Physics Year 8

Long Term Curriculum Plan

Subject: Physics

Subject Vision

Physics is the study of how bodies, small and large, interact with each other. Over the 2 key stages we look at motion both on a human scale and a planetary scale, the conservation of energy and the forms it can be found in, the dangers of electricity and how to harness it to control and enrich our lives. Nuclear fusion, fission and decay are all studied with their individual benefits and risks investigated. These areas are all under pinned by calculations, practical demonstrations and investigations. Students are encouraged to be creative and 'think outside the box' by linking abstract phenomena on the micro and macroscale to their experiences of the world around them

End Points

EP1. Demonstrate a deep understanding of Physics and how this relates to the real world
EP2. Conduct practical Physics safely and accurately
EP3. Visualise Physics related concepts and processes
EP4. Form reasoned and logical conclusions backed up with evidence
EP5. Manipulate mathematical equations

Subject Domains of Knowledge	**Subject Key Concepts**
D1. Energy & Energy Transfers D2. Particle Model D3. Force & their effects D4. Waves D5. Accurately Measuring and Reporting data	C1. Circuits & electrical charge C2. Energy transformation & rate of charge C3. Heating & Cooling C4. Energy Resources & generating electricity C5. Particle arrangement C6. Density C7. Pressure C3. Atomic Structure C4. Radioactive decay C5. Hazards & uses of radioactivity

	C6. Types of Force C7. Newtons Laws C8. Force & Motion C9. Magnetic field & the motor effect C10. Types of Wave C11. Wave equation C12. Wave behaviour C13. Formula rearrangement & application C14.Numeracy C15. Si Units C16. Standard Form C17. Graph Interpretation

Year 8: Waves

Units	Unit 1: Waves
Unit Overview	In this unit, students will construct ray diagrams from practical investigations to show how light rays behave when they are reflected, refracted and dispersed and be able to explain how images are formed in mirrors. Students will learn about the behaviour of waves in terms of their movement, reflection, transmission and absorption by a medium
Lesson Sequence	1. **Properties of light** - In this lesson students will learn about the different properties of light 2. **How light interacts with media** - End this lesson students will learn how light is transmitted absorbed and reflected by different media 3. **Reflection** - In this lesson students will investigate the relationship between the angle of the incidence and the angle of reflection 4. **Transverse waves** - In this lesson students will learn about the properties of transverse waves 5. **Refraction** - In this lesson students investigate how light refracts when travelling through different media 6. **Total Internal Reflection (optional)** - In this lesson students will investigate total internal reflection and give examples of where it can be used in everyday life 7. **Lenses (optional)** - In this lesson students will learn about the effect of lenses on rays of light 8. **Dispersion** - In this lesson students will learn about the spectrum of visible light observed through dispersion experiments 9. **Reflection from coloured objects (optional)** - In this lesson students will learn how objects appear different colours due to reflection of different wavelengths of light 10. **Filters and primary colours (optional)** - In this lesson students will learn about the effect of mixing coloured light 11. **The Human eye (optional)** - In this lesson students will learn about how the human eye works 12. **Colour perception (optional)** - In this lesson students will learn how humans detect different colours of light
Key Domains and Concepts taught in this Unit / Term	D4. Waves C10. Types of Wave C11. Wave equation C12. Wave behaviour C13. Formula rearrangement & application C14.Numeracy C15. Si Units C16. Standard Form C17. Graph Interpretation

SOUTH DOWNS LEARNING TRUST

Physics Year 8

KS4 End Points	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP2. Conduct practical Physics safely and accurately** **EP4. Form reasoned and logical conclusions backed up with evidence** **EP5. Manipulate mathematical equations**
Declarative Knowledge (Students should know)	**Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels.** **The greater the amplitude of the waveform, the louder the sound. The greater the frequency (and therefore the shorter the wavelength), the higher the pitch.** **When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours.** **When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model.** **When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy.** **A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and describes the properties of speed, wavelength and reflection.**
Procedural Knowledge (Students	**Explain observations where sound is reflected, transmitted or absorbed by different media.** **Explain observations of how sound travels using the idea of a longitudinal wave.**

