gravitational field strength: the force acting on each kilogram of mass.

extension: the increase in length of a stretched object.

You could learn more about this topic by:

- looking at the **Forces**, **Pressure** and **Moments** topics in **BBC Bitesize**
- using **Educake**
- exploring the Oak National Academy lesson resources
- investigating how engineers use levers, hydraulics and pressure systems in construction, transport and manufacturing.



Year 9 Physics – Hidden Forces

Hooke's Law: the extension of a spring is proportional to the force applied, provided the limit of proportionality is not exceeded.
elastic deformation: a change in shape that can be reversed.
plastic deformation: a permanent change in shape.
reaction force: the support force exerted by a surface on an object.
lever: a simple machine that increases the effect of a force.
pivot (fulcrum): the point around which a lever turns.
moment: the turning effect of a force about a pivot.
upthrust: the upward force exerted by a fluid on an immersed object.
density: the mass contained in a unit volume of a substance.
pressure: the force acting per unit area.
atmospheric pressure: the pressure exerted by the air surrounding the Earth.
liquid pressure: the pressure exerted by a liquid, which increases with depth.

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: Educake quizzes, a mid topic review and end of unit test.



Year 9 Physics – Waves

Learning about this topic is important because: Waves allow energy to travel from one place to another and are fundamental to many aspects of everyday life. We rely on waves whenever we communicate, listen to music, watch television, use mobile phones or receive medical scans. By studying waves, you will understand how energy is transferred, how waves behave and why different types of waves have different uses. These ideas underpin many important scientific and technological developments.

This builds on: Building on your prior knowledge of **Sound, Light and Vision** from Year 7, where you learnt that sound is produced by vibrations, light travels in straight lines and both can be reflected. You have also developed an understanding of energy transfers and scientific investigations, providing the foundation for studying waves in greater depth.

This leads to: This unit prepares you for GCSE Physics by introducing the wave model, transverse and longitudinal waves, wave speed and wave behaviour. These ideas are developed further when you study the properties of waves, the electromagnetic spectrum, reflection, refraction, wave calculations and the applications of waves in communications, medicine and engineering.

We will learn:

1. to describe what waves are and explain that they transfer energy without transferring matter.
2. to distinguish between transverse and longitudinal waves.
3. to identify the features of waves, including amplitude, wavelength and frequency.
4. to describe how wave speed depends on the medium through which a wave travels.
5. to calculate wave speed using measurements of distance and time.
6. to explain how waves are reflected at surfaces.
7. to describe how waves are absorbed, transmitted or reflected by different materials.
8. to explain how wave behaviour can be applied in everyday situations and modern technology.

We will develop/practise skills including:

- Making careful observations
- Planning and carrying out practical investigations
- Measuring distances and times accurately
- Using and rearranging equations
- Drawing and interpreting wave diagrams
- Identifying patterns in experimental data
- Evaluating the quality of evidence

Some of the vocabulary that we will use includes:

wave: a disturbance that transfers energy from one place to another.

energy transfer: the movement of energy between objects or places.

transverse wave: a wave in which the vibrations are perpendicular to the direction of travel.

longitudinal wave: a wave in which the vibrations are parallel to the direction of travel.

vibration: a repeated back-and-forth movement.

amplitude: the maximum displacement from the rest position.

You could learn more about this topic by:

- looking at the **Waves** topic in **BBC Bitesize**
- using **Educake**
- exploring the Oak National Academy lesson resources
- investigating how waves are used in communication systems, medical imaging, earthquake monitoring and music technology.



Year 9 Physics – Waves

wavelength: the distance between two corresponding points on successive waves.

frequency: the number of waves passing a point each second, measured in hertz (Hz).

wave speed: the distance travelled by a wave each second.

reflection: the bouncing of a wave from a surface.

absorption: when a material takes in the energy carried by a wave.

transmission: when a wave passes through a material.

medium: the substance through which a wave travels.

echo: a reflected sound wave.

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: Educake quizzes, a mid topic review and end of unit test.



Year 9 Physics – Resistance

Learning about this topic is important because: Electricity powers almost every aspect of modern life, from lighting our homes to charging our phones and running hospitals, factories and transport systems. Most electrical circuits in homes are connected in parallel because this allows appliances to work independently and safely. By studying parallel circuits and resistance, you will understand how electrical devices are designed, how energy is transferred and why different materials and components affect the flow of electric current.

This builds on: Building on your prior knowledge of simple series circuits, where you learnt about electrical current, potential difference (voltage), complete circuits, electrical components and how to measure current and voltage. You have also explored conductors and insulators and developed practical skills in constructing and testing electrical circuits.

This leads to: This unit prepares you for GCSE Physics by developing your understanding of current, potential difference and resistance in both series and parallel circuits. These ideas form the basis of AQA GCSE Physics Topic 2: **Electricity**, where you will investigate circuit behaviour quantitatively using Ohm's Law, calculate resistance in series and parallel circuits, explore electrical power and energy, and explain how domestic electrical systems operate safely.

We will learn:

1. to describe the differences between series and parallel circuits.
2. to explain how current behaves in a parallel circuit.
3. to explain how potential difference is shared in series circuits and remains the same across branches in parallel circuits.
4. to describe resistance as the opposition to the flow of electric current.
5. to investigate how different components and materials affect resistance.
6. to explain how changing the length, thickness and material of a wire changes its resistance.
7. to investigate the effect of adding components to parallel circuits.
8. to explain why parallel circuits are used in homes and many everyday electrical devices.

We will develop/practise skills including:

- Constructing electrical circuits safely
- Using ammeters and voltmeters accurately
- Recording and interpreting electrical measurements
- Identifying patterns in experimental data
- Drawing and interpreting circuit diagrams
- Using scientific evidence to explain observations
- Evaluating practical investigations

Some of the vocabulary that we will use includes:

electric current: the flow of electric charge through a conductor.
potential difference (voltage): the energy transferred to each coulomb of charge passing through a component.

resistance: a measure of how difficult it is for electric current to flow through a component.

series circuit: a circuit with only one path for current to flow.

parallel circuit: a circuit with two or more branches that provide multiple paths for current.

branch: one of the separate paths in a parallel circuit.

You could learn more about this topic by:

- looking at the **Electricity** topic in **BBC Bitesize**
- using **Educake**
- exploring the Oak National Academy lesson resources
- investigating how electrical circuits are used in homes, vehicles and electronic devices.



Year 9 Physics – Resistance

conductor: a material that allows electric current to flow easily. insulator: a material that resists the flow of electric current. ammeter: an instrument used to measure electric current. voltmeter: an instrument used to measure potential difference. variable resistor: a component whose resistance can be adjusted. filament lamp: a lamp whose resistance increases as it becomes hotter. current: measured in amperes (A). potential difference: measured in volts (V). resistance: measured in ohms (Ω).	
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