

### KS4 Physics – Electricity and Magnets

Subject curriculum intent:	<p>To develop in our students:</p> <ul style="list-style-type: none"> <li>• An enjoyment of Science by providing relevant, interesting and challenging experiences and activities.</li> <li>• Observational skills, by looking for patterns and contrasts.</li> <li>• An inquiring mind and a logical approach to problem solving.</li> <li>• The ability to draw conclusions from simple experiments and, where appropriate, to devise suitable experiments for further investigations.</li> <li>• Communication skills in speaking and listening, written, diagrammatic and symbolic forms.</li> <li>• Co-operation and a respect for others by being able to work as part of a team – the development of appropriate social skills.</li> <li>• Confidence in their own abilities.</li> <li>• A respect for the environment and a careful use of resources.</li> <li>• An interest in the world about them and a greater understanding of it.</li> </ul>		
End of KS3 intent/outcome	End of KS4 intent/outcome	End of KS5 intent/outcome	
Students will build on their knowledge of science through the different areas – biology chemistry and physics. Students will ‘work scientifically’ to achieve the goals of each topic area they encounter.	Students will continue to develop their scientific knowledge through the different areas – biology, chemistry and physics. Students will ‘work scientifically’ to achieve the goals of each topic area they encounter. Students will be able to relate their scientific experiences to everyday life and have an understanding that science is all around them.	N/A	
Intent for this topic:	<p>Students will learn about electrical circuits, how electrical current flows through them and the role of each component within a circuit. Students will investigate changes in electrical current, learn about dangers of electricity and how to keep themselves safe when working with electricity. Students will learn what magnets are made from and how magnets react with each other. They will also investigate magnetic materials and their uses in everyday life.</p> <p>Students will ‘work scientifically’ to achieve these goals, learning the key features of scientific enquiry; observing over time, pattern seeking, identifying, classifying, investigating (fair tests) and researching.</p>		
Core vocabulary needed for this subject/topic:	<p><b>Subject:</b> Biology, Chemistry, Physics Observe, pattern, identifying, classifying, investigating, fair test, researching</p>		

	<p><b><u>Topic:</u></b>  <b><u>Electricity</u></b>  Electricity, appliances, battery, circuit, mains electricity, conductor, insulator, current, ammeter  Components - cell, bulb, buzzer, motor, wires, switch  Series circuit, complete circuit, incomplete circuit.</p> <p><b><u>Magnets</u></b>  Magnets, magnetic, poles, north, south, repel, attract</p>
Vocabulary pupils will have accessed in other topics or subject areas:	<p><b><u>Electricity</u></b>  Electricity, appliances, battery, circuit, mains electricity, conductor, insulator, current, ammeter  Components - cell, bulb, buzzer, motor, wires, switch  Series circuit, complete circuit, incomplete circuit.</p> <p><b><u>Magnets</u></b>  Magnets, magnetic</p>
Key vocabulary taught within this topic:	<p><b><u>Electricity</u></b>  Electricity, appliances, battery, circuit, mains electricity, conductor, insulator, current, ammeter  Components - cell, bulb, buzzer, motor, wires, switch  Series circuit, complete circuit, incomplete circuit.</p> <p><b><u>Magnets</u></b>  Magnets, magnetic, poles, north, south, repel, attract</p>

**Prior knowledge: what pupils may already have studied**

Key stage	Subject	Topic title	Term/year taught	Content/What might pupils already know?
KS3	Science	Energy	Summer 1/Year 2	Students will have learnt what energy is and may have learnt about electrical and magnetic energy.
KS3	Science	What is electricity?	Summer 2/Year 2	Students will have learnt the names of different components and how to use them to make a circuit.
KS3	Science	Forces and Magnets	Summer 2/Year 3	Students will know what a magnet is and may have investigated which materials are magnetic.
KS3	Science	Waves: All about light.	Summer 2/Year 1	Students will have learnt about different light sources and how light travels.
KS3	PSHCE	Caring for the environment	Autumn 2/Year 1	Students may have looked at sustainable energy and how we can help the environment by providing electricity in different ways e.g. solar panels.
KS4	Science	Energy and Forces	Summer 1/Year 2	Students will have learnt what energy is and may have learnt about electrical and magnetic energy.

