Year 9 Physics Curriculum – 2022-23

	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
	Energy and Energy Resources		Practical Skills and Electricity			
National Curriculum Knowledge & Understanding	Energy and Energy Resources In this unit, pupils will continue to develop their understanding of energy and energy transfer begun in years 7 and 8. This includes development of an energy stores model and the processes, such as forces and electrical currents, through which energy can be transferred. Pupils will learn how to analyse energy changes in gravitational stores, through lifting and falling, and elastic potential stores during stretching using the relevant mathematical relationships. The conservation of energy through changes in the gravitational, kinetic, and elastic stores will also be discussed. Pupils will consider the dissipation of energy during transfers such as those caused by electrical heating, leading to the idea of efficiency during different energy changes and its calculation. The concept of efficiency will then be applied to the selection of electrical devices. They will apply this to the use of fossil fuels in a power station, and in contrast with why we should use more renewable resources of		Practical Skills Working scientifically skills are an important and integral aspect in physics. Pupils need to be able to identify variables and carry out investigations using their skills to obtain valid results to investigations. This unit will continue in the development of the working scientifically aspect of KS3 National Curriculum as maths and literacy skills.	Electricity Electricity is a fundamental part of life which we take for granted and it explains why everyday appliances work. Its important pupils know the safety aspects of it and basic methods of wiring plugs and making circuits. Electricity is a fundamental part of life which we take for granted. In this topic pupils will build upon their knowledge of electricity and energy transfers investigating how electricity is distributed safely in the home. They will acquire practical skills in terms of wiring a plug. Pupils will also build circuits with resistive devices investigating how external factors affect their resistance. They will also investigate the relationship between voltage, current and resistance including mathematical equations of ohmic conductors. Finally, the pupils will investigate and analyse a range of series and parallel circuits describing the path of current at junctions, the potential difference across branches and components, and the effect on resistance of series and parallel branches. Pupils will investigate and take	Revision Pupils will also use a variety of revision techniques and strategies to enable them to focus their independent revision on areas they need to further develop for their end of year assessment.

	energy to increase their awareness of the effects of using energy resources environment. The students will compare all the energy resources in terms of local environmental impacts such as pollution and global environment impacts such as acid rain and contribution to global warming. This module is crucial for students to develop an understanding of the climate change crisis and how to develop efficient systems for generating electricity for the future by incorporating more renewable resources. This will enable pupils to understand energy in everyday life.		measurements to enable them to apply mathematical equations to draw conclusions. They will continue their studies on resistance and investigate non-ohmic conductors.		
Assessment	End of unit assessment	Practical assessment of skills	End of unit assessment	Practical assessment of skills	End of year assessment
Why this? Why now?	Pupils have already studied energy and energy transfer in year 7 and then building on this knowledge in year 8. This unit further applies their existing knowledge to explain the properties of substances undergoing changes of state in relation to the energy of their particles. It is also important that this unit is taught after energy costs and energy transfer so that pupils can appreciate the laws of conservation of energy and includes development of an energy stores	This unit will build on skills from KS2 and from years 7 and 8 where they have already had many opportunities for developing working scientifically and practical working skills. This will also aid in the	Pupils should have a secure knowledge of circuits and basic circuit building skills which were studied in year 7 and prior to this KS2. This is an ideal point to revisit aspects of the KS3 curriculum, while delving deeper	Working scientifically skills are an important and integral aspect in physics, which is why pupils will continue in their learning. Pupils need to be able to continually identify variables and carry out investigations	In this section pupils will revisit vital aspects of each unit and mathematical skills studied in preparation for their end of year assessment. It is important pupils revisit scientific concepts in order to aid understanding

