Year 7 Physics Curriculum – 2020-21

	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	Forces		Electromagnets	Energy	Waves	
National Curriculum Knowledge & Understanding	**Speed** * Forces as pushes or pulls, arising from the interaction between two objects * Forces measured in newton * Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces * Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) * Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface. * Change depending on direction of force and its size.	**Gravity** * Non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity * Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun	**Potential Difference and resistance** * Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current * Differences in resistance between conducting and insulating components Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge	**Calculation of fuel uses and costs in the domestic context** * Comparing energy values of different foods (from labels) (kJ) * Comparing power ratings of appliances in watts (W, kW) * Comparing amounts of energy transferred (J, kJ, kW hour) * Domestic fuel bills, fuel use and costs * Fuels and energy resources * Energy as a quantity that can be quantified and calculated; the total energy has the same value	**Sound** * Sound needs a medium to travel, the speed of sound in air, in water, in solids * Frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound * Sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal * Auditory range of humans and animals.	**Light** * Light waves travelling through a vacuum; speed of light * The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface * Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye *Light transferring energy from source to absorber leading to chemical and

	* Speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) * The representation of a journey on a distance-time graph * Relative motion: trains and cars passing one another.		* Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects * The idea of electric field, forces acting across the space between objects not in contact.	before and after a change * Comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions * Using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.		electrical effects; photo-sensitive material in the retina and in cameras * Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.
Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment

		End of term Summative Assessment		End of term Summative Assessment		End of term Summative Assessment

Why this? Why now?	It is important for pupils to be introduced to the concept of force interaction pairs in their most basic form, as indentifying these interactions leads to the knowledge of balanced/unbalanced forces and resultant force which is needed to better understand motion in a straight line and Newtons Laws which pupils will need before progressing on to non-linear motion in year 8. Pupils have already been introduced to basic interaction pairs in in KS2 when they studied the effect of gravity and resistance on moving objects. It is important to now use investigative techniques to predict the motion of objects	Pupils will move forward in year 8 to investigate the stretching relationships in Hooke's Law. To fully understand and make scientific predictions based on knowledge, pupils need to understand how gravity effects objects with mass and be able to define the difference between force and mass. Pupils also study energy changes later in year 7 and then in more detail in year 8 and for this, pupils must be able to predict the energy changes when gravity is acting upon an object. Pupils need to have be able to plan, predict and obtain data, which	This unit is moving pupils forward to understanding what electricity is, how it is generated, how it is transferred, and the units associated with it. Pupils cover this unit to provide them with the necessary skills and understanding to understand electricity generation by electromagnetic induction in year 8. Pupils have already built simple series and parallel circuits in KS2 and can identify appliances powered by electricity, so this knowledge acts a good precursor to think about electrical current as moving charge, moving pupils	Energy is very important and often abstract concept that forms the basis of many topics in Biology, Chemistry and Physics. Pupils will have heard the term energy, but energy stores and transfers are not distinctly covered at KS2 outside of food chains and ecosystems. It is important for pupils to start understanding what energy it is in its own right, and how it can be stored and transferred through the main pathways. This will provide pupils with the skills and understanding needed to access the Light and	Sound is a concept that pupils will have been familiar with throughout their early years and KS1/KS2 education, but some pupils may not be aware that sound is a wave. It is important to correct this misconception and build upon pupils existing knowledge of sound. Pupils will study further the properties of waves I year 8 so fundamental knowledge of sound waves is required in this unit. Pupils should already be aware that sound must travel through a medium, but some may not be aware that sound travels as waves. It is	Light is another concept that pupils will be familiar with from KS2 and they can visualise some of its properties easily. Pupils should be aware that light travels in straight lines from their studies at KS2, but pupils may not have much knowledge or understanding of the wave nature of light, so it is important to address these misconceptions now in the teaching of this topic and build further upon their existing knowledge. Pupils should already be aware that light travels in straight lines, but some may not be aware that is a wave. It is