Links to other subjects: PSHCE, Geography

	<u>OU P Steps 5-6</u>	<u>OU P Steps 7-8</u>	<u>OU Step 1</u>	<u>OU Step 2</u>	<u>OU Step 3</u>
<b><u>Subject specific knowledge</u></b>					
<b><u>Electricity</u></b>	<p>Knows the circuit symbols for wire, bulb and battery.</p> <p>Understands that all components need to connect to make a circuit work.</p> <p>Can sort appliances that have a switch and don't have a switch.</p> <p>Can make a circuit using a wire, cell and bulb.</p> <p>Can label electrical components using symbols.</p> <p>Identifies 1 potential danger of electricity using images and a choice of 2 symbols.</p>	<p>Knows the circuit symbols for wire, switch, bulb and battery.</p> <p>Identifies that circuits only work when electricity can go all the way round.</p> <p>Know the components needed to make a complete circuit.</p> <p>Can name 3 appliances in the home that use a switch.</p> <p>Can label electrical components.</p> <p>Can complete a circuit diagram.</p> <p>Can build a circuit to include a switch and match a definition to explain how a switch works when it is on or off.</p>	<p>Knows the circuit symbols for wire, switch, bulb, ammeter and battery.</p> <p>Describes that circuits only work when they are 'complete'.</p> <p>Can name 5 appliances in the home that use a switch.</p> <p>Knows the name of the different components and can match them to their diagrams.</p> <p>Knows how to draw a circuit diagram.</p> <p>Can include a switch in a circuit and use key words and sentence scaffolds to explain how it works.</p> <p>Can name 3 conductors and 3 insulators of electricity.</p>	<p>Knows the circuit symbols for wire, switch on, switch off, bulb, ammeter and battery.</p> <p>Describes that circuits only work when the current flows all the way around.</p> <p>Can identify some appliances in the home that have a switch.</p> <p>Can include a switch in a circuit and use key words to explain how it works.</p> <p>Can name the electrical components used in a circuit they have made.</p> <p>Knows how to draw circuit diagrams.</p> <p>Knows the names of some insulators and conductors.</p>	<p>Knows the circuit symbols for wire, switch on, switch off, bulb, ammeter, volt meter and battery.</p> <p>Explains that circuits only work when the current flows all the way around.</p> <p>Can include a switch in a circuit and explain how it works in detail with scientific vocabulary.</p> <p>Knows the names of the electrical components and make a circuit.</p> <p>Can identify, series circuits, complete circuits and incomplete circuits.</p> <p>Can draw a range of circuit diagrams.</p>

		<p>Can name 1 conductor and 1 insulator of electricity.</p> <p>Identifies 3 potential danger of electricity using images and a choice symbols.</p>	<p>Identifies potential dangers of electricity using images and verbal prompts.</p>	<p>Describes potential dangers of electricity using images with verbal prompts.</p>	<p>Knows the names of several insulators and conductors.</p> <p>Knows that current is measured in ammeters.</p> <p>Describes potential dangers of electricity using images and suggests safety precautions.</p> <p>Identifies the neutral, live and earth wires in a plug.</p>
<b><u>Magnets</u></b>	<p>Identifies that the 2 ends of a magnet are called north and south with gestural prompts.</p> <p>Knows that something that is magnetic will stick to different things.</p> <p>Understands that not all metals are magnetic.</p> <p>Knows that magnets do not need to touch to react after a demonstration.</p>	<p>Knows that the 2 ends of a magnet are called north and south.</p> <p>Understands that not all metals are magnetic and can name 1 magnetic metal.</p> <p>Knows that magnets do not need to touch to react.</p>	<p>Know that the 2 ends of a magnet are called north and south and that they react differently when pushed together.</p> <p>Can identify that the magnetic materials are iron and nickel from a choice of symbols.</p> <p>Knows the basic shape of the magnetic field around a magnet.</p> <p>Understands that you can turn an electromagnet on and off.</p>	<p>Uses the terms repel and attract when describing how magnets react to each other.</p> <p>Knows that the magnetic materials are iron and nickel.</p> <p>Identifies the shape of the magnetic field around a magnet from a choice of 2 with verbal prompts.</p> <p>Explains the difference between a magnet and an electromagnet.</p>	<p>Describes the terms repel and attract when describing how magnets react to each other.</p> <p>Knows that the magnetic materials are iron, nickel and cobalt.</p> <p>Independently identifies the shape of the magnetic field around a magnet from a choice of 3.</p> <p>Explains the difference between a magnet and an electromagnet and suggests uses for both.</p>