should be able to do)	**Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture.** **Use drawings of waves to describe how sound waves change with volume or pitch.** **Use ray diagrams of eclipses to describe what is seen by observers in different places.** **Explain observations where coloured lights are mixed or objects are viewed in different lights.** **Use ray diagrams to describe how light passes through lenses and transparent materials.** **Describe how lenses may be used to correct vision.** **Explain differences in the damage done to living cells by light and other waves, in terms of their frequency.** **Explain how audio equipment converts sound into a changing pattern of electric current.** **Describe the properties of different longitudinal and transverse waves.** **Use the wave model to explain observations of the reflection, absorption and transmission of a wave.** **Extend - Suggest the effects of particular ear problems on a person's hearing. Evaluate the data behind a claim for a sound creation or blocking device, using the properties of sound waves. Use diagrams to compare the waveforms a musical instrument makes when playing different pitches or volumes.** **Extend - Use a ray diagram to predict how an image will change in different situations. Predict whether light will reflect, refract or scatter when it hits the surface of a given material. Use ray diagrams to explain how a device with multiple mirrors works.** **Extend – Suggest reasons why sound waves can agitate a liquid for cleaning objects, or massage muscles for physiotherapy. Evaluate electricity production by wave energy using data for different locations and weather conditions.** **Extend - Compare and contrast the properties of sound and light waves. Suggest what happens when two waves combine.**

Physics Year 8

Developing T3 Literacy and Numeracy	**Waves**: Vibrations that transport energy from place to place without transporting matter. **Transverse wave**: Where the direction of vibration is perpendicular to that of the wave. **Transmission**: Where waves travel through a medium rather than be absorbed or reflected **Incident ray**: The incoming ray. **Reflected ray**: The outgoing ray. **Normal line:** From which angles are measured, at right angles to the surface. **Angle of reflection**: Between the normal and reflected ray. Angle of incidence: Between the normal and incident ray. **Refraction**: Change in the direction of light going from one material into another. **Absorption**: When energy is transferred from light to a material. **Scattering**: When light bounces off an object in all directions. **Transparent**: A material that allows all light to pass through it. **Translucent**: A material that allows some light to pass through it. **Opaque**: A material that allows no light to pass through it. **Convex lens**: A lens that is thicker in the middle which bends light rays towards each other. **Concave lens**: A lens that is thinner in the middle which spreads out light rays. **Retina**: Layer at the back of the eye with light detecting cells and where an image is formed
Assessment (Summative and Formative)	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test
Links to Prior Learning	In Key Stage 2 students will have learnt: • recognise that light appears to travel in straight lines • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them
Next steps in learning	Covered in more detail in Key Stage 4 during the physics and combined science course.

Common Barriers to learning in this unit	Abstract concepts to model and visualise

Year 8: Atoms and Radioactivity

Units / Term	**Unit 2: Atomic Structure**	**Unit 3: Radioactivity**
Unit Overview	In this unit, students will learn about the structure of atoms in terms of subatomic particles and their arrangement. They will learn how our current atomic model was developed over time.	In this unit, students will learn about the types and nature of radioactive decay along with some useful applications and associated risks.

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Physics Year 8

Lesson Sequence	1. **The Atom** – In this lesson students will learn what an atom and an element is 2. **Subatomic particles** - In this lesson students will learn what protons, neutrons and electrons are and their properties 3. **Atoms and the Periodic Table** - In this lesson students will learn how to use the Periodic Table to find out the properties of different atoms 4. **Electronic Structure** - In this lesson students will learn how to predict the electronic structure of an atom 5. **Models of the atom** - In this lesson students will learn about the development of the modern atomic model 6. **Isotopes** - In this lesson students will learn what isotopes are	1. **Radioactivity** - In this lesson students will learn What nuclear radiation is and how it was discovered 2. **Types of radioactivity** - In this lesson students will learn about the three different types of radiation and their properties 3. **Working safely with radioactivity** - In this lesson students will learn what background radiation is and how to stay safe when working with radiation 4. **Uses of radioactivity** - In this lesson students will learn how radiation is used as an energy source and in medicine 5. **Disadvantages of radiation** – Chernobyl - In this lesson students will learn how radiation can be mis-used and the consequences of this 6. **Disadvantages of radiation** – Nuclear waste - In this lesson students will learn where nuclear waste comes from and why it is a problem
Key Domains and Concepts taught in this Unit / Term	D2. Particle Model C3. Atomic Structure	D5. Accurately Measuring and Reporting data C3. Atomic Structure C4. Radioactive decay C5. Hazards & uses of radioactivity C14.Numeracy C17. Graph Interpretation
KS4 End Points	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP3. Visualise Physics related concepts and processes**	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP3. Visualise Physics related concepts and processes** **EP4. Form reasoned and logical conclusions backed up with evidence**
Declarative Knowledge	The definition of an element The significance of the atomic and mass numbers of an element	What the terms radiation and radioactive mean in relation to atoms Compare the features of alpha, beta and gamma radiation