	based upon the relative force applied. Pupils should have now gained the appropriate skill sets from the “working scientifically” aspect of KS2 to plan, interpret and record the data needed to show the relationship between force interaction pairs and speed and should have the required mathematical skills from KS2 to use given formula and perform basic calculations.	they should have gained the necessary skills from during the “working scientifically” element of KS2. Pupils should have the mathematical ability in year 7 to calculate force/weight from mass. These concepts need to be taught before moving on to energy transfers later in year 7 and before stretching is taught in year 8, so that pupils can make scientific predications based on skills and knowledge.	towards thinking at a subatomic level. Pupils should have the practical skills needed to observe and record the relationship between current and resistance and should have the mathematical skill needed to perform basic calculations using given formula. This unit needs to be taught before further work on electromagnetism is completed in year 8.	sounds topics in year 7. Pupils will have heard of energy, but many will not be able to give a true definition at the start of year 7. It is important o address to gaps in knowledge about energy transfer and stores at this point in year 7, before the light and sound topic are taught in year 7 and before the additional Physics topics are taught in year 8. Pupils should now have the scientific skills from KS2 to make observations and record results, from which they can draw conclusions and make further predictions. Pupils will have already studied states of	important that pupils have already studied the energy unit before moving on to the sound topic, so they can apply their knowledge and understanding of energy transfers to the big question of “why can we hear sounds?”	important that this topic is taught after the energy topic, so that pupils can build upon their understanding of energy transfer pathways. Pupils should have the mathematical skills in year 7, required to measure angles and use a protractor correctly. This unit must be taught before the properties of waves unit taught in year 8, to ensure pupils can apply their knowledge and understanding to the new context.

				matter in year 7 chemistry, so they should already understand the changes taking place at a particle level when a substance changes state.		

Skills & Characteristics	**Resilience** Being able to look at practical results, identify anomalies and carrying out repeats are all essential skills to build resilience **Collaboration** Lessons involve practical group work to improve lab skills and communication. Pupils understand the importance of discussion and peer review in the scientific community. **Creativity** Application of knowledge and logical thinking skills are integral to scientific investigation
Aspirations & Careers	**CEIAG** Medical Experience days: These events link with scientific content and bring 'real-life', everyday experiences into the classroom which specifically link to new technology and waves in the curriculum. CDI: 4, 5, 6, 7 Careers Fairs: Provides an opportunity to students to practice presenting themselves in front of potential employers. This is also a great way for students to compare employers, and find out what area of science/ scientific skills they need to focus on in the classroom in order to be considered for future posts. CDI: 4, 5, 6, 7 Work Experience: Students are introduced to different scientific skills by work colleagues during work experience which includes; the ability to problem solve, handling/ analysing data and communicate effectively. All skills which are used daily during day – to day lessons. CDI: 11, 12 **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: Help to inspire, attract and develop STEM talents during school. The purpose of a STEM club is to raise student's engagement and achievement in these subject areas. Lego Robotics league: Students apply their mechanical and electronic skills which they have gained from the classroom and apply them in a competition; whilst gaining extra knowledge and team working skills along the way. "Physics is Fun" schools' competition: This involves students focusing on an area in physics they wish to explore, then to create a presentation on this area for physicists to judge. Another good example to encourage teamwork, problem solving and research skills. "Schools Physicist of the year" award: Encourages students to explore and research areas of physics they want to broaden their knowledge on – not just limited purely to classroom teaching.

Year 8 Physics Curriculum – 2021-2022

	Autumn Term		Spring Term		Summer Term	
	1	**2**	**1**	**2**	**1**	**2**
Key Concepts	Forces		Electromagnets	Energy Changes	Energy	Waves
National Curriculum Knowledge & Understanding	**Contact Forces** * Forces measured in newtons, measurements of stretch or compression as force is changed * Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water * Force-extension linear relation; Hooke's Law as a special case * Moment as the turning effect of a force	**Pressure** * Atmospheric pressure, decreases with increase of height as weight of air above decreases with height * Pressure in liquids, increasing with depth; upthrust effects, floating and sinking * Pressure measured by ratio of force over area – acting normal to any surface.	**Magnetism** * Magnetic poles, attraction and repulsion * Magnetic fields by plotting with compass, representation by field lines * Earth's magnetism, compass and navigation * The magnetic effect of a current, electromagnets, D.C. motors (principles only)	**Energy changes and transfer** * Work done and energy changes on deformation * Simple machines give bigger force but at the expense of smaller movement: product of force and displacement unchanged * Other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.	**Heating and Cooling** * The differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition * Atoms and molecules as particles. * Changes with temperature in motion and spacing of particles * Internal energy stored in materials. * Heating and thermal equilibrium: temperature difference between two objects leading to energy transfer	**Wave effects and properties** * The similarities and differences between light waves and waves in matter * Waves on water as undulations which travel through water with transverse motion; these waves can be reflected and add or cancel – superposition. * Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone.