	model and the processes, such as forces and electrical currents, through which energy can be transferred. Pupils have already been introduced to work in year 8, now they will learn how to measure the work done by a force acting over a distance and how this concept can be used to analyse energy changes in gravitational stores, through lifting and falling, and elastic potential stores during stretching using the relevant mathematical relationships. The conservation of energy through changes in the gravitational, kinetic, and elastic stores will also be discussed. Pupils will then be able to consider the dissipation of energy during transfers such as those caused by friction or electrical heating, leading to the idea of efficiency during different energy changes and its calculation. The concept of efficiency will then be applied to the selection of electrical devices. In year 8 pupils have been introduced to the idea that there are renewable and non-renewable energy resources. Pupils will now examine renewable energy stores in more detail. This unit will then incorporate aspects of both energy, work and energy transfers to be able to explain the laws of conservation of energy and to examine energy efficiency while also using developing investigative	enhancement of social skills such as working in groups to carry out investigative processes required. This is especially important post-covid where opportunities for practical group work may have been less frequent. Working scientifically skills are an imperative aspect of future learning as they are tested on throughout KS4 in the completion of required practical's for biology, chemistry and physics and in KS5 pupils practical skills will become more refined. These opportunities are essential for building skills	within the topic. Pupils will also have the practical skills such as the ability to be able to read meters correctly which are needed to successfully access the practical elements of this unit. Pupils will also be reliant on understanding of electrical conductors and insulators and apply this to electrical safety. Good practical planning and investigative skills are important to develop before progression to KS4 and pupils will have already experienced some of this while completing practical work. They will build on their understanding from this unit to	using their skills to obtain valid results to investigations. This unit will continue in the development of the working scientifically aspect of KS3 National Curriculum as maths and literacy skills. This unit will build on skills from KS2 and from years 7 and 8 where they have already had some opportunities for developing working scientifically and practical working skills. This will also aid in the enhancement of social skills such as working in groups to carry out investigative processes required. This is especially important post-covid where	and retention of scientific concepts to enable form foundations to be made.

	and mathematical skills. Pupils' knowledge will be further extended from KS3 to KS4 by introducing scientific language and theory such the mathematics behind kinetic energy stores helping to fabricate links to future study such as elasticity. Furthermore, pupils will then be able to analyse the changes in temperature when a material is heated, leading to the experimental determination of specific heat capacity along with corresponding calculations. The concept of specific heat capacity will then be used to explain the choice of materials used in heating systems. Finally, the reduction of energy transfers to the surroundings by insulation, such as loft or cavity wall insulation, will be studied and applied to the context of reducing energy loss in buildings to reduce heating costs including the idea prioritising home improvements in line with payback time which will be useful to them in the future. This will enable pupils to apply concepts of energy to their lives outside of school so they can determine how energy can be saved in the home. AT KS4 the basic principles of this unit will then be applied in their studies of elasticity and the particle model of matter. Pupils' mathematical skills should be developed enough by this stage to complete all the calculation elements of this unit. Good practical	ready for further education, apprenticeships and employment opportunities in the future.	further investigations of electrical components and analysis of the current-potential difference graphs showing non-ohmic behaviours for some resistors. At KS4 pupils will continue with their studies on energy and electrical power, by studying further related equations such as $E=QV$ and $P=I^2R$. At this stage their mathematical skills should be developed enough to complete multi-step calculations involving more than one equation. This unit also provides a link to developing their understanding of electricity in the home, where they will study	opportunities for practical group work may have been less frequent. Working scientifically skills are an imperative aspect of future learning as they are tested on throughout KS4 in the completion of required practical's for biology, chemistry and physics and in KS5 pupils practical skills will become more refined. These opportunities are essential for building skills ready for further education, apprenticeships and employment opportunities in the future.	

	planning and investigative skills are important to develop before progress in to KS4.		a.c and d.c in more details and how electric shocks can be caused. Pupils will also be able to carry out necessary mathematical equations and practice them in future units and at KS4.		
Skills & Characteristics	**Listening** Pupils will have opportunities to develop their listening skills throughout this academic year, specifically when being given instructions for investigative work. They will also listen to each other throughout group work and opportunities for presenting their work. **Problem Solving** Pupils will use problem solving skills when evaluating the results from investigative processes. They will work collaboratively to explain why anomalous results may occur. **Aiming High** All pupils will set clear, tangible goals and which can especially be met during investigative work and using level ladders in assessments. **Teamwork:** Pupils will be required to work in a group whilst carrying out practical work or problem-solving activities showing that these skills are necessary in the world of work irrespective of career choice.				
Aspirations & Careers	**CEIAG** Aerospace shadowing Careers Fair				