(Students should know)	The features of sub-atomic particles – protons, neutrons and electrons The electron shell – filling rule for elements The main comparisons between the plum pudding and nuclear model of the atom Isotopes are atoms of the same element with different numbers of protons / mass numbers	The sources of background radiation Use of radiation in medical treatments is useful Nuclear waste is dangerous for many years and poses a long term problem
Procedural Knowledge (Students should be able to)	Use the atomic and mass numbers to elicit the number of protons, electrons and neutrons in an atom Use the atomic number of an element to complete an electron shell diagram Identify isotopes of an element from comparing the mass and proton numbers of atoms of an element EXTEND – Explain how relative atomic mass can be calculated using the abundance of the different isotopes for that element EXTEND – Evaluate the different models of the atom and how the work of different scientists has changed our ideas HOW SCIENCE WORKS - Describe through words and diagrams how the atomic model has developed over time	Explain how to measure the activity of a radioactive source Be able to plot a half life decay curve and find the half life of a source from it Be able to evaluate the dangers posed by background radiation Explain how dangerous radiation can be used to help us in medical procedures EXTEND – link data on half life and activity of a source to its risk EXTEND – link the features of alpha, beta and gamma radiation to the risks they pose to us outside and inside our body EXTEND – Evaluate the risks and benefits of using radioactive sources in a variety of situations HOW SCIENCE WORKS – Discuss the current and future issues with the sustainable treatment and storage of nuclear waste
Developing T3 Literacy and Numeracy	Atom – simplest building block of matter Nucleus – central part of the atom containing proton and neutrons Element – pure substance made of only one type of atom Atomic number – shows the number of protons in an atom	Radioactive – describes the unstable nature of the atom's nucleus Radiation – a particle / electromagnetic wave emitted from a radioactive nucleus in order to stabilise Decay – the process of an atom emitting radiation

	Mass number – shows the number of particles in the nucleus of an atom Proton – positively charged sub-atomic particle Neutron – uncharged sub atomic particle Electron – negatively charged sub atomic particle which orbits the nucleus Sub-atomic particle – particles which make up the atom Isotopes – atoms of the same element with different numbers of neutrons	Half life – the time taken for the radioactivity of a sample to halve Dose – the amount of radiation a person receives Alpha – large, heavy particle emitted in decay Beta – a small, fast particle emitted in decay Gamma – an electromagnetic wave emitted in decay
Assessment **Summative and Formative**	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test	Formative – questioning in class, live marking and MS Forms online homework Summative – End of unit test
Links to prior learning	Introduced to the concept of atoms in context of particle model in year 7.	Introduced to the concept of atoms in context of particle model in year 7.
Next steps in learning	Covered in more detail in Key Stage 4 during the physics and combined science course.	Covered in more detail in Key Stage 4 during the physics and combined science course.
Common Barriers to learning in this unit	Abstract concepts to model and visualise	Abstract concepts to model and visualise Unfamiliar content