	* Work done and energy changes on deformation				from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators	
Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment End of term Summative Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment End of term Summative Assessment	End of Unit Assessment Badger Assessment	End of Unit Assessment Badger Assessment End of term Summative Assessment
Why this? Why now?	Pupils have investigated force interaction pairs in year 7. They are now going to further their knowledge and understanding by investigating specific force relationships such as Hooke's law. Pupils will need to have covered the	Pupils will have heard of the term pressure used in a variety of contexts. Pupils will also understand the particle model of matter and what happens to the energy and particle arrangement when a substance changes state from their year 7	Pupils will already have some knowledge of magnetic fields and the effect of magnetic poles from the year 7 curriculum and their studies at KS2. Pupils should also understand how electric current flows and how it can be created	Pupils have been introduced to the concept of energy and fuels as energy stores in year 7. This unit will further develop their understanding by introducing work done and energy transfer. It is important that the year 7 energy unit is taught prior to	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	Pupils should know that light and sound are both waves. Pupils should also be familiar with the transfer of energy through waves and pressure in fluids from their prior Physics topics. This unit builds upon their existing knowledge while

	topics of forces, gravity and energy in year 7 before they start this topic to ensure they can apply their existing knowledge to this new content and context. Pupils should now have the mathematical skills needed to plot a graph and identify the proportional relationship between force and extension. Understanding relationships between forces will prepare pupils for further investigation of motion, such as acceleration and circular motion in year 9 and KS4.	Chemistry studies. This unit is important to build upon these fundamentals and provide pupils with the knowledge and skills to investigate and describe pressure in fluids. Pupils should have the appropriate mathematical skills to carry out calculations using given formula and record and observe findings from investigations.	using static rods and clothes from year 7. Pupils will build upon their existing understanding in this unit and apply principles of magnetism and electricity to electromagnetism. Pupils should have the appropriate scientific skills at this age to use plotting compasses correctly and use the equipment needed to produce an electromagnet safely. Pupils should have the scientific skills to plan, observe and make conclusions and predictions based on outcomes.	this unit, to allow pupils to apply their existing knowledge to the concepts of energy transfers and pathways. Pupils should have appropriate mathematical skills in year 8 to calculate work done and energy.	relation to the energy of their particles. It is also important that this unit is taught after particle theory is taught in year 7 and year 8 Chemistry.	introducing new contexts. Waves have played a vital part in exploring the structure of the Earth and formation of the universe and a good understanding of these properties now, will enable pupils to explore the potential uses of waves in topics in year 9 and KS4.
Skills & Characteristics	**Resilience** Being able to look at practical results, identify anomalies and carrying out repeats are all essential skills to build resilience **Collaboration** Lessons involve practical group work to improve lab skills and communication. Pupils understand the importance of discussion and peer review in the scientific community.					

	Creativity Application of knowledge and logical thinking skills are integral to scientific investigation
Aspirations & Careers	**CEIAG** Aerospace shadowing CDI: 6 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 9 Curriculum – 2022-23

	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	New Technology		Turning Points in Physics		Detection	
National Curriculum Knowledge & Understanding	Physics in the home In this topic pupils will look at the applications of Physics in the technology in the home and sports settings. They will apply their knowledge of waves to the electromagnetic spectrum and investigate how these waves are utilised in everyday appliances such as mobile phones, internet, tv and microwave ovens. Pupils will build upon their knowledge of electricity and	Physics for medicine and energy In this topic pupils will build upon their existing knowledge of wave properties and light to investigate how reflection and total internal reflection is used in medical imaging. Pupils will continue to develop their knowledge and understanding of electricity as they research how defibrillators and ventilators are used in hospitals to keep patients alive. Pupils will evaluate the issues countries face to produce	Discovering the Universe In this topic pupils will look at early models of the universe and how the development of imaging devices and techniques such as the telescope have led to development of new models of the solar system and universe. Pupils will apply their knowledge of waves to evaluate the creation of the universe by the Big Bang Theory and look at the role of satellites and space missions in providing evidence	Radioactivity Pupils will apply their knowledge of sub-atomic structure to investigate alpha, beta and gamma radiation. Pupils will evaluate the uses and dangers of radiative sources and make conclusions about benefit and risk. Pupils will apply mathematical skills to look at the relationship of radioactive decay over a time period and define the term half-life.	Electromagnetism Pupils will apply their knowledge of magnets and electricity to explain the phenomenon of electromagnetism. Pupils will investigate how to induce an electrical current using magnets and how to produce a magnetic field using an electric current. Pupils will then investigate the uses of electromagnetic waves for communication including radio	Particles and planets Pupils will build upon their previous knowledge of light, space and electromagnetic waves to explore how scientists are searching for the existence of unknown sub-atomic particles, Pupils will draw on their previous knowledge of solar system models and telescopes to evaluate how scientists are searching for life on other planets within in the universe and describe how radio