	Work Experience **Cultural Capital** Pupils are encouraged to make links between current events, like renewable energy sources, and our Physics learning in the classroom. All pupils take advantage of our excellent links with the Engineering department at Sunderland University, the Reece Foundation and the Ogden Trust for external visits and in school activities. **Extracurricular** Stem club Lego Robotics league "Physics is Fun" schools' competition "Schools Physicist of the year" award

Year Group	Basic (Lower Ability End Points)	Clear (Middle Ability End Points)	Detailed (Higher Ability End Points)
9	Pupils describe processes and phenomena related to energy and electrical circuits using abstract ideas and appropriate terminology, for example energy stores and transfers. They take account of a number of factors in their explanations of processes and phenomena, for example how resistance can be changed within a circuit. They also use abstract ideas or models for example to identify changes in some energy stores using simple systems. They apply and use knowledge and understanding in unfamiliar contexts. They describe some evidence for some accepted scientific ideas, such as the transfer of energy from one store to another. They explain the importance of some applications and implications of science, such as the responsible use different types of renewable energy systems. **Working Scientifically** Pupils decide appropriate approaches to a range of tasks, including selecting sources of information and apparatus. They select and use methods to obtain data systematically. They recognise hazard symbols and make, and act on,	Pupils describe a wide range of processes and phenomena related to energy and electrical circuits using abstract ideas and appropriate terminology and sequencing a number of points, for example how energy is transferred by radiation or by conduction. They make links between different areas of science in their explanations, such as between using non-renewable energy resources and the effects on the environment. They apply and use more abstract knowledge and understanding in a range of contexts for example energy stores and transfers. They explain how evidence supports some accepted scientific ideas, such as the greenhouse effect in terms of absorption and emission of radiation. They explain, using abstract ideas where appropriate, the importance of some applications and implications of science, such as renewable energy systems. **Working Scientifically** Pupils identify an appropriate approach in investigatory work, selecting and using sources of information, scientific knowledge and understanding. They select and use methods to collect adequate data for the task,	Pupils demonstrate extensive knowledge and understanding related to energy and electrical circuits. They use and apply this effectively in their descriptions and explanations, identifying links between topics for example between current flow, work done and energy transfer. They interpret, evaluate and synthesise data from a range of sources and in a range of contexts. They show they understand the relationship between evidence and scientific ideas, and why scientific ideas may need to be changed, such as the use of nuclear energy. They describe and explain the importance of a wide range of applications and implications of science, such as relating the dissipation of energy during energy transfer to the need to conserve limited energy resources. **Working Scientifically** Pupils plan appropriate approaches and procedures, by synthesising information from a range of sources and identifying key factors in complex contexts and in which variables cannot readily be controlled. They select and use methods to obtain reliable data,

	simple suggestions to control obvious risks to themselves and others. They use line graphs to present data, interpret numerical data and draw conclusions from them. They analyse findings to draw scientific conclusions that are consistent with the evidence. They communicate these using scientific and mathematical conventions and terminology. They evaluate their working methods to make practical suggestions for improvements.	measuring with precision, using instruments with fine scale divisions, and identify the need to repeat measurements and observations. They recognise a range of familiar risks and take action to control them. They record data and features effectively, choosing scales for graphs and diagrams. They analyse findings to draw conclusions that are consistent with the evidence and use scientific knowledge and understanding to explain them and account for any inconsistencies in the evidence. They manipulate numerical data to make valid comparisons and draw valid conclusions. They communicate qualitative and quantitative data effectively, using scientific conventions and terminology. They evaluate evidence, making reasoned suggestions about how their working methods could be improved.	including making systematic observations and measurements with precision, using a range of apparatus. They recognise the need for a risk assessment and consult appropriate sources of information, which they follow. They record data in graphs, using lines of best fit. They analyse findings to draw conclusions that are consistent with the evidence and use scientific knowledge and understanding to explain these conclusions and identify possible limitations in primary and secondary data. They use quantitative relationships between variables. They communicate effectively, using a wide range of scientific and technical conventions and terminology, including symbols and flow diagrams. They begin to consider whether the data they have collected are sufficient for the conclusions they have drawn.