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Physics Year 8

Year 8: Forces 2

Units	Unit 4: Pressure	Unit 5: Speed
Unit Overview	In this unit students will begin to understand the force of pressure acting in liquids and on surfaces and be able to explain their observations in terms of the forces acting in different situations.	In this unit students will begin to understand how resultant forces acting on an object affects its motion and speed. Students also are required to develop their numeracy skills by calculating the speed of an object and drawing and analysing distance –time graphs to represent motion.
Lesson Sequence	1. **Stress and calculating pressure** - In this lesson students will learn about the effect of area and force in calculating pressure applied 2. **Air Pressure** - In this lesson students will learn about the effect of air pressure 3. **Water pressure** - In this lesson students will learn about the effects of water pressure 4. **Buoyancy** - In this lesson students will learn why some objects float and others do not 5. **Hydraulics** - In this lesson students will learn about some applications of increasing or decreasing pressure	1. **Calculating speed** - In this lesson students will learn what is meant by speed and use a formula to calculate the speed of objects 2. **Distance-Time graphs** - In this lesson students will learn how to plot distant - graphs and interpret their shape 3. **Acceleration** - In this lesson students will learn how to interpret velocity - time graphs to identify when an object is increasing or decreasing speed 4. **Relative Motion** - In this lesson students will learn how to describe objects' relative motion 5. **Graph the Race** - In this lesson students will learn how to interpret data from experimental results

SOUTH DOWNS LEARNING TRUST

Physics Year 8

Key Domains and Concepts taught in this Unit / Term	D1. Energy & Energy Transfers D2. Particle Model D3. Force & their effects C3. Heating & Cooling C5. Particle arrangement C6. Density C7. Pressure C6. Types of Force C13. Formula rearrangement & application C14.Numeracy C15. Si Units	D3. Force & their effects D5. Accurately Measuring and Reporting data C7. Newtons Laws C8. Force & Motion C13. Formula rearrangement & application C14.Numeracy C15. Si Units C16. Standard Form C17. Graph Interpretation
KS4 End Points	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP2. Conduct practical Physics safely and accurately** **EP3. Visualise Physics related concepts and processes** **EP4. Form reasoned and logical conclusions backed up with evidence** **EP5. Manipulate mathematical equations**	**EP1. Demonstrate a deep understanding of Physics and how this relates to the real world** **EP2. Conduct practical Physics safely and accurately** **EP3. Visualise Physics related concepts and processes** **EP4. Form reasoned and logical conclusions backed up with evidence** **EP5. Manipulate mathematical equations**
Declarative Knowledge (Students should know)	Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased. Use the idea of pressure changing with depth to explain underwater effects. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces. Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an	Suggest how the motion of two objects moving at different speeds in the same direction would appear to the other. Predict changes in an object's speed when the forces on it change. Use the formula: speed = distance (m)/time (s) or distance-time graphs, to calculate speed. Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object.

	upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust. Use the idea of stress to deduce potential damage to one solid object by another. Given unfamiliar situations, use the formula to calculate fluid pressure or stress on a surface. Explain observations where the effects of forces are different because of differences in the area over which they apply. Use diagrams to explain observations of fluids in terms of unequal pressure. Explain why objects either sink or float depending upon their weight and the upthrust acting on them.	Be able to understand that a straight line on a distance-time graph shows constant speed, a curving line shows acceleration and appreciate that the higher the speed of an object, the shorter the time taken for a journey. Label the changes in motion on a distance –time graph Understand that if the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. Illustrate a journey with changing speed on a distance- time graph.
Procedural Knowledge (Students should be able to do)	Explain the effects of air pressure To state evidence that air is made of particles To describe the effect of changing pressure on an object To explain the effects of pressure on an object in terms of particles To state that atmospheric pressure decreases with an increase in height, due to decrease in weight of air	Use a formula to calculate the speed of objects To state that speed is a measurement of how fast an object is moving To explain factors that may affect an object's speed To calculate the average speed of an object To convert a speed into different units Interpret distance time graphs

SOUTH DOWNS LEARNING TRUST

Physics Year 8

	Explain the effects of water pressure To describe the force of water pressure To state that pressure in liquids increases with a depth To describe how water pressure acts in all directions To explain the dangers of water pressure when scuba diving Use an equation to calculate pressure To describe high pressure and low pressure To describe ways to increase or decrease pressure To calculate pressure when given the force and area To calculate the pressure by finding the force and area in the correct units Explain why some objects float and others don't To explain how pressure in liquids results in upthrust, allowing some objects to float To describe how floating or sinking is dependent on density To calculate density when given the mass and volume of an object	To interpret distance-time graphs to tell when an object is moving and stationary To interpret distance-time graphs to describe changes in motion To interpret distance-time graphs to calculate speed To interpret distance-time graphs to calculate average speed Interpret graphs to see when an object is increasing or decreasing speed To describe simple changes in motion To identify when an object is accelerating To identify on a graph when an object is accelerating To calculate acceleration Describe an objects relative motion To state that objects move at different speeds in relation to each other To describe changes in relative motion, such as trains and cars passing one another To calculate relative motion speeds To explain an application of relative motion Collect and interpret speed data