Subject specific skills

<p><b><u>Electricity</u></b></p>	<p>Is able to make circuits using equipment identified by symbols.</p> <p>Identifies changes in a circuit when more batteries are added.</p> <p>Identifies the difference between a safe piece of electrical equipment and a dangerous piece of equipment.</p>	<p>Is able to make series circuits using circuit diagrams, with verbal and gestural prompts.</p> <p>Identifies changes in a circuit when more batteries or bulbs are added.</p> <p>Identifies hazards for an electrical danger in given examples.</p>	<p>Is able to confidently make series circuits using circuit diagrams.</p> <p>Uses an ammeter to measure current in circuits with differing numbers of batteries.</p> <p>Identifies hazards for an electrical danger and suggests examples.</p>	<p>Is able to confidently make series circuits using circuit diagrams, identify errors, and correct them with verbal prompts.</p> <p>Uses an ammeter to measure current in circuits with differing numbers of batteries and bulbs.</p> <p>Identifies hazards for an electrical danger and identifies the correct precaution from given options.</p>	<p>Is able to confidently make series circuits using circuit diagrams, identify errors, and correct them independently.</p> <p>Independently uses an ammeter to measure, and record, current in circuits with differing numbers of batteries and bulbs.</p> <p>Identifies hazards for an electrical danger and suggests precautions.</p>
<p><b><u>Magnets</u></b></p>	<p>Observes and identifies how the 2 poles of a magnet react when they are pushed together.</p> <p>Is able to use a magnet to test materials.</p> <p>Is able to use iron fillings and a magnet to create a pattern of the magnetic field with gestural prompts.</p>	<p>Investigates how the 2 poles of a magnet react when they are pushed together.</p> <p>Is able to use a magnet to test materials and record the information in a simple table.</p> <p>Is able to use iron fillings and a magnet to create a pattern of the magnetic field with verbal prompts.</p>	<p>Investigates how the 2 poles of a magnet react when they are pushed together and describes what happens using a bank of symbols.</p> <p>Is able to use a magnet to test materials and record the information in a simple table by describing results.</p> <p>Is able to use a template and a compass to plot the magnetic</p>	<p>Investigates how the 2 poles of a magnet react when they are pushed together and describes what happens using the terms repel and attract with verbal prompts.</p> <p>Is able to use a magnet to test materials and record the information in a table by analysing results.</p> <p>Is able to use a template and a compass</p>	<p>Investigates how the 2 poles of a magnet react when they are pushed together and independently describes what happens using the terms repel and attract.</p> <p>Is able to use a magnet to test materials, record the information in a table and identify trends or unusual results.</p>

	Demonstrates the effect of turning an electromagnet on and off with verbal prompts.	Demonstrates the effect of turning an electromagnet on and off independently.	field with verbal prompts.  Investigates the strength of electromagnets and records the results in a simple table.	to plot the magnetic field with pictorial or written instructions.  Investigates the strength of electromagnets and creates a simple table to record results.	Is able to use a compass to plot and draw the magnetic field around a magnet.  Creates an investigation into the strength of electromagnets.
<b><u>Both Topics</u></b>	Is able to follow a set of demonstrations to carry out a simple investigation.	Is able to make a prediction from a choice of 3 using symbols.  Is able to follow a picture method to carry out a simple investigation.  Is able to identify one thing that has changed when completing a fair test.  Identifies the correct result in a table.	Is able to select an appropriate prediction from a given choice.  Is able to follow a word and picture method to carry out a simple investigation.  Is able to suggest what to change when completing a fair test.  Is able to record results in a simple table.  Analyses results in the form of tables, simple bar graphs and a brief descriptions using key words or sentence blanks.	Is able to make a prediction linked to their investigation.  Is able to follow a written set of instructions to carry out a simple investigation.  Is able to explain why their investigation included a fair test.  Is able to record results in a suitable table.  Is able to record results in the form of a simple bar graph.  Analyses results in the form of tables, simple bar graphs and a brief description.	Is able to make predictions.  Is able to follow a written set of instructions to carry out a simple investigation.  Is able to design an experiment to include a fair test.  Is able to record results in a suitable table.  Analyses results in the form of tables, simple bar graphs and a brief description.  Is able to draw conclusions from their results.