	energy transfers investigating how energy is utilised in the home and investigate the efficiency of many household appliances and devices. Pupils will also build circuits with resistive devices including LDR's and thermistors to investigate how external factors effect their resistance.	energy but reduce carbon dioxide and other emissions from fossil fuels. Pupils will apply their knowledge of energy stores and transfers and investigate other potential energy sources such as renewables and nuclear fusion.	for the theory and further space exploration.		waves and microwaves.	waves can be used to send and receive messages.
Assessment	Assessed project comprising of unit test, practical assessment of skills in circuit building and further independent development project on new uses of electromagnetic radiation in the home.	Assessed project comprising of unit test, practical assessment of skills in in light reflection and finding the critical angle of total internal reflection and further independent development project on medical	Assessed project comprising of unit test, practical assessment of skills in using lenses and making a telescope and further independent development project on mission to Mars.	Assessed project comprising of unit test, practical assessment of skills in predicting what materials can reduce the count rate from different radioactive sources and further independent development project on the uses	Assessed project comprising of unit test, practical assessment of skills in making an a/c generator and motor and further independent development project on transformers.	Assessed project comprising of unit test, and further independent development project on known hadrons and leptons.

		imaging using nuclear radiation.		of radiation in medicine.		
Why this? Why now?	Pupils should have a secure understanding of basic wave properties from year 7 and year 8 and this unit seeks to extend this knowledge further by applying known content to electromagnetic radiation and its applications in the home. Pupils should have a secure knowledge of circuits and basic circuit building skills which will be needed to successfully access the practical element of this unit. Good practical planning and investigative skills are important to develop before progress in to KS4.	Pupils will have a basic knowledge of organ systems from their year 7 and 8 Biology by this point and should also have a secure knowledge of light and electricity needed to successfully complete this unit. Pupils mathematical skills should be developed enough by this stage to complete all the practical and calculation elements of this unit. Good practical planning and investigative skills are important to develop before progress in to KS4.	Pupils should have a secure understanding of basic wave properties from year 7 and year 8 and this units seeks to apply this to Space exploration and how scientific models are developed. Pupils observation and investigative skills should be developed enough by this unit for pupils to objectively evaluate what makes a good model and realise when newer models need to be proposed. Good practical planning and investigative skills are important to develop before progress in to KS4.	Pupils have a basic knowledge of sub-atomic structure from their year 7 and 8 Chemistry studies and this unit will expand upon this. Pupils should have the appropriate mathematical skills to plot graphs relating to half-life and use this to make evaluations about the use of radioactive sources in medicine. Good practical planning and investigative skills are important to develop before progress in to KS4.	Pupils should have a secure knowledge of magnetism and electromagnetism from their studies in year 7 and year 8 Physics by this point, which makes this unit a good choice to bridge the gap to GCSE. Pupils must be able to plan, observe and assess their practical work, along with using electrical sources safely. Pupils need to be able to read meters correctly and should have the appropriate mathematical skills to use and manipulate given formula. Good practical planning and investigative skills are important to	Pupils have a basic knowledge of sub-atomic structure from their year 7 and 8 Chemistry and of models of the universe from their year 9 unit. Pupils will need this content to apply to the theory of unknown particles and how they can be detected. Pupils need to evaluate data and missing/incomplete evidence to offer models for planets that potentially host life forms, and this is an abstract skill. Good practical planning and investigative skills are important to develop before progress in to KS4.

					develop before progress in to KS4	
Skills & Characteristics	**Resilience** Being able to look at practical results, identify anomalies and carrying out repeats are all essential skills to build resilience **Collaboration** Lessons involve practical group work to improve lab skills and communication. Pupils understand the importance of discussion and peer review in the scientific community. **Creativity** Application of knowledge and logical thinking skills are integral to scientific investigation					
Aspirations & Careers	**CEIAG** Aerospace shadowing CDI: 6 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					