	To use calculations of density to predict whether an object will float or sink Investigate a hydraulic system To discuss applications of changing pressure To explain some applications of increasing or decreasing pressure To explain the differences of force in a hydraulic system To calculate the force of a hydraulic system	To collect data on a race To draw a distance time graph using experiment results To interpret distance-time graphs to calculate speed To interpret distance-time graphs to calculate average speed
Developing T3 Literacy and Numeracy	**Keywords** Fluid - A substance with no fixed shape, a gas or a liquid Pressure - The ratio of force to surface area Upthrust - The upward force that a liquid or gas exerts on a body floating in it Atmospheric pressure - The pressure caused by the weight of the air above a surface Compress - to press together Pressure = force/area Unit for Surface Area = m^2 **Numeracy** Physics Calculations, substitutions and rearrangement	**Keywords** acceleration - How quickly speed increases or decreases accurate - A measurement that is close to the true value applied force - a force which is applied to an object by a person or another object average speed - The overall distance travelled divided by overall time for a journey control variable - A variable that is kept constant during a controlled experiment. dependent variable - The variable that may change in response to changes of the independent variable. free body diagram - A diagram showing all the forces acting on an object force - A push or a pull independent variable - The single experimental variable that is changed motion - A movement, change in position

		precise - The same result every time, there is very little spread around the mean relative motion - The motion of one object relative to another speed - The distance travelled in a fixed time period, usually one second unbalanced forces - Forces that cause a change in the motion of an object **<u>Numeracy</u>** Physics Calculations, substitutions and rearrangement Distance-time graphs
Assessment (Summative and Formative)	Formative – questioning in class, live marking and Educake online homework Summative – End of unit test	Formative – questioning in class, live marking and Educake online homework Summative – End of unit test
Links to Prior Learning	In Key Stage 2 students will have learnt: • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	In Key Stage 2 students will have learnt: • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect
Next steps in learning	Covered in more detail in Key Stage 4 during the physics and combined science course.	Covered in more detail in Key Stage 4 during the physics and combined science course.
Common Barriers to learning in this unit	Numeracy skills	Numeracy skills

SOUTH DOWNS
LEARNING TRUST

Physics Year 8

Year 8: Electromagnetism

Units	Unit 6: Current	Voltage and Resistance
Unit Overview	In this unit, students will be able to describe what current is, its role in making components work and construct circuits to allow them to measure current and elicit rules about how it is affected in both series and parallel circuits. Students will also investigate electrostatic charge and how electric field affects charged objects.	In this unit, students will be able to describe what voltage is and construct circuits to allow them to measure voltage and elicit rules about how voltage is affected in both series and parallel circuits. Students will also investigate resistance and its effect on the current flowing in a circuit.
Lesson Sequence		1. **Charging** - In this lesson students will learn how insulators become electrically charged 2. **Uses of charge** - In this lesson students will learn about how static charge can be used in different situations 3. **Circuit building** - In this lesson students will learn the names and symbols of different electrical circuit components 4. **Circuit design** - In this lesson students will learn how to draw series and parallel circuits using different circuit symbols 5. **Current** - In this lesson students will learn what current is and about the rule for current in a series circuits 6. **Potential difference** - In this lesson students will learn what happens to voltage in series and parallel circuits 7. **Ohm's Law** - In this lesson students will learn what is meant by resistance in a circuit and be able to rearrange and apply the Ohm's law equation