<p><b><u>Suggested Activities</u></b></p>	<p><b><u>Electricity</u></b></p> <ul style="list-style-type: none"> <li>• Look at electrical items and non-electrical items in the home.</li> <li>• Look how to stay safe with electricity in the home. E.g. not overloading sockets, leaving wires running accorss the floor, not putting fingers in sockets etc.</li> <li>• Matching circuit symbols to pictures.</li> <li>• Matching circuit symbols names.</li> <li>• Label the different components in a circuit.</li> <li>• Making circuits using equipment.</li> <li>• Changing numbers of batteries in a circuit.</li> <li>• Making circuits using diagrams.</li> <li>• Make different circuits including different components e.g. bulb, buzzer, motor.</li> <li>• Look at electrical appliances that use a switch in the home.</li> <li>• Build a circuit containing a switch.</li> <li>• Make a switch using a paper clip and split pins.</li> <li>• Explain what happens to the circuit when the switch is on (closed) and off (open).</li> <li>• Draw and label circuit diagrams of circuits made.</li> <li>• Explore conductors and insulators of electricity.</li> <li>• Use ammeters to measure current in an electrical circuit.</li> <li>• Measuring current.</li> <li>• Making fruity batteries.</li> <li>• Wiring a plug correctly. See RA.</li> </ul> <p><b><u>Magnets</u></b></p> <ul style="list-style-type: none"> <li>• Repel/Attract magnets.</li> <li>• Making a magnetic field using iron fillings</li> <li>• Testing electromagnets.</li> </ul>
<p><b><u>Possible Investigations/ Working Scientifically</u></b></p>	<p><b><u>Electricity</u></b></p> <ul style="list-style-type: none"> <li>• Investigation - which circuits are complete or incomplete? - Look at diagrams of circuits, predict if they are complete or incomplete. Make the different circuits and record the results.</li> <li>• Investigation - Which objects are conductors of electricity - build a circuit and include different objects to test if they are conductors or insulators of electricity. Make predictions first and record results.</li> </ul> <p><b><u>Magnets</u></b></p> <ul style="list-style-type: none"> <li>• Investigation - what is magnetic? Investigate which materials are magnetic and not magnetic. Make predictions 7 record results.</li> <li>• Dancing paper clips - observe and describe what happens.</li> </ul>

<p><b><u>Personal development</u></b></p>	<p><b><u>Problem solving</u></b> Investigations and matching exercises</p> <p><b><u>Communication skills</u></b> Working as pairs in investigations, asking and answering questions</p> <p><b><u>Self-belief</u></b> Learning new skills, practising them and demonstrating them.</p> <p><b><u>Self-management</u></b> Working with new equipment</p> <p><b><u>Teamwork</u></b> Working as groups to solve problems or find out new information</p>
<p><b><u>Online resources</u></b> twinkl CLEAPPS for risk assessments BBC bitesize for video resources.</p>	
<p><b><u>Evidencing Work</u></b> All work / evidence sheets need to be printed off, annotated by staff, self-assessed by pupils and stored in student folders.</p>	

**RRSA Articles:**

Article 13 - I have the right to find and share information.

Article 17 - I have the right get information in lots of ways, so long as it's safe.

Article 29 - I have the right to an education which develops my personality, respect for others' rights and the environment.