		8. **Resistance** - In this lesson students will learn about the effect of a length of wire on its resistance through investigation 9. **Magnetism –** In this lesson students will learn about the effect of magnetic fields on magnetic objects 10. **Electromagnetism** – In this lesson students will learn about how to construct electromagnets and change their strength
Key Domains and Concepts taught in this Unit / Term	D1. Energy & Energy Transfers D2. Particle Model D5. Accurately Measuring and Reporting data C1. Circuits & electrical charge C2. Energy transformation & rate of charge C5. Particle arrangement C9. Magnetic field & the motor effect C13. Formula rearrangement & application C14.Numeracy C15. Si Units C17. Graph Interpretation	D1. Energy & Energy Transfers D2. Particle Model D5. Accurately Measuring and Reporting data C1. Circuits & electrical charge C2. Energy transformation & rate of charge C3. Heating & Cooling C5. Particle arrangement C13. Formula rearrangement & application C14.Numeracy C15. Si Units C17. Graph Interpretation
KS4 End Points	**EP1. Demonstrate a deep understanding of science and how it relates to the world around us.** **EP2. Conduct practical science safely and accurately** **EP3. Visualise physical, chemical and biological processes** **EP4. Solve problems, communicate ideas, Enquire and Analyse information** **EP5. Numeracy and manipulation of mathematical equations**	**EP1. Demonstrate a deep understanding of science and how it relates to the world around us.** **EP2. Conduct practical science safely and accurately** **EP3. Visualise physical, chemical and biological processes** **EP4. Solve problems, communicate ideas, Enquire and Analyse information** **EP5. Numeracy and manipulation of mathematical equations**
Declarative Knowledge (Students should know)	Current is a movement of electrons and is the same everywhere in a series circuit.	We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway.

	Current divides between loops in a parallel circuit, combines when loops meet, lights up bulbs and makes components work. The field strength decreases with distance. Two similarly charged objects repel, two differently charged objects attract.	In a series circuit, voltage is shared between each component. In a parallel circuit, voltage is the same across each loop. Components with resistance reduce the current flowing and shift energy to the surroundings.
Procedural Knowledge (Students should be able to do)	Describe how current changes in series and parallel circuits when components are changed. Turn circuit diagrams into real series and parallel circuits, and vice versa. . **EXTEND** - Compare the advantages of series and parallel circuits for particular uses. **EXTEND** - Evaluate a model of current as electrons moving from the negative to the positive terminal of a battery, through the circuit. HOW SCIENCE WORKS - Compare and explain current flow in different parts of a parallel circuit enabling students to: draw conclusions present data, communicate ideas, construct explanations, devise questions, plan variables and test hypothesis.	Calculate resistance using the formula: resistance (Ω) = potential difference (V) ÷ current (A). Draw a circuit diagram to show how voltage can be measured in a simple circuit. Use the idea of energy to explain how voltage and resistance affect the way components work. Given a table of voltage against current. Use the ratio of voltage to current to determine the resistance. Use an analogy like water in pipes to explain why part of a circuit has higher resistance. **EXTEND** - Predict the effect of changing the rating of a battery or a bulb on other components in a series or parallel circuit. **EXTEND** - Justify the sizes of voltages in a circuit, using arguments based on energy. **EXTEND** - Draw conclusions about safety risks, from data on voltage, resistance and current.

		HOW SCIENCE WORKS - Draw conclusions, present data, communicate ideas, construct explanations, devise questions, plan variables and test hypothesis
Developing T3 Literacy and Numeracy	**Electrons**: Tiny particles which are part of atoms and carry a negative charge. **In series**: If components in a circuit are on the same loop. **In parallel**: If some components are on separate loops. **Field**: The area where other objects feel a magnetic force	**Potential difference (voltage):** The amount of energy shifted from the battery to the moving charge, or from the charge to circuit components, in volts (V). **Resistance:** A property of a component, making it difficult for charge to pass through, in ohms (Ω). **Electrical conductor:** A material that allows current to flow through it easily, and has a low resistance. **Electrical insulator:** A material that does not allow current to flow easily, and has a high resistance.
Assessment (Summative and Formative)	Formative – questioning in class, live marking and Educake online homework Summative – End of unit test	
Links to Prior Learning	In Key Stage 2 students will have learnt: • associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit • compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches • use recognised symbols when representing a simple circuit in a diagram	
Next steps in learning	Covered in more detail in Key Stage 4 during the physics and combined science course.	

Common Barriers to learning in this unit	Abstract concepts to model and visualise	